



July 5, 2007

**Technical Sessions on Water Issues – EA0607-002:
Tamerlane Ventures' Pine Point Pilot Project
July 17-18, 2007 Ptarmigan Inn, Hay River, NT
AGENDA**

Introduction: Explaining the Technical Sessions Format

1. These Technical Sessions are designed so that technical experts can have face-to-face, informal and open discussions on the issues specified by the Review Board (with input from parties), on water issues. For more information, see *Notes from the Pre-Technical Sessions Meeting and Teleconference* conducted on June 27, 2007 (available on the MVEIRB website public registry).
2. Alistair MacDonald from the Review Board will be facilitating the sessions. This is an informal setting, where dialogue is encouraged. However, we have limited time to discuss these issues, and discussion in the plenary will not be allowed to diverge from the identified topics. Parties should feel free to address other issues in sidebar discussions during breaks, and through other venues provided by the EA. Discussion topics that diverge from water issues will not be included.
3. For each of the four identified topics, the developer will first be asked to give a presentation dealing with the general considerations and specific questions identified (see attached material for specifics). Questions will be entertained only after the presentation is complete.
4. After presentations are complete and clarification questions are posed, there will be an open forum for dialogue, with any of the technical experts present allowed to pose specific questions to the developer, make statements regarding their thoughts on the accuracy of estimates, and promote potential mitigation or required additional work.
5. The facilitation team will try to keep the discussion focused, and capture some of the key ideas being expressed. Once all the technical experts have had an opportunity to speak to an issue, the facilitator may attempt to guide the room toward a consensus, or to identify specific areas that are still in dispute. All technical experts are encouraged to think about specific action items; Technical Sessions are a valuable opportunity within an EA to develop consensus and identify mitigation in a cooperative forum.
6. The sessions will be digitally taped and a copy of the recording placed on the public registry for the EA. There will be no written verbatim transcripts. Draft meeting minutes with Action Items (“undertakings”), commitments to mitigate or do further work, will be distributed to attendees for comment prior to their release to the Public Registry.
7. Reporting will be guided by Chatham House Rules, where unless specified, people’s comments will not be attributed in the meeting minutes.

***NOTE: TOPIC DISCUSSION TIMES IN THE AGENDA ARE APPROXIMATE ONLY.
EACH TOPIC WILL BE DISCUSSED IN AS MUCH TIME AS IS NECESSARY.**

Day 1: July 17, 2007

| TIME | TOPIC |
|------------------|--|
| 8:30 – 8:45 am | <i>SETTLING IN</i> |
| 8:45 – 9:15 | Introduction to the Technical Sessions <ul style="list-style-type: none"> <input type="checkbox"/> Welcome and Opening Remarks from the Review Board <input type="checkbox"/> Discussion of the Role of Technical Sessions <input type="checkbox"/> Agenda Review and Goals for the Day <input type="checkbox"/> Discussion of the Format and Rules of Order |
| 9:15-10:15 | Topic 1: Analysis of different scenarios of water inflows to the mine, and what potential increases in water quantity might mean for impacts on the environment (SEE DETAILED QUESTIONS BELOW) <ul style="list-style-type: none"> <input type="checkbox"/> Developer presentation on topic, addressing specific questions <input type="checkbox"/> Open forum for experts to discuss, ask questions |
| 10:15 – 10:30 am | <i>WE WILL TAKE REFRESHMENTS AND HAVE A STRETCH</i> |
| 10:30 – 12noon | Continuation of Topic 1 discussion |
| 12noon - 2:00 pm | <i>WORKING LUNCH: SITE VISIT TO THE R-190 LOCATION</i> Parties are responsible for their own transportation. MVEIRB will provide a bagged lunch for attendees and directions to the R-190 site. |
| 2:00 pm – 3:15 | Topic 2: Confidence in predicting water discharge characteristics |
| 3:15 – 3:30 pm | <i>WE WILL TAKE REFRESHMENTS AND HAVE A STRETCH</i> |
| 3:30 – 5pm | Topic 2 discussion continued Break for the day at 5pm, unless parties agree to move forward |

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Day 2: July 18, 2007

| TIME | TOPIC |
|------------------|--|
| 8:30 – 8:45 am | <i>SETTLING IN</i> |
| 8:45 – 9:00 | Refresher on Technical Sessions Format <input type="checkbox"/> Day 2 Opening Remarks from the Review Board |
| 9:00-10:15 | Topic 3: Potential impacts of different water components on the immediate (gravel pit) and surrounding receiving environment, with an emphasis on potential impacts of salts, ammonia, nitrates, and metals |
| 10:15 – 10:30 am | <i>WE WILL TAKE REFRESHMENTS AND HAVE A STRETCH</i> |
| 10:30-12 noon | Continuation of Topic 3 discussion |
| 12noon - 1:00 pm | <i>LUNCH BREAK (CHOOSE YOUR OWN ADVENTURE)</i> |
| 1:00 – 3:00 pm | Topic 4: Water quality management planning |
| 3:00 – 3:15 pm | <i>WE WILL TAKE REFRESHMENTS AND HAVE A STRETCH</i> |
| 3:15 – 4:30pm | Topic 4 discussion continued |
| 4:30 – close | Review Board Overview of Technical Sessions outcomes and Next Steps |

Technical Session Topics, General Considerations and Specific Questions

Introduction

On June 19, 2007, the Mackenzie Valley Environmental Impact Review Board (the “*Review Board*”) determined that Technical Sessions were required for EA0607-002. These sessions will be held at the Ptarmigan Inn in Hay River on July 17-18, 2007, and will focus on water issues. For more specifics, please consult the file “*Announcement of Technical Sessions in Hay River*” on the Review Board’s website -

http://www.mveirb.nt.ca/upload/project_document/1182379709_technical%20sessions%20with%20tip%20sheet.pdf.

Four main topics were identified for the Technical Sessions by the Review Board. Parties were asked at the Pre-Technical Sessions Meeting, held on Wednesday, June 27, 2007, to identify any additional water issues they felt needed to be included in the Technical Sessions. Any comments received by July 4, 2007, from any parties to the EA have been considered in the agenda and specific questions posed herein.

The Review Board, with assistance from its expert advisors and the aforementioned comments from parties, has posed several questions under each of the four main topics that it feels need to be addressed before the Review Board can make proper determinations of any potential impacts, their significance, and the ability of proposed mitigation to manage those impacts. The developer is invited to address these questions with written replies on the Public Record prior to the Technical Sessions. The more information that is available prior to the Technical Sessions, the more effective the sessions will be. **More importantly, however, the developer needs to be ready to address each of the questions posed here at the Technical Sessions themselves.**

On July 6, 2007, the Review Board will be issuing a list of “water-related” material on the Public Registry for this EA file. This list will identify in one place all of the documents on the Public Registry that might merit consideration as the developer and parties are preparing for the Technical Sessions. **The Review Board has set a deadline of 12pm (MST) on July 6, 2007, for any additional resources to be forwarded for inclusion on this list of relevant materials.**

If you have any questions about the proposed format, agenda or topics of the Technical Sessions, contact

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Also, if you have not already contacted the Review Board and plan to send technical experts to these meetings, please let Alistair know ahead of time.

Technical Meeting Topics

Topic 1: Analysis of different scenarios of water inflows to the mine, and what potential increases in water quantity might mean for impacts on the environment

GENERAL CONSIDERATIONS: Although the developer has expressed a high degree of confidence in its ability to minimize water inflows to the mine through freezeway technology, specific discussions of the groundwater conditions in the R-190 area by experts are required before previously stated concerns of a variety of parties are put to rest. At present, there are questions of whether the conditions have been adequately characterized.

In addition, one of the goals of Environmental Assessment is to consider “worst case” scenarios and have contingency planning in place for such situations, even if they are considered unlikely. In particular, the potential for significant inflows from the base of the frozen wall seem to merit more consideration.

SPECIFIC QUESTIONS:

- a) There appears to be lack of information provided to date by Tamerlane regarding the potential for upwelling of water from below the base of the mine workings into the mine. Given the properties of the lithology at the base of the workings, it seems very plausible that this rock formation could be an aquifer. Can Tamerlane, given its limited data, confidently assert that water inflow into the bottom of the workings is to be manageable and not significant?
- b) Can Tamerlane justify its use of the Beak 1981 study as the main input for its desk-top inflow study? This study was apparently conducted for the purpose of a pump-out mining system, not a freezeway system as is currently proposed.
- c) Tamerlane estimated an inflow to the underground workings (main sump in shaft at 165m depth) of 55 m³/hr (DAR, p. 148). Which method was used and which assumptions were made to arrive at this estimate? Is this a steady-state estimate of basal inflow (below the freeze wall) or an average pumping rate over the period of progressive dewatering over the period of the PPPP? What is the estimated range of uncertainty in this estimate?
- d) Tamerlane proposes to use a pumping system with a maximum capacity of 2,273 m³/hr. This capacity is significantly (about 40 times) higher than the estimated inflow to the underground workings. What is the basis for selecting this capacity? In the DAR, it states that this capacity is sized for any unforeseen inflows of water. If such high inflows were to occur the infiltration basin would be at capacity within about 17 days. Has Tamerlane developed any contingency plans for discharge of these large quantities of deep groundwater pumped to surface in the event of an unforeseen inflow of this magnitude?
- e) What is the relationship between an operational failing (not failure) of the freezeway and water inflow? For example, if the wall proves 5%-10% percent less effective than predicted, how much water will have to report to the surface? What are the implications of this? Is there a margin of error for the effectiveness of such freezeway systems? What has the margin of error been in other locales?

Topic 2: Confidence in predicting water discharge characteristics

GENERAL CONSIDERATIONS: Overall, concerns have been identified about the limited amount of on-site baseline data. In particular, there is a lack of information about the likely characteristics of deep groundwater versus that used in preliminary desktop studies, or in shallow well samples.

In addition, the developer has stated in its Information Request responses that it cannot make predictions of likely amounts of nutrients, sediment, and metals that will be deposited in the infiltration basin. Experts at the Technical Sessions will be asked to provide evidence and opinion both on likely discharge characteristics, and what would be the prudent course of action if discharge characteristics cannot be identified with an acceptable level of confidence (e.g., whether additional work needs to be done, either prior to the completion of the Environmental Assessment or in a follow-up water monitoring and management program).

The issue remains that a realistic estimate of effluent quality needs to be prepared and some form of contaminant transport fate and effects analysis of this discharge on ground and surface water quality should be considered.

SPECIFIC QUESTIONS:

- a) The Brown, Erdman & Associates Ltd report from 1981 contains data concerning a well test study at R190. The parameters reported upon appear more extensive than those provided in the 2006 study conducted by Tamerlane. Is there any reason why this data was not included in the DAR and considered? Is Tamerlane aware of this data, is the depth at which the water quality sample was taken known?
- b) In the DAR, Tamerlane has developed its annual ammonia loading from the estimate of using 240m³ of excess ground water. It does not however consider the other 585 m³ that will be sent through the DMS circuit. What is the fate of ammonia passing through the DMS? Should its contribution be included in an overall loading estimation?
- c) Is it possible that ammonia concentrations reporting to the surface may be higher in the PPPP than in the Giant Mine, given the predicted smaller amount of water passing through the mine workings?
- d) Concerning the metal leach testing; is a single test statistically sufficient to estimate the degree of leaching expected from the ore? Is the use of Ontario tap water acceptable as a proxy for deep minewater from this specific location?
- e) Will recycling of water in the DMS lead to concentration of leached metals? What is the fate of such metals if the concentration does indeed occur? Will they report to the infiltration basin, or will they be sorbed onto separated concentrates?
- f) What percentage of metal content moving through the DMS circuit is lost to the receiving environment rather than captured in the concentrate? Of these metals lost, what proportion would likely be in solution and what portion would be in suspension?
- g) What is the principle aquifer at depth that is being intercepted by underground workings? Is it the sulfate-bicarbonate containing aquifer, or is it the aquifer that contains sodium chloride brines? Are highly saline waters expected to be discharged to surface? If so, what chemical properties are they likely to possess? i.e conductivity, chloride content, TDS content

Topic 3: Potential impacts of different water components on the immediate (gravel pit) and surrounding receiving environment, with an emphasis on potential impacts of salts, ammonia, nitrates, and metals

GENERAL CONSIDERATIONS: At its core, an Environmental Assessment is focused on developing confidence that we understand likely changes to the environment from proposed developments. The developer has stated in IR responses that if any impacts occur from process water inflows, they will be *“extremely localized and likely non-detectable within 10-20 metres downgradient of the infiltration basin”*. The developer has also stated, in relation to discharge of nutrients, *“nutrients that exfiltrate into the shallow groundwater table would be rapidly assimilated by the natural biological processes operating in the surface and shallow subsurface overburden of the area.”*

Technical experts will be invited to provide comments on the veracity of such predictions at the Technical Sessions. Participants will be encouraged to consider whether and how specific chemical constituents in the discharge water might impact on the environment and if any of these constituents should be the focus of water monitoring and management programs. The Review Board recognizes that this is a dryland infiltration basin rather than a waterbody receiving environment – expert technical input on probable impacts in this type of environment will be valuable to the Review Board’s decision making process.

In addition, the concerns of the GNWT, particularly those of its Department of Transportation, regarding the potential spiking of metals and other potential contaminants in the infiltration basin merit further discussion by experts.

SPECIFIC QUESTIONS:

- a) Nitrites and Nitrates are not discussed in pg 271 of the DAR. Are they also byproduct of ANFO blasting? Are there any implications regarding such compounds entering the surrounding environment?
- b) What are the implications of discharging highly saline waters to surface on surrounding vegetation, if such waters are expected to be discharged?
- c) Are waters discharged to surface likely to be within the rooting zone of vegetation adjacent to the infiltration basin?
- d) Tamerlane states that the infiltration basin has an infiltration rate of 100 m³/hr (DAR, p. 165). What method was used to estimate the infiltration rate and what assumptions were made? Did the calculation take into account that groundwater may mound beneath the infiltration basin over time?
- e) What information is available about the soil profile (and their hydraulic properties) below and adjacent to the infiltration basin and the depth to the water table in this area? Can Tamerlane better explain how the subsurface composition of the infiltration basin will affect the rate of infiltration as it seems plausible that the clay content within the till material could restrict infiltration rates in the overburden profile?

Topic 4: Water quality management planning

GENERAL CONSIDERATIONS: The level of detail on monitoring, management and contingency plans in the developer's submissions merit further investigation. Water quality management and monitoring should include discussion of Best Available Technologies for treatment, containment and monitoring, and how they apply to direct release into an infiltration basin. Experts in the Technical Sessions will be invited to identify whether the monitoring and management systems the developer has proposed correspond appropriately to the level of confidence in the prediction of potential impacts.

In addition, parties have identified longer-term water management issues that should be addressed in the reclamation and closure planning as a sub-topic that needs to be addressed. In their DAR submission, the developer provides limited information on water related closure issues, including reflooding of the underground workings and associated water quality issues, and monitoring/mitigation of a potential seepage plume that might develop beneath the infiltration basin. INAC has pointed out that a newly updated version of the *Mine Site Reclamation Guidelines for the Northwest Territories* dated January 2007 are available for reference; Appendix A of which has an example of general content of a Closure and Reclamation Plan. The developer will be asked to identify specific reclamation measures for the underground workings and its influence on groundwater or potentially surface water quantity and quality.

SPECIFIC QUESTIONS:

- a) Is Tamerlane planning to implement the BIODISK system at the mine site? What is the background context to the sewage treatment plant data provided in the IR responses given no information appeared to be available regarding at what capacity the RBC was operating at, or other factors that might be of consideration?
- b) Has Tamerlane given consideration to what conditions would lead to the implementation of adaptive management procedures for discharge of mine and process water? Notwithstanding any water quality/quantity criteria required by the MVLWB in a licence, what would Tamerlane consider to be unacceptable in terms of discharge water characteristics? In other words, what are the cutoff lines?
- c) Discussion is required, at least conceptually, on installation of site specific water quality and baseline data and monitoring points for long term monitoring of the basin area.
- d) What is the estimated time for complete reflooding of the underground workings? What is the expected water quality of the mine water pool after end of reflooding? What is the estimated fate of any potential contaminants of concern in the mine water pool, i.e. where and when could this water discharge to surface? What is the estimated impact of this mine water pool on nearby aquatic resources (aquifers and/or streams) in the long-term?
- e) The mine water pumped to surface and discharged into the infiltration basin may have elevated concentrations of TDS and potentially other contaminants of concern. Infiltration of this mine water into the shallow subsurface may result in the development of a "salinity plume" beneath the infiltration basin. What monitoring is planned by Tamerlane for this mine water plume in the shallow aquifer post-closure? What contingency plans has Tamerlane developed to mitigate any potential environmental impacts of this mine water plume after closure?
- f) What are the best practices and reclamation techniques for a pilot project of this nature and the freeze curtain system, as noted on page 414 of the DAR?
- g) How will the freeze pipe brine be removed, what measures will be in place to prevent spillage/seepage and what are the disposal options that Tamerlane is considering?
- h) How will refilling freeze pipes with grout affect long term groundwater flow in the area?