Appendix 9 D

Report from Independent Review of TMA Design

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30th July 2013

Guyana Goldfields Inc.
258 Thomas Street
North Cummingsburg
GEORGETOWN GUYANA

Attention: Mr Ashley Martin

Dear Ashley,

RE: AURORA GOLD PROJECT – TAILINGS MANAGEMENT TECHNICAL REVIEW

1. EXECUTIVE SUMMARY

At the request of Aurora Gold Mines Inc., Knight Piésold has undertaken a high level technical review of the Early Works Earthworks Design generated by Tetra Tech Inc for the Guyana Gold Project, Guyana.

Limited detailed design data was provided for this review. Detailed calculations have not been generated by the reviewer to confirm the design basis or assumptions made by Tetra Tech Inc.

The main points noted during the technical review are summarised as follows:

- River Diversion Dike: The consequences of failure of the Dike into the open pits and underground workings are considered to be catastrophic. Overtopping, instability of the dike during seismic events, instability of the pit leading to dike failure / river ingress and liquefaction of the foundation are considered to be major risks. These risks were not formally quantified in the documentation provided for review and it is not clear as to whether all mechanisms and consequences of failure have been fully considered. We recommended that this process is formalised to ensure all risks have been fully addressed.

- Tailings Management Area: The consequences of failure of the TMA are considered high and as such warrant a rigorous design process during which potential risks associated with failure of the facility are identified and appropriate mitigation measures incorporated into the design. A detailed dam break assessment was not sighted during the review for the TMA (or the Dike) and as such, it is not clear as to whether all mechanisms and consequences of failure have been fully considered. We recommend that this process is formalised to ensure all risks have been fully addressed.

- Tailings Management Area: The design of the TMA is based on continual discharge from the facility. Based on the data and modelling sighted, it was not possible to confirm that concentrations of environmentally significant elements will meet discharge limits at all times during operation. We recommend that a detailed dilution / concentration / water balance model is formalised that confirms that discharge under all operating and climatic conditions will be possible.

- The overall tailings management concept appears to be feasible. No fatal flaws were noted with the overall TMA development plan presented.

2. SCOPE OF WORK

The scope of the review is summarised as follows:

- Undertake a high level review of the design.

- Provide comment on any 'fatal flaws' identified during the review.

It is noted that due to the limited technical data provided for review, comments are primarily based on an engineering judgement assessment. Calculations have not been checked.

3. DATA PROVIDED

The following documents (generated by Tetra Tech Inc. and issued 19th June 2013) were provided as the basis for the review:

- Early Works Engineering Design Report (Ref: 11485005300-REP-R005: 20/06/13).

- Early Works Engineering Specifications (Ref: 11485005300-REP-R007: 20/06/13).

- Early Works Engineering – Issued for Construction Drawing set (IFC: Rev 0 and 1).

- AMEC Environmental and Infrastructure – Meterological Data Review Memo. 4th October 2011 (TC113920-500).

In addition, the following reports had been sighted as part of the review process:

- NI 43-101 submission – 29th January 2013.

- AGM Technical presentation - 14th January 2013.

- Preliminary drawing set – 1st February 2013.

4. EARLY WORKS ENGINEERING REVIEW

4.1 GENERAL

4.1.1 Climatic conditions

Raw data used to generate the assumed climatic conditions was not sighted.

No issues were noted based on the review undertaken of the summary document generated by AMEC (provided 5th July 2013). It is noted that AMEC had identified the limited availability of in-country / site specific climatic data sets as an issue and had attempted to address this during their assessment.

4.1.2 Seismicity

Reference made to earlier probabilistic assessment generated by AMEC-Geomatrix in 2010 which nominated the following parameters:

- Maximum Credible Earthquake (MCE) = 0.19 g (1 in 10 000 yr ARI).
- 1 in 5 000 yr ARI = 0.13 g.

Based on global seismic hazard maps, the site is located in an area of low to moderate seismic risk and the values adopted for design appear valid.

4.1.3 Geotechnical Investigation

A number of geotechnical investigations (five phases) have been undertaken by numerous parties between April 2009 and 2013. Tetra Tech provided partial oversight of the last two phases (Phase 4 and Phase 5).

Investigation, insitu testing and laboratory testing are generally considered sufficient to support the Early Engineering Phase.

Alluvial deposits, potentially liquefiable, were identified within the foundations of a number of major structures. These are considered to pose a significant stability and seepage risk and will require appropriate works during construction to ensure the foundations remain stable in the longer term.

An assessment of the liquefaction potential of alluvial deposits identified within the embankment footprints was not sighted. It was noted however that the materials were assumed to liquefy as part of stability assessments. We were not able to verify that the full impact of liquefaction of foundation materials had been fully considered (assessments appear to be based on a reduction in strength of the materials – the impact of global foundation stability was not clearly documented).

4.2 RIVER DIVERSION DIKES

4.2.1 General

The river diversion dikes are located close to the proposed open pits, with the East River Dike located within 50 m of the pit crest. Seepage, stability and freeboard are all considered significant risks.

The zone of subsidence of the proposed underground development and its possible impact on the stability of the diversion dikes was not sighted. It is suggested that this is incorporated formally in seepage and stability assessments.

4.2.2 Flood routing

A range of river flood levels in the vicinity of the open pit have been sighted during the review. Preliminary assessment indicates that the levels determined are sensitive to minor changes of the design assumptions. Based on the data provided, it was not possible to confirm the validity of the flood levels adopted for design.

It is noted that the design has been staged, Phase 1 based on a 1 in 100 yr ARI 24 hr storm, and a follow up phase including protection for a 1 in 1 000 yr ARI or 1 in 10 000 yr ARI storm event. The timing of the phasing was not clear in the report. It is suggested that the timing of the ultimate phase be confirmed.

Freeboard provisions appear appropriate. However, it is suggested that these be reconsidered in conjunction with a sensitivity and risk assessment of the likely flood regime.

4.2.3 Stability

Stability model outputs provided indicated the assessment of the diversion dike and immediate foundation area stability did not appear to consider interaction with the open pit. It is suggested that pit / dike stability be considered concurrently.

An assessment of the liquefaction potential of the alluvial deposits within the embankment footprint area were not sighted. We recommend that this assessment is formalised to ensure all possible mechanisms associated with liquefaction of the material are considered (eg: global block failure into the pit).

It is noted that the materials were assumed to liquefy as part of a pseudo static stability assessment, however, it is not clear that this approach was incorporated in the actual models (models indicate an 80% reduction in strength). It is suggested that a detailed finite element deformation assessment may be more appropriate in this case.

4.2.4 Seepage

Based on the available geotechnical investigation data, seepage would be expected to be a significant issue both in terms of the water reporting to the pits and the possible instability caused by strong seepage / piping through the alluvial deposits within the foundations of the diversion dikes.

The design report suggests a cut off wall be included in the construction of the diversion dike, but also states that the cut off is *'not required, but should be considered'*. We would suggest a definitive assessment is required in this area due to the significant risks associated with a dike failure, pressurisation of potentially liquefiable soils within the foundation footprint and / or uncontrolled seepage entering the pits.

4.2.5 Settlement

Deformation estimates generated for the river dike indicate total settlements within the foundation soils in the order of 1 m may be expected due to consolidation. It is accepted that the majority of settlement is likely to occur during construction and therefore may be rectified by default as part of ongoing construction activities.

It is noted that embankment freeboard is set at 1 m, and as such, it is suggested that the freeboard provision be reviewed in light of the possible longer term settlement estimates and the resulting increased flood risks to the pit.

Deformation estimates for the dike and foundations during seismic events were not sighted. It is recommended that provision be made in the freeboard allowances to accommodate settlement induced by seismic events. Due to the low probability of a flood event occurring simultaneously with a seismic event, it is considered possible to manage this risk with operational monitoring procedures and remediation plans.

4.2.6 Monitoring

It is noted that real time monitoring has been included in the diversion dike design and this is considered appropriate. Operating guidelines were not sighted as part of this review and as such, it is not possible to confirm the integration of the proposed monitoring system with the emergency response procedures. Appropriate procedures must be generated prior to commissioning.

4.2.7 Closure

Breaching of the dikes has been nominated as the closure strategy and we have no issues with this concept. No details were sighted on the post closure profile (closure details were not been generated as part of the IFC documentation).

4.2.8 Risk assessment

A dam break / risk assessment for the River Dike was not sighted as part of the review. As the consequences of failure are high, it is suggested that a risk assessment be completed to ensure appropriate controls, measures and surveillance is in place to manage the associated risks.

4.3 TAILINGS MANAGEMENT AREA

4.3.1 Dam Failure Consequence Category

A risk assessment / hazard rating for the facility was not sighted.

It is noted that the process plant is located immediately downstream of the main embankment and may be located within the inundation area if the main embankment failed. Based on preliminary review, it is expected that inundation of he plant site may be limited, however, it is recommended that this is formally reviewed and documented.

In addition, the open pits are located downstream of the TMA and depending on the timing, may also be significantly impacted by embankment failure.

Based on ANCOLD (May 2012) and a preliminary assessment, the tailings management system would be considered to have a ‘HIGH’ dam failure consequence category, resulting in a requirement to adopt a rigorous design approach. It has not been possible to verify the level of design adopted based on the limited documentation provided. However, it is noted that the parameters adopted as the design basis for stability / seismicity and flood routing appear to be in accordance with the dam failure consequence category of ‘HIGH’.

4.3.2 Tailings Geochemistry

Geochemical laboratory testing of a tailings sample data was sighted as part of this review.

Interpretation of the data was not sighted. It is recommended that the interpretation is documented to confirm that environmentally significant elements will not be mobilised, either in the supernatant or seepage during operation of the facility.

It is noted that tailings will be detoxified using an air / SO_2 cyanide destruction system and tailings will be delivered to the TMA with a CN_{WAD}< 0.5 ppm.

We recommend that this aspect be confirmed with appropriate modelling.

4.3.3 Tailings Geotechnical parameters

Limited geotechnical laboratory testing data sighted as part of this review (generated as part of metallurgical testing).

Settling and associated geotechnical parameters appear to have been assumed based on previous experience and no formal laboratory testing has been undertaken.

A fully consolidated dry density of 1.4 t/m^3 has been adopted as the insitu tailings density. We would suggest that this is at the upper limit for fine tailings (P_{80} = 109 µm) deposited effectively sub aqueously (predominantly flooded tailings basin) in a wet climate. We would recommend that a density of 1.0 t/m^3 may be more appropriate for the initial development of the facility.

The assumed 1 % beach slope may not be appropriate in a flooded basin condition. A steeper slope may be expected depositing into a flooded basin which is likely to impact the rate of rise of the tailings beach at the main embankment. This may require additional deposition points to achieve the planned Staged construction timing.

It is suggested that embankment staging plans be confirmed based on a sensitivity assessment of achieved insitu density and beach slopes prior to commissioning.

4.3.4 Stability

Stability assessments generally appeared appropriate.

We would suggest that a pseudo static assessment to simulate seismic loadings may no longer be considered appropriate for a facility of a ‘High’ failure consequence (ANCOLD 2013).

Details of how the possible liquefaction of the foundation insitu alluvial soils was accommodated in the design process / stability assessment were not sighted.

4.3.5 Water balance

Limited water balance modelling output was sighted as part of this review (Attachment C).

Forecasts indicate discharge of excess water from the TMA via the spillway into Diversion Pond 2 will occur within the first two years of operation.

Water quality discharge limits were not sighted as part of this review.

No details on the likely quality of the excess / discharge water quality were noted.

We have some concerns that the water quality may not be suitable for release at all times during operation and post closure. It is not clear how this scenario would be accommodated within the current design.

4.3.6 Tailings delivery and containment systems

No details sighted.

It was noted that tailings will be pumped / piped to the TMA. No reference to a pipeline containment system was noted. Some controls would be expected.

4.3.7 Basin preparation

No basin preparation works were noted.

Based on the available data, it is understood that the existing vegetation will be removed and insitu soils will be left in their current condition and not removed or reworked.

The following points are noted:

- Without sighting geochemical / dilution / concentration modelling of the tailings supernatant and solids, it is not possible to verify the validity of the approach adopted.
- The non removal of topsoil has impacted longer term closure plans when material is required to cap facilities.
- The insitu condition of the basin soils will not control seepage rates from the facility. This may be an issue if water quality does not meet expectations and discharge requirements post closure.

4.3.8 Tailings deposition system

No details sighted. Based on the beach profile, it is assumed that a multiple point spigot discharge system off the northern embankments is envisaged. This approach is considered appropriate.

4.3.9 Embankments

The overall embankment geometry nominated at each location is considered suitable.

Embankment designs are based on a homogeneous embankment fill with a limited cut off trench and are considered suitable where tailings will beach on the upstream batter of the embankment.

4.3.10 Decant return system

No details of the proposed decant return system were sighted.

It is noted that decant recycle has been assumed in the water balance modelling.

4.3.11 Spillway

The spillway design provided appears satisfactory. No issues noted.

4.3.12 Monitoring system

The monitoring system nominated generally appears satisfactory. It is suggested that monitoring be included in all embankments and saddle dams.

4.3.13 Closure

It is noted that the TMA will be capped and revegetated and that runoff from the area will report to the spillway constructed for the operational facility. No details on the capping geometry or capping material availability were noted during the review of the IFC documentation. It is suggested the closure details be verified and formally documented.

4.4 SURFACE WATER DIVERSION SYSTEMS

4.4.1 Embankments

The southern embankments (tailings / diversion embankments) that are effectively long term water retaining structures include erosion protection which is considered appropriate.

4.4.2 Diversions

The diversion systems at the southern extent of the TMA generally appear satisfactory. We would recommend that the diversion systems be designed based on a PMP storm event to ensure that floods cannot back up and route back into the TMA.

It is noted that the fresh water pond and mine water pond designs and details were not included in this review.

4.5 JANUARY 2013 NI 43-101 / TECHNICAL PRESENTATION REVIEW

In addition to the Early Works Documentation provided for the formal review, background information provided by AGM was sighted in January 2013 during which the following points noted:

Tailings Management Area costs:

- Up front capital costs are lower that would be typically expected.
- Sustaining capital costs are lower than would be typically expected.
- Rehabilitation costs are lower than typically expected.

Tailings Management Area design:

- Detox / dilution approach – appears feasible in concept. Calculations not verified.
- Impact of TMA and MWP seepage / recharge on pits / underground workings – not sighted. We had noted that groundwater models have only considered the river – we would expect some impact due to the TMA and associated water storages.
- Closure / capping detail not sighted. A soil cover and revegetation had been noted as the capping detail, however, this did not appear to match with the cost estimate of $0.8M that had been noted (subsequently advised that the allowance included for the recovery and scrapping of plant and equipment on closure and therefore was not a true reflection of the actual amount budgeted, however, we have not sighted the detailed breakdown).

5. CONCLUSIONS

No fatal flaws were noted during the high level review completed.

6. RECOMMENDATIONS

It is recommended that:

1. That the tailings geochemistry and associated dilution / concentration modelling be documented, with specific regard to the potential for environmentally significant elements being released at levels which exceed designated discharge limits.

2. A formal risk assessment of the river dike structure, tailings management area and associated surface water management systems be undertaken.

3. A dam break assessment be completed for the river dike structures, TMA and associated surface water management structures.

4. A sensitivity assessment is undertaken on the achieved insitu density of deposited tailings to confirm embankment freeboard and staging provisions are adequate for a range of values. It is recommended that, at a minimum, an achieved density of 1 t/m^3 be used to confirm interim storage requirements.

We trust this provides sufficient detail at this stage, however, should you require further information, please contact us.

Yours sincerely,
KNIGHT PIÉSOLD PTY LTD

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