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On behalf of Flinders Mines Limited

Independent Third Party Review of Mine Waste Characterisation
Pilbara Iron Ore Project: Process Waste Tailings

EXECUTIVE SUMMARY

In 2011, Graeme Campbell & Associates Pty Ltd (GCA) completed a geochemical characterisation and assessment program for a single process tailings solid sample from the Pilbara Iron-Ore Project (PIOP): for Flinders Mines Limited (FMS). The purpose of the GCA program of work was to predict the potential environmental risks posed by the process waste tailings materials during mining and post-closure.

RGS has undertaken an independent third party review of the GCA 2011 report and finds that the static and kinetic geochemical characterisation and assessment of the process waste tailings is generally ‘fit for purpose’. Overall, RGS is satisfied that the sampling, testing and assessment of tailings materials aligns with Australian and internationally recognised practices.

It is not clear from the GCA 2011 report whether the composite samples of ore materials used to generate the single tailings solids sample provide a reasonable representation of the tailings solids likely to be generated by the Project. A later report by Worley Parsons (2012) suggests that the single tailings solids sample was generated from simulated processing of composite ore materials from the detrital iron deposit (DID) and Brockman iron deposit (BID) ores of the Delta deposit from the Blacksmith tenements. No Channel Iron Deposit (CID) ores were included in the composite ore materials used to generate the tailings solid sample, although it is currently not clear whether CID ores will be mined at the Project along with DID and BID ores. If CID ores are to be mined at the Project, these should have been included in any tailings solid materials used for geochemical characterisation and assessment and/or a clearer explanation provided as to the logic behind the selection of various ore materials used to generate the tailings solid sample.

The composite samples of ore materials used to generate the single tailings solids sample were sourced from only one of the deposits to be mined at the PIOP (Delta deposit). This is not explained in the GCA 2011 report and no explanation is provided as to the why this sampling approach was taken.

The sample preparation and laboratory methods and procedures employed by GCA for the characterisation and assessment of the tailings solid sample are appropriate and align with industry guidelines and standards. However, the specific methods/procedures used by GCA for the tailings solid sample should be reported rather than generic methods/procedures.

In RGS’s opinion, the process tailings materials represented by the single tailings solid sample are considered to pose a low environmental and human health risk at the Project. This finding supports the view provided in the GCA (2011) report.

Any decision on the need (or otherwise) for further geochemical characterisation and assessment of process tailings materials at the Project should be guided by whether it can be clearly and confidently demonstrated that the single tailings solid sample tested by GCA in 2011 provides a reasonable representation of the tailings solids likely to be generated by the Project.

The potential criticism that not all of the ore types and only one of the deposits (Delta) were used to generate the tailings sample could possibly be addressed by using existing information, some of which is already contained in Project reports (eg. Worley Parsons, 2012), to better illustrate and verify the claims that:

- There is a high degree of geochemical homogeneity between deposits at the Project;

- The geochemical results can be extrapolated between deposits with a high level of confidence;
- The inclusion of the CID ore type in the composite ores used to generate the tailings sample would not have significantly changed the geochemical characteristics of the tailings sample;
- Similar geochemical results from other deposits in the Pilbara region, which share related geology and style of mineralisation (channel iron deposits - CID), support these claims.

If the veracity of these claims can be better illustrated and verified, it may not be necessary to undertake further or more elaborate geochemical characterisation of tailings materials at this ‘approvals’ and ‘mine planning’ stage, as based on the current results, these materials probably pose a low risk and can be managed using standard operating procedures at a Tailings Storage Facility (TSF) by FMS during mining and post closure.

On the other hand, only a single tailings sample has been geochemically characterised to date, and therefore a higher level of confidence regarding the predicted geochemical nature of the tailings materials could be gained by additional sampling and testing of tailings samples as the Project develops.

1. INTRODUCTION AND SCOPE

RGS Environmental Pty Ltd (RGS) has been requested by Preston Consulting on behalf of Flinders Mines Limited (FMS) to complete an Independent Third Party Review of mine waste characterisation and assessment work completed by Graeme Campbell & Associates Pty Ltd (GCA) in 2011. The mine waste characterisation and assessment work was associated with a single sample representing process waste tailings likely to be generated from the Pilbara Iron Ore Project (the 'Project').

The Project is located in the Pilbara region of Western Australia (WA), approximately 60 km north-west of the town of Tom Price. The Project site is located within a Public Water Protection Area (Water Reserve) and therefore tailings disposal is a key issue for the Stage 2 approvals process currently underway.

In 2012, during the regulatory assessment of Stage 1 of the Project, the WA Environmental Protection Authority (EPA) indicated that the tailings characterisation and assessment work conducted may not be sufficient and stated that:

"*The proponent will need to undertake more detailed characterisation of the materials that will be disposed into the TSF and locate and design the facility to demonstrate that it does not present an unacceptable risk to the Water Reserve. The EPA recommends that the proponent consults with DoW, DMP and DER in regard to waste characterisation and the design and location of the TSF prior to referring Stage 2".*

The geochemical work completed by GCA on simulated process waste tailings from the Project is documented in one main memo style report:

- Graeme Campbell & Associates Pty Ltd (2011). *Flinders Pilbara Iron-Ore Project (FPIOP): Geochemical Characterisation of Process-Tailings-Solids Sample and Management Implications* Consultants report prepared for Flinders Mines Limited, 15 November 2011;

The GCA memo report also contains four attachments namely:

1. Worley Parsons (2011). *Pilbara Iron Ore Project Tailings Sample Testwork:* Consultants report No. 201012-00322 prepared for Flinders Mines Limited Limited, 30 August 2011;
2. Test work Methods*:* Generic description of test work methods used by GCA and commercial laboratories for the tailings characterisation work program;
3. Acid Forming Potential (AFP): Calculated Parameters and Classification Criteria; and
4. Laboratory Reports: Mineralogy, Static and Kinetic Test Results.

RGS has been engaged by FMS (through Preston Consulting) to technically review the GCA report and provide comment on the adequacy of the geochemical characterisation and assessment work with respect to predicting the potential environmental risks posed by the process waste tailings materials during mining and following closure.

Specifically, the review documented herein has considered the:

- Representativeness of samples used in the geochemical assessment;
- Sample preparation, laboratory methods and analytical results;
- Data assessment; and
- Appropriateness of findings and recommendations proposed.

In the context of the purpose of the assessment and review, RGS has provided commentary on the overall environmental risks posed by the process waste tailings materials and the need (or otherwise) for further geochemical characterisation and assessment of these materials.

2. TECHNICAL REVIEW

The technical review focuses on the adequacy of the data and whether the methodology and rationale applied by GCA (and FMS) is appropriate. The review does not attempt to re-assess the data.

2.1 Sample Representativeness

Tailings Solids Sample

The GCA 2011 memo report contains information on the source and composition of the single tailings solids sample used for the characterisation and assessment work in Attachment 1 (Worley Parsons, 2011). The tailings solids sample was generated from simulated processing of ore materials from the detrital iron deposit (DID 2, DID 3 and DID 4 composites) and Brockman iron deposit (BIDg and BIDh composites) ores of the Delta deposit from the Blacksmith tenements.

RGS Comment: It is not clear from either the GCA report (or Attachment 1) whether the composite samples of ore materials used to generate the single tailings solids sample provide a reasonable representation of the tailings solids likely to be generated by the Project.

Further investigations by RGS of publicly available Stage 1 approval documents for the Project reveal the presence of a Worley Parsons report, which provides broader information on this topic.

- Worley Parsons (2012). *Geochemical Characterisation of Mine Waste and Tailings. Implications for Mine Waste Management.* Report No. 201012-00322-0000-EN-REP-0011. 31 July.

The 2012 Worley Parsons report contains the GCA 2011 report on the tailings solid sample (Appendix B), but provides additional information on the location and types of ore materials used to generate the composite tailings solid sample.

Figure 1 (overleaf) is reproduced from the Worley Parsons 2012 report and shows the various deposits at the Blacksmith tenements of the Project. The 2012 report indicates that the tailings solid sample was produced from simulated processing of composite ore samples from the Delta deposit, which appears to be one of six deposits at the Project. It could therefore be simplistically argued that the tailings solid sample only represents a portion of the tailings materials likely to be produced at the Project over the life of mine.

RGS Comment: The composite samples of ore materials used to generate the single tailings solids sample were sourced from only the Delta deposit, the first deposit to be mined at the Project.

However, further reading of the Worley Parsons 2012 report indicates that there is a “high degree of geochemical homogeneity between deposits” at the Project and suggests that “the results can be extrapolated between deposits with a high level of confidence”. The authors state that “This statement is supported by similar results from other deposits in the Pilbara region, which share related geology and style of mineralisation (channel iron deposits - CID)”.

RGS Comment: The high degree of geochemical homogeneity between deposits and similar results from other CID deposits in the Pilbara region with similar geology has also been found by RGS.

Figure 2 (overleaf) is also reproduced from the Worley Parsons 2012 report and shows a schematic cross-section of Pilbara style CID mineralisation. The tailings solid sample was prepared from simulated processing of composite materials from DID and BID ores of the Delta deposit but does not contain ores from the CID mineralisation close to the footwall. The Worley Parsons 2012 report notes that waste bedrock samples below the base of oxidation (shale and CID units from the basement zone) generally have higher sulfur contents than the regolith materials (from above the base of oxidation) and were variously classified as Potentially Acid Forming (PAF) and Non-Acid Forming (NAF) at the Delta, Eagle and Champion deposits. These materials have also only had a modest capacity for buffering (neutralising any acidity) by reactive carbonates. The GCA work on waste rock contained in the Worley Parsons 2012 report states that “shales and BIFs from the basement zone may, or may not, be disturbed by the Project”.

RGS Comment: It is currently not clear whether CID ores will be mined at the Project along with DID and BID ores. If CID ores are to be mined at the Project, these should have been included in any tailings solid materials used for geochemical characterisation and assessment and/or a clearer explanation provided as to the logic behind the selection of various ore materials used to generate the tailings solid sample.

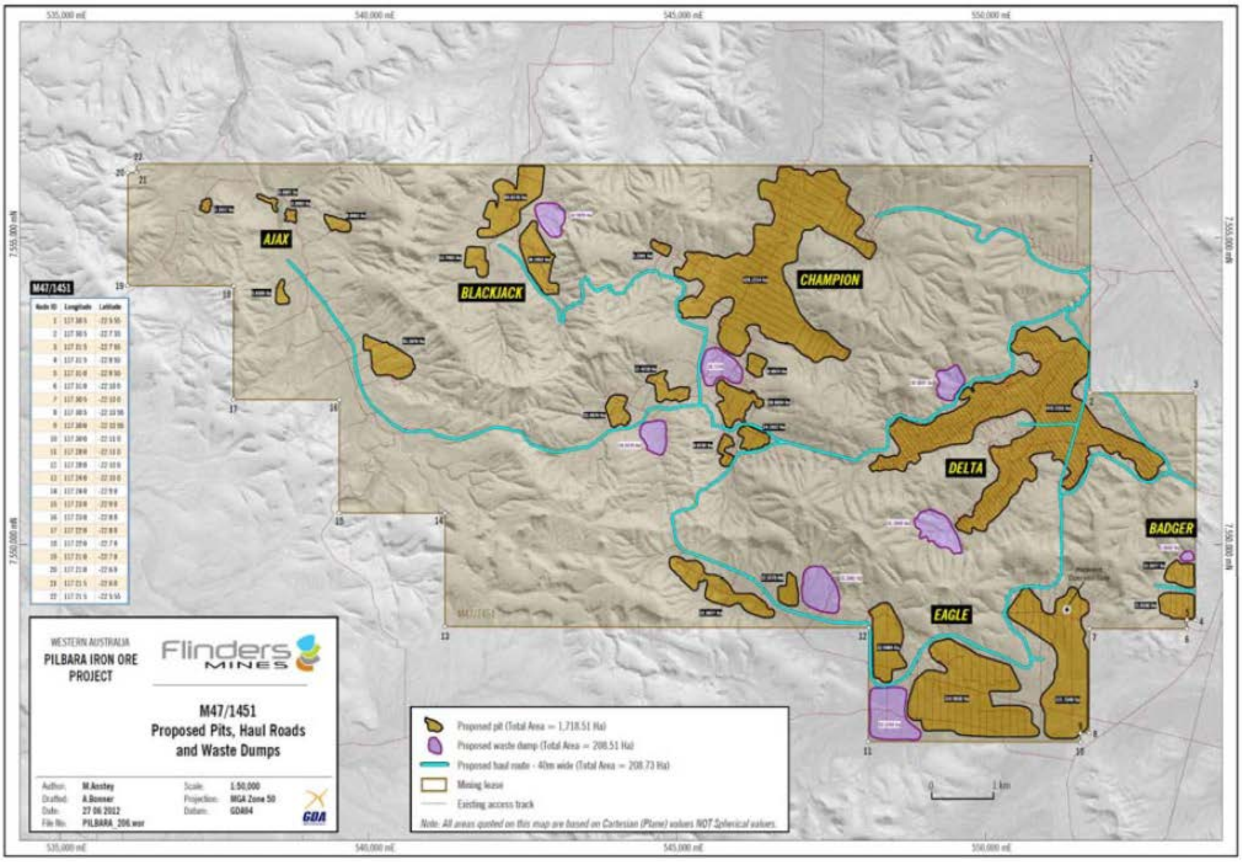

Figure 1: Proposed Pits, Haul Roads and Waste Dumps (Worley Parsons, 2012)

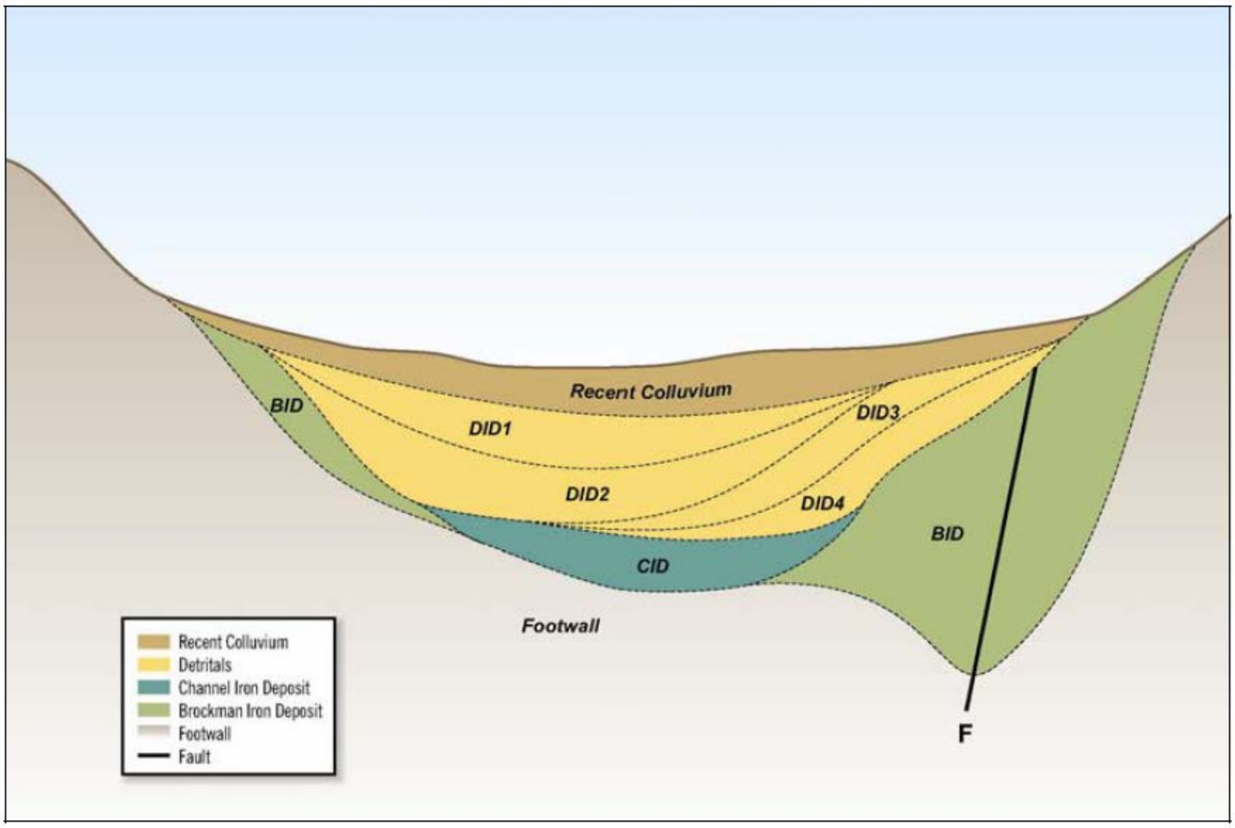

Figure 2: Schematic Cross-Section of Pilbara Style CID Mineralisation (Worley Parsons, 2012)

2.2 Sample Preparation, Laboratory Methods and Analytical Results

Sample Preparation

The GCA 2011 memo report contains information on the sample preparation associated with the single tailings solids sample used for the characterisation and assessment work. Attachment 1 (Worley Parsons, 2011) indicates that composite DID and BID ores from the Delta deposit were crushed to -6.3mm, with the DID2 and DID3 composites subjected to a 0.3 mm wet screening step. In addition to this beneficiation step, the samples were grade controlled and blended to ensure that iron, silicon dioxide and aluminium oxide target grades were met prior to sinter test work.

Prior to geochemical testing, the tailings solid sample was prepared by crushing to nominal 2mm (crushed sample) in a jaw/roll crusher and pulverising to nominal 75 µm (pulps) for specific static and kinetic geochemical tests, as required.

RGS Comment: The sample preparation methods are standard methods used in the mining industry for preparation of mine waste samples and require no further comment.

Laboratory Methods

The single tailings solid sample was provided by FMS/Worley Parsons to GCA for analysis. Paste pH and electrical conductivity (EC) tests were undertaken on a 1:2 (w/w) solid:solution slurry by GCA, using the 'crushed' sample after aging for 24 hours. Total sulfur, sulfate sulfur, total carbon, carbonate carbon, ANC and exchangeable cation tests were completed on the sample pulp by Genalysis Laboratory (part of the Intertek Laboratory group) using standard methods and the sulfide sulfur value and Net Acid Producing Potential (NAPP) calculated from the results obtained. The Net Acid Generation (NAG) test was completed by GCA following the AMIRA (2002) method.

Multi-element (solids) analyses were also undertaken by Genalysis Laboratory using a four acid 'near total' digestion, followed by ICP-MS or -OES analysis. Enriched elements were identified using the *Geochemical Abundance Index* advocated in Australian (DITR, 2007) and international; (INAP, 2009) guidelines. Mineralogical tests were completed by Roger Townsend and Associates using standard mineralogical test methods to provide an indicative abundance of minerals in the solid tailings sample, which is dominated by hematite with sub-ordinate kaolinite, goethite and quartz.

A kinetic leach column (KLC) test program was completed by GCA over a period of six weeks on the tailings solid sample, with weekly flushing using deionised water. The KLC tests and based on those described in AMIRA (2002) with some modifications. Most of the KLC test modifications are considered appropriate however the GCA (2011) report contains generic information on KLC test operation and states that "Prior to commencing the weathering-cycles, the GCA-columns are subjected to a thorough pre-rinsing treatment using deionised-water to elute pre-existing solutes. Pre-rinsing is continued using 1.00-kg lots of deionised-water until the EC value of the "last-incremental-leachate" (e.g. last 100 mL) is less than *c.* 300-500 µS/cm. This pre-rinsing step facilitates interpretation of the kinetic testing results overall". It is not clear from the GCA report what the specific methodology used for the KLC test pre-rinsing step was, although the KLC results in Table 4 indicate that a single pre-rinsing step was used. .

In all other respects, sample preparation and laboratory methods employed by GCA and the commercial laboratories sub-contracted to GCA were appropriate for the tailings solid sample and for the purpose of the geochemical characterisation and assessment. The methods employed generally followed those static and kinetic geochemical test methods recommended and routinely applied within the Australian and international mining industry; such as AMIRA (2002), INAP (2009) and Price (2009). Genalysis laboratory has Australian National Association of Testing Authorities (NATA) accreditation for most of the 'routine' analytical methods undertaken, such as sulfur and carbon species, total metals analysis and soluble metals analysis.

RGS Comment: RGS generally agrees with the laboratory methods and procedures utilised by GCA to characterise the tailings solid sample. However, the methods and procedures are described generically in Attachment 2 of GCA (2011) and the specific methods used for some analysis (eg. the KLC test program) for this project are not clear. It is recommended that the specific methods/procedures used by GCA be reported rather than generic methods/procedures.

Analytical Results

In the context that the laboratory methods employed are generally appropriate and that the correct laboratory procedures have been followed and that GCA and the sub-consulting laboratories used are reputable firms experienced in these analyses, it is assumed that the results are accurate. However, this cannot be assured as no formal laboratory QC/QC reporting information has been provided. No information is provided on chain-of-custody documentation, matrix spikes or laboratory control spikes. However despite this, the analytical results provided include duplicate analyses and control (reference) blanks and standards. There is good agreement between primary and duplicate sample results. Control and reference blank results are shown, but the 'actual' values these reference samples represent is not provided.

Therefore, despite limitations in how the results are reported, RGS accepts that the results are considered to be accurate for the purposes of the assessment.

2.3 Data Assessment

The geochemical results for the tailings solid sample have been assessed in the context of the project geology, mineralogy and GCA's experience with similar CID iron-ore projects in the Pilbara. GCA has considered recognised Australian (AMIRA, 2002) and international (INAP, 2009; and Price, 2009) acid generation classification procedures, which RGS supports. There is no one single classification criteria applicable to all sites/projects, as each project is suitably unique.

Acid generation classification

The GCA report correctly identifies that the tailings solid sample contains negligible sulfides (0.01 %) and trace carbonates (0.07 %) and is classified as NAF.

Samples with a total sulfur concentration of less than 0.1 % are typically regarded as 'barren', with negligible capacity to generate acid (INAP, 2009[1]).

RGS Comment: RGS agrees with the assessment approach undertaken by GCA to assign a NAF classification to the tailings material represented by the tailings solid sample.

Assessment of multi-element enrichment and solubility

Multi-element scans are undertaken to identify any elements (particularly metals and metalloids) present in a material at concentrations that may be of environmental concern with respect to surface water quality and revegetation. There are no guidelines and/or regulatory criteria specifically related to total metal and metalloid concentrations in tailings materials. In the absence of specific guidelines and/or regulatory criteria, and to provide relevant context, GCA has compared the total assay result for each element (mg/kg) to the average background concentration of those elements in soil and rock.

From the comparison with average crustal abundance in tailings solids a geochemical abundance index (GAI) was calculated. The GAI quantifies an assay result for a particular element in terms of the average crustal abundance for that element. As a general rule, a GAI greater than three indicates enrichment to a level that potentially warrants further investigation. This is particularly the case with some environmentally important 'trace' elements, such as arsenic, cadmium, copper and zinc, more so than with major rock-forming elements, such as aluminium, calcium, iron, magnesium and sodium.

Elements identified as enriched may not necessarily be a concern for revegetation, drainage water quality or public health, but their significance should be evaluated. Similarly, because an element is not enriched does not mean it will never be a concern, because under some conditions (eg. low pH) the geochemical behaviour of common environmentally important elements such as aluminium, copper, cadmium, nickel and zinc increases significantly.

GCA has reported that some metals/metalloids in the tailings solid sample, such as antimony, arsenic, silver and selenium are modestly 'enriched' with respect to soils, regoliths and bedrocks derived from un-mineralised terrain. These elements were sparingly soluble from the kinetic leach column tests, producing low concentrations in column leachate. After the pre-flush cycle, the solid tailings sample tested had a very low level of salinity in column leachate.

[1] The average crustal abundance of sulfur is 0.07 %.

RGS accepts the results and interpretations of the multi-element analyses that the concentration of salts, soluble metals and metalloids in seepage/run-off from tailings materials (as represented by the tailings solid sample) would be expected to be low, based on the sample lithology/mineralogy and NAF nature of the sample (*ie*. circum-neutral pH leaching environment).

RGS Comment: RGS agrees with the assessment approach undertaken by GCA to determine the metal/metalloid concentrations in, and potential mobility from, the tailings solid sample.

2.4 Appropriateness of Conclusions

GCA has concluded that based on the geochemical characterisations results obtained from a single simulated sample of tailings solids, the process tailings to be produced by the Project should be geochemically benign. Due to the weathered and leached status of the Project ores, the process tailings that will be disposed into the TSF are not expected to pose an unacceptable risk to the Water Reserve

Assuming that the tailings solid sample is representative of the tailings likely to be produced at the Project and considering the low environmental risks these tailings materials are expected to pose, RGS considers the conclusions outlined by GCA to be reasonable and appropriate.

3. OVERALL ENVIRONMENTAL RISKS POSED BY TAILINGS MATERIALS

In RGS's opinion, the process tailings materials represented by the single tailings solid sample are considered to pose a low environmental and human health risk at the Project. This finding supports the view provided in the GCA (2011) report.

4. NEED FOR FURTHER GEOCHEMICAL CHARACTERISATION AND ASSESSMENT

Any decision on the need (or otherwise) for further geochemical characterisation and assessment of process tailings materials at the Project should be guided by whether it can be clearly and confidently demonstrated that the single tailings solid sample tested by GCA in 2011 provides a reasonable representation of the tailings solids likely to be generated by the Project.

The potential criticism that not all of the ore types and only one of the deposits (Delta) were used to generate the tailings sample could possibly be addressed by using existing information, some of which is already contained in Project reports (eg. Worley Parsons, 2012), to better illustrate and verify the claims that:

- There is a high degree of geochemical homogeneity between deposits at the Project;
- The geochemical results can be extrapolated between deposits with a high level of confidence;
- The inclusion of the CID ore type in the composite ores used to generate the tailings sample would not have significantly changed the geochemical characteristics of the tailings sample;
- Similar geochemical results from other deposits in the Pilbara region, which share related geology and style of mineralisation (channel iron deposits - CID), support these claims.

If the veracity of these claims can be better illustrated and verified, it may not be necessary to undertake further or more elaborate geochemical characterisation of tailings materials at this 'approvals' and 'mine planning' stage, as based on the current results, these materials probably pose a low risk and can be managed using standard operating procedures at a Tailings Storage Facility (TSF) by FMS during mining and post closure.

On the other hand, only a single tailings sample has been geochemically characterised to date, and therefore a higher level of confidence regarding the predicted geochemical nature of the tailings materials could be gained by additional sampling and testing of tailings samples as the Project develops.

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5. REFERENCES

AMIRA (2002). *ARD Test Handbook*: Project 387A Prediction and Kinetic Control of Acid Mine Drainage. Australian Minerals Industry Research Association, Ian Wark Research Institute and Environmental Geochemistry International Pty Ltd, May 2002.

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Worley Parsons (2012). *Geochemical Characterisation of Mine Waste and Tailings. Implications for Mine Waste Management.* Report No. 201012-00322-0000-EN-REP-0011. 31 July.

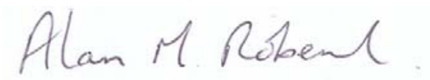
6. LIMITATIONS AND SIGNOFF

The Review was undertaken by Dr Alan Robertson of RGS Environmental Pty Ltd. Alan Robertson is appropriately qualified and experienced in environmental geochemistry and mine waste management to undertake this review. RGS is independent of FMS, Preston Consulting and GCA and has no involvement in the Project other than through this review.

While the discussion and findings presented in this Review are based on information that RGS considers reliable unless stated otherwise, the accuracy and completeness of source information (outside of RGS' control) cannot be guaranteed. RGS has made no independent verification of source information beyond the agreed scope of works and beyond the documentation provided to RGS. RGS assumes no responsibility for any inaccuracies or omissions outside of RGS's direct control. Furthermore, this Review addresses the specific needs of FMS and Preston Consulting, so may not address the needs of additional third parties using this Review for their own purposes. Thus, RGS and their employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this Review. Those acting on information provided in this Review do so entirely at their own risk.

This Review does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Yours sincerely,



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