Cardno HRP
Shaping the Future

CLARIFICATION OF IDENTIFIED WATER QUALITY MATTERS

ATTACHMENT

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ADDITIONAL INFORMATION:
ENVIRONMENTAL IMPACT STATEMENT

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22 October 2013

Cardno HRP

Scott.Clarke@cardno.com.au

Attention: Scott Clarke

Dear Scott

RE: GOLD COAST QUARRY – ADDITIONAL INFORMATION TO THE EIS

In response to the analysis of the submissions lodged during the public advertising period, please find attached the responses to the identified key matters.

Where relevant, the responses have been prepared with input from Ashley Ruffin (from Lambert and Rehbein).

Please contact me if any further clarification is required.

Yours Faithfully
BMT WBM Pty Ltd

Brad Dalrymple
Associate, Senior Environmental Engineer
Urban Water Team Leader

Key Matter 1 – Sediment Control Design Parameters

Clarification of the following matters:

- *the sediment control design objective for basin design is sufficient for the operational lifespan of the project and the subsequent risk associated with extended periods of land disturbance;*
- *the basin design standard for ERAs involving significant land disturbance like this project includes a settling zone to accommodate runoff from a 1 in 5 ARI, 24hr rainfall event; and*
- *Confirmation that further sediment control design work will be undertaken at the appropriate time (i.e. detailed design / operational works) to ensure the quarry will be hydraulically efficient.*

It is confirmed that further detailed design of the sediment basin will be undertaken at a later date.

In response to the other items raised, the following is noted:

- The volume of the sedimentation basin has been designed in accordance with industry-accredited best practice guidelines, namely:
  - *Best Practice Erosion & Sediment Control* (2008) by International Erosion Control Association
  - *Sediment Basin Design, Construction, Operation and Maintenance* (2001) by Brisbane City Council.
    - It should also be noted that the more stringent volume requirements (given in the IECA guideline) were adopted for the sediment basin design.
- The design standards that have been noted in the state agency response are not from any published or industry-accredited best practice guideline – whilst what has been designed is in accordance with published industry-accredited best practice guidelines.
- As described in the technical report provided in Appendix CC of the Environmental Impact Statement (EIS) "*it is proposed that a 'high efficiency' flow through sediment basin be adopted",* which have been shown to achieve significantly higher rates of sediment removal (relative to standard sediment basins, which the state agency standards relate to). It is subsequently anticipated that the proposed sediment basin design will likely achieve sediment removal rates higher than standard sediment basins.
- It should also be noted that the assessment described in the aforementioned technical report indicates that the project (and associated stormwater quality management strategy), will likely decrease stormwater pollutant loads discharging from the site (relative to the existing site).
  - This is largely due to a demonstrated commitment to best practice is evident in all aspects of the design and operation of the project that relate to the management of water quality and quantity.
  - The integrated water management hierarchy described in the water resources report (Appendix CC of the EIS) includes multiple aspects, with treatment and disposal as the least preferred management options. The design of the sediment basin (whilst done in accordance with best practice industry-accredited guidelines, with higher treatment performance predicted through the use of 'high efficiency' flow through sediment basins), is still only a single element of this best practice management hierarchy.

Key Matter 2 – Sediment Control

- *Clarification with respect to the following matters:*
  - *the effectiveness of the sediment stripping efficiency of rock swales that are proposed;*
  - *the effectiveness of the proposed high efficiency flow through sediment basin under a range of flow events; and*
  - *the likely dosing needs to be undertaken by flocculants along with a consideration of the impact of these at downstream environments.*
- *Clarification of soil types, soil texture/class or particle size distribution associated with the site to assist with determining the effectiveness of erosion controls; and*
- *Confirmation that further assessment of the sediment basin will be undertaken at the appropriate time (i.e. detailed design / operational works).*

The following responses to the items described above:

Item #1: Sediment removal of rock swales

In the absence of any sediment removal data (or guidance) for modelling sediment removal in rock swales, the sediment removal of the proposed rock swales have been modelled based on input parameters recommended for 'swales'.

Swales are typically grassed, and not typically laid with rock (as we have proposed for the quarry project). Nevertheless, it is a reasonable assumption to apply modelling parameters recommended for grassed swales (to the proposed rock swales) given that the principal processes by which sediment is removed by swales (i.e. sedimentation – letting suspended material settle by gravity) is the same for both.

The presence of grass (instead of rock) within a swale would be anticipated to have a negligible impact to the sediment stripping performance of the swale. If anything, we would anticipate a rock-lined channel to be slightly better at removing sediment from stormwater flows given the following:

- Higher channel roughness for rock channels (relative to grassed swales), and subsequently lower velocities (which will increase sediment retention/ deposition – reducing sediment loads discharged downstream).
- Greater ability for the retention of sediment (between gaps between the rocks) – and subsequently reduced risk of retained sediment being scoured/ 'washed' downstream.

Regardless of this, adopting different model parameters for the rock channel was tested and had very little impact to sediment removal of the catchment where the rock swales will be integrated into (given the presence of the proposed sedimentation basin downstream of the swales) and for the overall site (given that the proposed rock swales are only a minor part of the overall integrated water management strategy for the site).

Item #2: Effectiveness of the sediment basin under a range of flow events

The analysis has already assessed the performance of the sediment basin "*for a long term simulation of rainfall events*" and/ or "*under a range of flow events*". As described in Appendix B of the technical report provided in Appendix CC of the EIS:

- The water balance assessment of the strategy (including the sediment basin) involved modelling using a 111-year period of historical rainfall data at daily time-steps. So, for example, the daily operation of the sediment basin (e.g. water level variation, inflows, outflows) was calculated applying the same 111-years of historical rainfall data as previously recorded.
- Similarly, the assessment of the 'stormwater quality' treatment performance of the strategy (including the sediment basin) utilising rainfall data from a period of ten years (from 1st January 1989 to 31st December 1998), using recorded pluvio data at six minute time-steps. The use of this climate data is in accordance with the relevant industry-accredited guideline for assessing 'stormwater quality' treatment performance.
    - The 10-year modelling period is obviously smaller than the 111-years of data used for the water balance, but is required as many more calculations are undertaken given the smaller (6-minute) modelling time-step utilised (i.e. time interval between each modelling calculation). This smaller time-step is required to appropriately model the treatment performance of the sediment basin (and other treatment devices).

The climatic periods applied in the water balance and 'stormwater quality' treatment performance assessments obviously include a range of rainfall/ flow events. The item raised is subsequently unjustified.

Further information in relation to the methodology applied to assess the performance of the sediment basin is available in Appendix B of the technical report provided in Appendix CC of the EIS.

Item #3: Application and Potential Impacts of Flocculants

It is recommended that an assessment of likely dosing needs with consideration of the impact of these at downstream environments will be incorporated into an appropriate flocculation and dewatering strategy for the sediment basin.

The potential impacts of flocculants has already been raised in Section 4.3 of the technical report provided in Appendix CC of the EIS: "*If aluminium-based flocculants (for example), are over-used however, these may result in toxic levels of aluminium in receiving waterways … An appropriate flocculation and dewatering strategy will … be required for the sediment basin*".

In this same section, it is also described that "*If turbidity is high, alum-based flocculants typically reduce aluminium in the water column because they remove sediment. They typically only contribute to the Al concentration if the Al concentration is already low.*" As described in Section 3.5.2.2 of the aforementioned technical report, "*Aluminium within the sites waterways appears to be high in both dissolved and particulate forms – and high levels were observed across all three sites.*"

In addition to the above items, from a perspective of reducing the costs alone associated with flocculant use, it is anticipated that excessive flocculant usage will be highly unlikely.

It is therefore very unlikely that the proposed use of flocculants will have any negative impact on the health of downstream environments. Nevertheless, this will be further considered in the preparation of an appropriate flocculation and dewatering strategy (as recommended in the aforementioned technical report).

Item #4: Assessment of Soil Types

As the site development works involve cuttings of up to 35m in depth into fresh Argillite, it is not possible to obtain a sample of the future floor material for testing. Soil characteristics will vary greatly according to depth and location. Due to the ever changing extents of the overburden removal works, the type of soil being dealt with will undoubtedly change as the works progress. For the purpose of the sediment basin design, a 10% dispersive soil has been assumed.

Item #5: Further assessment of the sediment basin

It is confirmed that further assessment of the sediment basin will be undertaken at an appropriate time (e.g. detailed design stage, operational works).

Key Matter #3 – Water Quality Discharge Objectives

Clarification of the following matters that relate to water quality discharge objectives:

- *the discharge criterion of 50mg/L Total Suspended Solids (TSS); .*
- *the water quality discharge objectives that will be employed to ensure downstream environmental values are suitably protected; and*
- *the appropriate mitigation measures that will be implemented to address potential water quality discharge impacts.*

As outlined in the technical report provided in Appendix CC of the EIS, the project (and associated stormwater quality management strategy) is predicted to achieve a reduction in Total Suspended Solids (TSS) loads relative to the existing site and is therefore unlikely to cause greater environmental harm compared to existing conditions.

Whilst a significant portion of the total flow volume will overflow the sediment basin, this overflow volume will still be at least partially treated via the 'at source' erosion control measures, the rock-lined channel, and sediment basin. Whilst this overflow volume may not achieve a TSS concentration less than 50mg/L, TSS loads and concentrations are still anticipated to be significantly reduced by this stormwater 'treatment train' (combination of treatment measures) – and anticipated to be lower than the loads/ concentrations from the existing site.

Section 5.2.4.2 of the aforementioned technical report already states "*Longer term discharge criteria should be developed from a comprehensive assessment of receiving water quality and the setting of appropriate receiving water quality objectives*." The report also already recommends "*developing and implementing site specific discharge criteria to ensure that downstream environmental values are suitably protected*."

It should also be noted that the assessment described in the aforementioned technical report indicates that the project (and associated stormwater quality management strategy), will likely decrease stormwater pollutant loads discharging from the site (relative to the existing site). This is largely due to a demonstrated commitment to best practice is evident in all aspects of the design and operation of the project that relate to the management of water quality and quantity. The integrated water management hierarchy described in the report includes multiple aspects, with treatment and disposal as the least preferred management options. The sediment basin is only a single element of this best practice management hierarchy

Key Matter #4 – Water Quality Testing

Confirmation that a commitment has been made to water quality testing of the sediment basin prior to de-watering.

It is confirmed that water quality testing of the sediment basin will occur prior to de-watering.

Section 5 of the technical report provided in Appendix CC of the EIS provides a detailed monitoring plan for the project – including recommended monitoring of discharges from the sediment basin. It is anticipated that the state agency has not reviewed this section, and that appropriate detail is provided therein.

Key Matter #5 – Water Quality Impacts

Demonstration that the construction and operation of the proposed quarry will not adversely impact water quality as a result of accidental or inappropriate release of contaminants or pollutants, as well as increased suspended sediment levels as a result of vegetation clearing and earthworks.

The technical report provided in Appendix CC of the EIS provides a detailed description of mitigation measures to ensure the protection of water quality in downstream waterways. The state agency is referred to the following relevant sections of this report for further information:

- "*At a Glance*"
- "*Summary*"
- Section 4 – "*Potential Impacts and Mitigation Measures*"
- "*Appendix B: Stormwater Quality, Hydrology and Water Cycle Management Plan*"

Additional information in relation to mitigation measures for water quality protection is also provided in the following reports by Lambert and Rehbein (also included in the EIS):

- *Erosion and Sediment Control Program – Boral Gold Coast Quarry, Reedy Creek*
- *Stormwater Management Program – Boral Gold Coast Quarry, Reedy Creek*

It is anticipated that sufficient detail regarding the mitigation measures is provided within these aforementioned reports.