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Shaping the Future

CLARIFICATION OF GROUNDWATER DEPENDENT ECOSYSTEMS AND TERRESTRIAL FAUNA MATTERS

ATTACHMENT

C

ADDITIONAL INFORMATION:
ENVIRONMENTAL IMPACT STATEMENT

BORAL CONSTRUCTION MATERIALS
Build something great™

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22 October 2013

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Dear Scott

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,

KEY MATTER 1: NATURE CONSERVATION – GROUNDWATER DEPENDENT ECOSYSTEMS

Clarification of the following matters relating to the potential for Groundwater Dependent Ecosystems (GDEs):

- *Utilisation of the Australian Groundwater Dependent Ecosystems Toolbox (2011) to confirm that no GDEs exist on the site;*
- *addressing seasonal variations and downstream impacts to aquatic and riparian GDEs; and*
- *the adequacy of proposed mitigation measures in addressing identified impacts, particularly how changes to vegetation and hydrology will be detected and mitigated over the life of the quarry.*

The Australian Groundwater-Dependant Ecosystems Toolbox (SKM, 2011) is composed of 2 parts:

- Part 1 – Assessment Framework; and
- Part 2 – Assessment Tools.

Section 3 of Part 1 outlines the hierarchical structure of groundwater-dependant ecosystem (GDE) assessments in three stages.

- **Stage 1** focus on gaining a baseline understanding of where potential GDEs exist, classification of ecosystem type and conceptualisation of the ecohydrogeologic setting.
- **Stage 2** assessments build on this information to characterise the likely reliance of the ecological asset on groundwater (e.g. describe timing of use of groundwater).
- **Stage 3** involves creating a detailed and quantified understanding of how the biotic state of GDEs can change as abiotic (e.g. groundwater) conditions change.

To determine whether any of the ecosystems of the Gold Coast Quarry site constitute a GDE an assessment was made against stage 1. The table below summarises the approach to Stage 1 as outlined in Part 1 of the Assessment Framework:

STAGE 1

Question	Approach	Tools
1.1 Where are the ecosystems that potentially use groundwater?	Conceptualisation and landscape analysis, site specific information	i. T1 Landscape Mapping ii. T2 Conceptual Modelling iii. GDE Atlas
1.2 What is the broad type of GDE and functional grouping?	Comparison to standard guidelines and frameworks	i. ANAE Classification ii. GDE Atlas iii. GDE Typology

We have structured our response to the questions by providing individual answers by applying each of the tools outlined in the right hand column of the table. However, this step-by-step analysis should not obscure the basic elements of the soil-water-plant system on this site i.e. that the hillsides have shallow regolith soils which hold little water and drain quickly, and the gullies are narrow with only seasonal flows.

Answers

1.1 (i) Tool 1 'Landscape Mapping' can be applied through GIS approaches or Remote Sensing. Tool 1 largely assumes there is an understanding of which ecosystems in an area constitute GDEs or relies being able to predict the presence of possible GDEs based on assessment of the landscape elements indicators (e.g. water table depth, geomorphology).

GIS mapping of vegetation and regional ecosystems was prepared at a scale of 1:10,000 as part of the "Flora and Fauna Technical Report" (Appendix X of the EIS). Regional Ecosystem mapping requires inputs of geology (to define land zones) and vegetation (floristics determined from aerial image interpretation and ground truthing). This assessment indicated that most of the vegetation aligning the drainage line to the south of the proposed void is regrowth and those portions that are remnant are either:

- Regional Ecosystem 12.3.11 "*Eucalyptus siderophloia*, *E. tereticornis*, *Corymbia intermedia* open forest on alluvial plains usually near coast". The Regional Ecosystem Description Database (Queensland Herbarium, 2013) indicates that this ecosystem can contain palustrine wetlands (e.g. in swales), but no wetlands were identified during site surveys; or
- Regional Ecosystem 12.11.5a "Open forest of *Eucalyptus tindaliae*, *Eucalyptus carnea* +/- *Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra*, *Eucalyptus major*, *E. helidonica*, *Corymbia henryi*, *Angophora woodsiana*, *C. trachyphloia* …Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and interbedded volcanics". The Regional Ecosystem Description Database (Queensland Herbarium, 2013) does not identify the presence of wetlands in this ecosystem. No wetlands were identified during site surveys.

The AGE "Groundwater Impact Assessment of Proposed Gold Coast Quarry" study prepared as part of the EIS (refer to Appendix FF of the EIS) identified that the water table is located around 20m below the surface and is associated with the regolith (i.e. areas of metastediment that coincide with areas of 12.11.5a). The dominant structural elements of these ecosystems are the Eucalypts and Corymbias. The root systems of these genera are generally located in the top 0.5-1m of the soil profile (Jacobs, 1955), but can extend to water tables at depth e.g. approx. 3m (Flakiner *et. al.* 2006). However, given the depth of the water table and the normal shallow nature of eucalypt and corymbia root systems, areas of 12.11.5a of the study area cannot be GDEs. The AGE study also notes that the alluvial deposits are shallow and its associated water table drains quickly. So while ecosystem associated with alluvium (i.e. 12.3.11) is dominated by species that have root systems that are likely to intersect the alluvial water table, given its propensity to drain quickly the ecosystem cannot be regarded as dependant on this water source.

1.1 (ii) Tool 2 'Conceptual modelling' is a tool that relies on numerous inputs and can be presented as varying outputs. Some of the vegetation characteristic of drainage lines occurs in these localities owing to an interaction of abiotic and biotic factors. While groundwater discharging from the regolith (as described by AGE in the EIS) helps support this gully vegetation, it is not the sole contributor and at times may be entirely absent as an input. That is, the ecosystems are not dependant on groundwater and rely on water inputs from rain and drainage line flows as well as groundwater. Also, water is only one contributor to the structure

and floral composition of vegetation within the drainage lines. Soils, topography, buffering of surrounding vegetation, absence of fire etc. are likely to play equal or greater role in the determining the structure and composition particularly given propensity for the regolith to rapidly drain.

1.1 (iii) The GDE Atlas mapping indicates that there are no GDE reliant on surface or subsurface expression of groundwater within the study area. Mapping of inflow dependant (ID) ecosystems illustrates that the site has a very low likelihood of supporting this type of ecosystem with much of the site regarded as "Unlikely to be ID". While the site falls into an area mapped as having ecosystems not analysed for "GDE, Subterranean (Cave & Aquifers)" site based studies undertake by AGE for the EIS indicate that:

- "*The groundwater system identified within the Project area and surrounds depends primarily on rainfall for recharge, with rainfall infiltrating the regolith, that is, the upper weathered zone*."
- "*..the groundwater in the regolith is essentially perched on the underlying fresh, very low permeability rock mass*."
- "*Groundwater flow is from the ridge areas towards the creeks primarily through open fractures in the weathered material and along the interface with the fresh rock. Groundwater discharge to the creeks (baseflow), maintains creek flow for some time, however pools in the creek bed are reported to be ephemeral, indicating that the regolith drains reasonably quickly, as would be expected given the steep topography, and that discharge to the creeks and alluvium diminishes and may stop during drier periods*."
- "*During and post quarry operations groundwater discharge to the creeks will continue from the regolith in the catchments to the south, west and north of the quarry footprint and therefore some groundwater discharge to the creeks should continue throughout and post quarry operations*."

The groundwater entering drainage lines is therefore episodic and unreliable for vegetation fringing these areas. That is, while some of the vegetation may utilise this resource there cannot be dependency on it owing to its ephemerality.

1.2 (i) The Aquatic Ecosystems Toolkit (Aquatic Ecosystems Task Group, 2012) is composed of four modules of which Module 2 is the 'Interim Australian National Aquatic Ecosystem (ANAE) Classification Framework'. The ANAE Framework (Aquatic Ecosystems Task Group, 2012) identifies aquifer systems as 'Unconsolidated aquifer', 'Porous sedimentary rock aquifers', 'Cave/Karst' or 'Fractured rock aquifers'. The metrics and thresholds provided in the framework are broad and imply that fractured rock aquifers can be regarded as an aquatic ecosystem even if the resident time for the water can be measured in minutes. Importantly, the module also provides a definition of a GDE which is consistent with the Australian groundwater-dependant ecosystems toolbox being:

> "*Natural ecosystems that require access to groundwater to meet all or some of their water requirements on a permanent or intermittent basis so as to maintain their communities of plants and animals, ecological processes and ecosystem services*."

While vegetation of the study area's drainage lines are likely to utilise ground water draining through the regolith to meet some of their water requirements on an intermittent basis, they are unlikely to be dependent on it to the point where the water is necessary to "maintain their communities of plants and animals, ecological processes and ecosystem services". The presence of groundwater in the regolith is strongly linked to rainfall. When water resources are available from the regolith they are also likely to be available soil moisture (derived from rainfall and surface flows). Therefore, in order to maintain their current structure they are unlikely to "require" access to ground water.

1.2 (ii) as per 1.1 (iii) above.

1.2 (iii) The GDE typology identifies 3 types being '1. Aquifer and cave ecosystems', '2. Ecosystems dependant on the surface expression of groundwater' and '3. Ecosystems dependant on subsurface presence of groundwater'. Vegetation of the study area's drainage lines does not equate with the first 2 typologies, but might be considered under 3. However, the vegetation in these areas does not 'depend' on the water fully, seasonally or episodically. The presence of groundwater in the regolith is strongly linked to rainfall. When water resources are available from the regolith they are also likely to be from soil moisture (derived from rainfall and surface flows). There is likely to be little difference in the availability of water from

soil moisture or groundwater and as such there is unlikely to be any time at which the vegetation is entirely dependent on groundwater to avoid impacts on its condition.

Conclusion - While vegetation fringing drainage lines is likely to 'use' groundwater resources owing to its proximity of the discharge point of water draining from the regolith, it is not dependant on this resource owing to its ephemerality and availability of other resources (i.e. soil moisture). The structure and floristic makeup of vegetation is the drainage lines are shaped by multiple biotic and abiotic inputs, not water alone. By definition, vegetation in the drainage lines are not groundwater dependant ecosystems (GDEs). On this basis assessment against Stages 2 and 3 have not been conducted as Stage 1 concludes vegetation communities associated with the drainage lines are not GDEs.

Downstream areas outside of the study area would be subject to the same unreliability of groundwater as those in the study area. Therefore it is unlikely these would be dependent on the surface expression of groundwater from the arising from the study area. Notwithstanding this, AGE had indicated that the regolith in the catchments to the south, west and north of the quarry footprint would continue to discharge to the drainage lines throughout and post quarry operations.

There are no proposed mitigation measures for GDEs as no GDEs dependant on groundwater from the study area have been identified within or downstream of the study area. However, the EIS proposes to monitor the health of vegetation in the mid catchment waterway and provide mitigation only if required. Specifically the following is noted:

> *Monitoring is fundamental to determining whether a mitigation response is required. Natural systems are dynamic. By way of example, the current study documented the natural attrition of threatened plant species within the Mid Catchment Waterway. It will therefore be necessary to undertake monitoring over time and take into account climatic conditions to ensure it accurately charts changes that can be attributed to the proposed development. The following monitoring actions are proposed for species within drainage lines and waterways along with the appropriate mitigation response.*
>
> - *Monitor the population of threatened species specifically within the Mid Catchment and Northern Catchment Waterways upon commencement of earthworks. Information attained prior to clearing will assist in establishing the baseline condition. Information collected will include the number of individual threatened trees, a description of the health and vigour of individual threatened trees, a count of the number of trees/shrubs on which the Ribbon root orchid occurs and an estimate of the overall Ribbon root orchid population.*
> - *For threatened species in the Mid-catchment Waterway upstream of the proposed sediment pond and in the Northern catchment - if there is a decline in the health of trees or abundance of Ribbon root orchid over 5 successive years that can be attributed to quarrying activities (e.g. changes in hydrology) then implement the following mitigative steps (1) supplement flows in the waterway to mimic the pre-clearing state; (2) if Ribbon root orchid continues to decline translocate a limited number of specimens to the Southern Catchment waterway to establish a separate population.*
> - *For threatened tree species in the Mid-catchment Waterway downstream of the proposed sediment pond - if there is a decline in the health of trees over 5 successive years that can be attributed to quarrying activities (e.g. changes in hydrology) then manage the volume of water received by the vegetation.*

The 'changes in hydrology' noted in the proposed monitoring refers to potential reductions in surface flows resulting from a change in the surface area of the catchment. The primary objective of the monitoring and the proposed adaptive management response is to ensure the health of threatened plant species' is maintained. Despite the possibility that there will be no impacts on threatened plant species because of the buffers provided and retention of much of the catchment, a precautionary approach will be adopted whereby monitoring aims to detect and respond to declining health where it can be attributed to a change in hydrology. This approach is regarded as adequate because:

- there are no GDEs;
- the risk of impacts on the species is only regarded as medium;

- monitoring to be conducted during the life of the quarry targets threatened species and health will be measured against baseline (pre-quarry) conditions;
- there will be an achievable response if required to mimic pre-clearing conditions surface flow conditions; and
- there is a supplementary approach of translocating the ribbon root orchid to an unaffected drainage line within Boral's holdings that supports host species in similar densities to the mid catchment waterway.

References

- Aquatic Ecosystems Task Group. 2012. *Aquatic Ecosystems Toolkit*. Department of Sustainability, Environment, Water, Population and Communities.
- Jacobs, MR. 1955. *Growth Habits of the Eucalypts*. Forestry and Timber Bureau – Department of the Interior.
- Falkiner, RA., Nambiar, EKS., Polgase, PJ., Theiveyanathan and Stewart, LG. 2006. Root distribution of Eucalyptus grandis and Corymbia maculata in degraded saline soils of south-eastern Australia. Agroforestry Systems, 67:279-291.
- Queensland Herbarium. 2013. *Regional Ecosystem Description Database* (REDD). Version 6.1 (February 2013) (DSITIA: Brisbane).
- Sinclair Knight Merz. 2011. *Australian Groundwater-Dependant Ecosystems Toolbox*. National Water Commission on Key Water Issues.

KEY MATTER 2: NATURE CONSERVATION - TERRESTRIAL FAUNA (WHITE-BELLIED SEA-EAGLE)

- *Clarification of the potential impacts of the project on the White-bellied Sea Eagle and proposed measures (and offsets) to mitigate the potential impacts on the species.*

The potential impact of industrial noise on nesting white-bellied sea-eagles requires consideration of:

- The existing and proposed acoustic environments;
- Our existing knowledge of the tolerance of white bellied sea eagles to industrial noise; and
- Our existing knowledge of the tolerance of other raptors to industrial noise.

Knowledge of these parameters is based on science, observation and anecdotal evidence.

The White-bellied sea-eagle (*Haliaeetus leucogaster*) is not scheduled as a threatened species under State or Commonwealth legislation. Despite being listed as a migratory species under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*, migratory species were not identified as a controlling provision by the Department of Sustainability, Environment, Water, Population and Communities.

An acoustic report was prepared as part of the EIS by Acoustics RB (refer to Appendix II of the EIS "Assessment of Environmental Noise Issues for Environmental Impact Statement"). To assess the baseline levels Acoustics RB established a number of monitoring locations across the study area. The sea-eagle nest is located approximately half way between monitoring locations 'B' and 'C'. The day time baseline $L_{Aeq,T}$ for both of these locations frequently reaches 50dBa and occasionally exceeds 55dBA. Noise contour plots generated as part of the study mapped the noise contours resulting from the construction and operation of the quarry. The white-bellied sea-eagle nest is located in an area that will be approximately in the range of 53-60dBA (*pers. com* Acoustics RB). So while there is likely to be a slight increase in the upper limit of noise levels at the location of the nest, the lower range is likely to be consistent with some levels already experienced at the nest site. Noise generated at night from maintenance operations in the proposed workshop are likely to peak at around 24-26dBA on the rare occasion that loud maintenance activities are required at night, but would otherwise be consistent with the existing levels of night time noise.

Mitigation measures outlined in the EIS for the white-bellied sea-eagle include covering the nest when construction is being undertaken proximate to the nest site. This has been proposed as a precautionary measure to discourage nesting because the shifting of earth and rock to create the proposed haul road is likely to have concurrent visual and acoustic impacts on the nest site. Following construction the nest will be

largely visually separated from operations and will experience the relatively minor change in acoustics as discussed.

There has not been a great deal of literature published specifically about the noise tolerance of white-bellied sea-eagles there is anecdotal evidence to suggest that they can be tolerant of industrial noise. Three examples are discussed below:

- A nest site in Townsville is located within 20m of a Bunnings warehouse carpark and was used for at least 6 years (Ezzy, 2010; Ecosure, 2008). In addition to noise generated from the carpark and Bunnings, the site is located approximately 300m from the intersection of a 4-lane road with the Bruce Highway and only approx.150m from the edge of the 4-laned road. It is likely that, while traffic would peak during daylight hours it would not cease at night. It is likely that the level of noise generated by carpark movements and traffic on the nearby roads during the day will be in the range 50-60dBA $L_{Aeq,T}$. At night, the $L_{Aeq,T}$ noise levels are likely to drop to 35-45dBA (pers. comm. Acoustics RB). While the nest site was ultimately abandoned (for reasons unknown), the nesting pair has subsequently relocated to a nearby tree located in a suburban backyard (pers. comm. Townsville Region Bird Observers Club, 2013);
- So & Lee (2010) recorded a nest 10-15m above an area subject to heavy sea traffic in Hong Kong; and
- O'Donnell and Debus (2012) recorded one nest in northern NSW was 12m from a river's edge near that was frequented by boats and fisherman.

Research on other raptor species indicate that some show tolerance of noise environments. Trimper *et. al.* 1998 undertook as study on the effects of low-level jet aircraft on the behaviour of nesting osprey. They found that despite noise levels occasionally exceeding 100dBA the nesting birds did not appear startled or agitated. Furthermore, and by way of example, an Osprey nest site is located proximate to the study area on the Southport Broadwater. Illustrated in the Plate below is an image of the active nest location situated proximate to the Gold Coast Highway, the heavily trafficked Broadwater and popular park.

Plate 1 – An Osprey nest on the Southport Broadwater (note arrow)

Conclusion - Given the relatively minor change from the existing to the proposed sound environment, the examples of other locations where white-bellied sea-eagles experience industrial noise and the scientific and anecdotal evidence of the tolerance of other raptors, it is not anticipated that there will be a significant impact on the study area's nest site.

References

- Ecosure. 2008. *Green heart reserves draft literature review*. Prepared on behalf of Gold Coast City Council.
- Ezzy, L. 2010. *Boobook - journal of the Australasian raptor association*. Volume 28 Number 1
- O'Donnell, W.B., and S.J.S. Debus. 2012. *Nest-sites and foraging of the White-bellied Sea-eagle Haliaeetus leucogaster on the subtropical eastern coast of Australia*. Australian Field Ornithology 29:149-159.
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- Trimper, PG., Standen, NM, Lye, LM., Lemon, D., Chubbs, TE. and Humphries, GW. 1998. *Effects of low-level jet aircraft noise on the behaviour of nesting osprey*. Journal of Applied Ecology, 35:122-130.

KEY MATTER 3: NATURE CONSERVATION – IMPACTS ON NOCTURNAL FAUNA

- *Identify potential impacts of night time maintenance activities on nocturnal fauna and detail mitigation measures to address identified impacts.*

Maintenance activities will occur both inside and outside of quarry operating hours. Prior to the construction of the proposed workshop (i.e. during the construction phase of the quarry) this will occur in the open. Maintenance will not be a 24hr operation and will only occur on an as needs basis.

Following the construction of the proposed workshop maintenance activities will be largely contained within structures. The Acoustics RB report forming part of the EIS notes the following with regard to maintenance noise generated prior to the construction of the workshop:

> The "*…control of noise emission arising from such maintenance events is achieved by application of specific provisions within the Construction Noise Management Plan and appropriate mitigation measures to be adopted in the event of out-of-hours maintenance activities being necessitated*"

Therefore noise impacts on wildlife resulting from maintenance activities are likely to be minimal or absent because:

- Maintenance will only be conducted as needed (most maintenance activities will be conducted in day time hours);
- Maintenance will largely be housed within structures; and
- The noise of maintenance during construction will be mitigated through implementation of a management plan.

Gleeson and Gleeson (2012) note that there have been few studies of artificial lighting impacts on Australian fauna. The Lighting Report prepared by Multi Tech Solutions as part of the EIS (refer to Appendix T of the EIS, "Lighting Report for Electrical Services at Boral Gold Coast Quarry") noted the following in relation to minimising lighting impacts:

- Use of lighting control system, localised lighting and lighting fittings to minimise spill lighting. Spill lighting will comply with the relevant standards (AS4282). And therefore illumination of vegetation areas will be limited in time and intensity;
- Use of a lighting control system that will automatically switch off lighting at predetermined times to minimise effect on flora and fauna; and
- Overall the lighting around the site will be restricted to specific localised lighting around the buildings and on the processing plant.

The report identifies that light spill is largely contained within the proposed development footprint with relatively low light levels (<2 lux) spilling into vegetation at the immediate edge of clearing.

Based on the persistence of nocturnal wildlife at other Boral operations where night-time maintenance occurs in lit workshops it is evident the two can co-exist. For example, surveys conducted at Boral's Ormeau working quarry recorded the nocturnally active Koala, Yellow-footed Antechinus, Feathertail Glider, Fawn-footed Melomys and Bush Rat in trap lines in vegetation associated with a drainage line located approximately 200m from a workshop (BAAM, 2008). While not identical, a similar suite of species were recorded across the Gold Coast Quarry study area as part of investigations conducted for the EIS. The proposed workshop is located approximately 140m from the edge of a drainage line located in the proposed buffer area.

Conclusion - Given the proposed lighting, the relatively low levels of light spill into a small portion of the wooded buffer and evidence from other quarry operations that a broad suite of native animals persist in similar environments there is very little likelihood of lighting having an impact on native wildlife.

References

- Biodiversity Assessment and Management. 2008. *Terrestrial Fauna Assessment Ormeau Quarry: Crushing and Screening Plant Upgrade*. Prepared for Chenoweth EPLA.
- Gleeson, J. and Gleeson, D. 2012. *Reducing the Impacts of Development on Wildlife*. CSIRO Publishing.

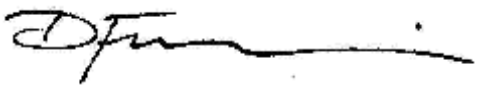
Overall Conclusion

We were requested to review the nature conservation items of the key matters raised in relation to the Gold Coast Quarry EIS specifically including potential impacts on groundwater ecosystems, potential impacts of industrial noise on the white-bellied sea-eagle nest and potential impacts of site lighting on nocturnal wildlife. We have considered a range of scientific and anecdotal evidence as part of assessment and note:

- There are no GDEs within the study area and no GDEs external to the study area that will be adversely affected as a consequence of quarrying operations;
- It is not anticipated that there will be a significant impact on the study area's white-bellied sea-eagle nest site resulting from industrial noise; and
- It is unlikely lighting will have an impact on native wildlife using the proposed buffer area.

If we can be of further assistance or are required to meet to discuss the contents of our correspondence in more detail please contact me on 3877 6909.

Yours faithfully



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