U B M
ECOLOGICAL
CONSULTANTS

7 October 2009

Mr Ben MacGibbon
Murlan Consulting
6 Ulonga Avenue
GREENWICH 2065

Dear Ben

Re: Shadowing Issues for Blue Gum High Forest at Water Street, Wahrooga

You have asked me to comment on concerns expressed by Ku-ring-gai Council and their consultant Theresa James about the potential over-shadowing of the Blue Gum High Forest (BGHF) remnant at Water Street by new buildings proposed for the Waterbrook Development, and you have also asked about the shade-tolerance of diagnostic BGHF species (as determined by the Scientific Committee in its Final Determination of BGHF as a 'critically endangered' ecological community 2007).

In responding to your request, UBM has reviewed the various reports and correspondence provided by yourself, including the supplementary James and Smith Reports, and responses to those reports prepared by David Robertson for Cumberland Ecology and Gary Leonard for Biosis.

With reference to the structural composition and floristic diversity of the BGHF ecological community we have referred to a number of publications by DECCW (NPWS 2002, SCIVI 2006) and the Final Determination of the Scientific Committee (2007). We have also reviewed a number of previous studies and reports previously undertaken by UBM in BGHF, including a Species Impact Statement and Vegetation Management Plan prepared for 55 Mahratta Avenue, Wahroonga – a case which was won in the Land & Environment Court, Proceedings 11193 of 2006).

The BGHF ecological community occurs on shale soils receiving more than 1050 mm/annum and is characteristically dominated by tall trees with a mean height of 39.3m, and a projected foliage cover (PFC) of at least 30.7%. While a sub-canopy of smaller trees is also present (@ 14.7m mean height and 20% PFC), the shrub layer is typically sparse (4.8m mean height and only 8.0% PFC). In contrast, the ground covers, consisting of grasses and flowering forbs, is relatively dense (@ 1.7m mean height and 44.2% PFC) (NPWS 2002).

The low % of small trees and small shrubs occurring in BGHF can be attributed to the lowered light levels and the competition for water, light and nutrients afforded by the tall trees. Herbaceous ground covers (as described) require fewer resources to support their biomass and are able to establish and grow in the filtered light on the forest floor.

The *diagnostic species* provided by NPWS 2002 and listed in the Final Determination (2007) are generally species which grow in sheltered positions in low to moderate light conditions. While it is true that a few of these species are able to grow in higher light conditions, and are found in other plant communities, the majority are shade-tolerant, if not shade-dependent.

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Note that the understorey in naturally occurring BGHF contains a considerable number of ferns and other species loosely described as 'rainforest species' (DECC Endangered Ecological Community Information website 2004), species which by definition require sheltered sites, moist soils, and low light conditions.

In undertaking ecological studies for a similarly degraded BGHF remnant at Mahratta Avenue Wahroonga in 2007/2008, and responding to similar concerns expressed by DECCW and Ku-ring-gai Council, UBM undertook to survey a number of local bushland reserves supporting BGHF. This was done in order to determine typical light levels in the forest understorey, and to allow the preparation of a planting plan for a BGHF 'reconstruction' project on the Mahratta Avenue site (see Appendix 1).

The light readings presented in Appendix 1 suggest that understorey species in naturally occurring BGHF are highly tolerant of moderate to low-light levels, whereas light levels in the degraded BGHF remnant at Mahratta Avenue (100% weed cover) are extremely low, and unlikely to allow for the germination and establishment of BGHF or other forest species. Similar abiotic conditions exist in the highly degraded BGHF remnant at Water Street.

***Note**:* the information above is presented to reinforce the position that BGHF understorey species are naturally shade-tolerant and this is not expected to be altered significantly as a result of having a building or other structure placed in close proximity. Tall trees, being at or above the height of the buildings are not expected to be impacted, and of course, trees shelter/over-shadow each other, particularly at the mean PFC found in BGHF.

UBM would also point out that the understorey in the BGHF remnant at Water Street comprises a dense sub-canopy (>95%) of weed or introduced horticultural species. These weed thickets have created a permanently moist and highly shaded habitat (far in excess of 'naturally occurring' conditions in this type of community), and their establishment has displaced most native understorey species. Such 'unnatural' conditions have militated against the regeneration of BGHF species, and will continue to do so until removed via a bush regeneration program (as detailed in the Vegetation Management Plan prepared by UBM (February 2009). However, we note that recent DECCW correspondence refers to the *maintenance* of a diverse BGHF community in the Water Street remnant.

In other parts of the Water Street site described by James *et al*. as 'BGHF' or 'potential BGHF', it is worth noting that the understorey comprises garden beds or lawns. The issue of overshadowing by buildings to the detriment of the naturally occurring BGHF understorey is irrelevant in these areas.

The photographs provided by Cumberland Ecology in their response of 14th September clearly illustrate that building construction close to or adjacent to BGHF trees or habitat can be carried out without damage to the vegetation by direct or indirect impacts provided that appropriate protection and mitigation measures are set in place at the outset. More such examples can be found in the locality, including I would suggest, a number of commercial-scale developments. However, we note that DECCW has not accepted these photographs at face value, and has commented that the buildings illustrated do not duplicate the bulk or scale of the buildings proposed by Waterbrook.

As per comments made by David Robertson (Cumberland) and forwarded to me via email on 6/10/09, I would disagree that details sectional studies to further examine the shading issue (while interesting in theory) are now required. Such additional studies will result in increased costs to the client and I do not believe that the outcomes of these or any other studies will change Council's position.

As stated above, and acknowledged by Robertson, the BGHF understorey is by definition a shade-tolerant part of the community. Increasing the shade factor by a few degrees here or there across the remnant and at different times of the day is not significant. *Unless the shading factor post development exceeds the existing shade factor presented by the weed thickets, then I see no issue.*

I refer to Robertson's statements that:

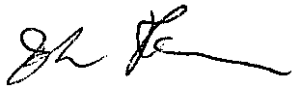
- The imposition of some westerly shadowing is not incompatible with the Blue Gum High Forest because in a normal forested situation the trees on the site would have received considerable shadowing from their neighbours in the forest to the west of them. If a buffer of trees is planted this will also result in shading and will result in some competition for water and nutrients.
- The limited shading in the southern section of the Blue Gum High Forest has potential to benefit the forest because it will shelter the forest from harsh westerly sunlight. This could become an increasingly important factor if the climate changes and dries out as it will protect the forest from getting too hot on a late summer afternoon.
- The majority of the understorey is currently weedy but when it is restored, at worst the most likely thing that will happen as a result of the building is that some more shade tolerant plants will occur in the Blue Gum High Forest understorey - e.g. ferns. This will simply mean that there may be a slight difference between the northern and southern patches of Blue Gum High Forest, which is a good thing not a bad thing for habitat diversity.

UBM concurs with this opinion.

The Species Impact Statement (Cumberland Ecology) and Vegetation Management Plan (UBM) adequately address the issues of over-shadowing and hydrology. I do not believe that there is any point in revisiting these issues, particularly as they have been the focus of a number of past and more recent investigations.

Please be aware that I am out of the office and will be travelling overseas for 3 weeks from the 14th October. In my absence, please contact Gabriel Wardenburg at our UWS offices.

Yours sincerely



Judith Rawling BA,DipEd,DipEnvStud,MEnvStud
Managing Director

Appendix 1: Extract from Vegetation Management Plan for 55 Mahratta Avenue Wahroonga ('the Subject Site') UBM 200x

In attempting to determine 'near natural' light levels for the reconstruction of a typical BGHF habitat, conditions in nearby The Glade Reserve were inspected to provide some comparison with site conditions in Lot 33. The Glade Reserve was chosen because a long-term bush regeneration program has been undertaken on this site, and it is assumed that such works have largely restored the typical BGHF structure and floristic composition.

The tree canopy cover in the BGHF in The Glade Reserve was assessed at a number of locations, but averaged about 80% (or slightly) less. The light reaching for the forest floor has promoted the dense growth of ferns, flowering forbs, native grasses and sedges (in moist conditions) (see Plates). Where light windows occur or in canopy gaps, a range of shrubs and young trees were noted to occur.

In contrast, the interior of the forested zone (the stand of BGHF trees) on the Subject Site Lot 33 was extremely dark, and there were no native shrubs or tree seedlings/saplings noted. On the other hand, shade tolerant species such as the woody weeds Privet and Ochna were found in abundance.

In order to determine appropriate light levels for the Habitat Garden, a Lux Meter was used to measure illumination (intensity of light level) at a number of different locations within the Subject Site Lot 33. To provide a comparison of illumination in a 'near natural' BGHF habitat, the Lux Meter was used at a number of locations within The Glade Reserve. The results of readings taken using the Lux Meter are presented in Table 3.3.

Table Error! No text of specified style in document.**.3: Comparison of Illumination (in Lux) between the Subject Site and The Glade Reserve**

Location	SUBJECT SITE		THE GLADE RESERVE	
Reading 1	Forested area, north part of site	400	Various Locations Under Tree Canopy	2800
Reading 2	Forested area: edge site	500		2000
Reading 3	Gap in canopy western part of site	550		2500
Reading 4	Driveway	6000		1750

These light readings suggest that understorey species in naturally occurring BGHF are highly tolerant of moderate to low-light levels, whereas light levels in the degraded BGHF remnant at Mahratta Avenue (100% weed cover) are extremely low and unlikely to allow for the germination and establishment of BGHF or other forest species. Similar conditions exist in the BGHF remnant at Water Street.