Appendix D: Independent Peer Review of Ecology Assessments

Monday, 16th November 2015

The General Manager
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Dear Sir/Madam,

RE: Peer Review of Ecological Assessments for Proposed Residential Subdivision of part Lot 35 DP 1167775, Waianbar Avenue, South West Rocks - Stage 1 and Concept Plan.

As requested, we provide a rigorous peer review of the ecological assessment for the subject proposal, in view of current statutory requirements, policies, and survey guidelines/standards (DEC 2004, DECC 2007), to satisfy Council's obligations under the *Environmental Planning & Assessment Act 1979*.

1.0 Background Information

1.1. Request for Peer Review

Geoff Smyth & Associates have lodged a Statement of Environmental Effects (SEE) for a proposed subdivision for Stage 1 and a Concept Plan for the remainder of the Residential zoned land.

Kempsey Shire Council (KSC) advised the proponent that the ecological assessment submitted with the DA (Flametree Ecological 2014) was limited to Stage 1 only, and that an ecological assessment was required for the overall Concept Plan footprint for which approval was also sought. KSC also provided the proponent with a submission from the Office of Environment and Heritage (OEH 2015), and the Environment Defenders Office (EDO 2015) from Dr Arthur White, a published herpetological researcher and consultant.

KSC expressed concern about the Wallum Froglet (*Crinia tinnula*), of which a large population occurs on site and on adjoining lands to the south (Fanning 2015, Connell Wagner 2008a, 2008b). KSC requested further survey during suitable conditions (given the frog is cryptic and hence best detectable when males call during breeding) to determine the significance of habitat within the Concept Plan area.

The proponent provided an additional report in October (Fanning 2015a, 2015b, 2015c), essentially comprising a Section 5A (Seven Part Test) assessment. The Section 5A assessment for Stage 1 and the Concept Plan (Fanning 2015a, b, c) utilises information from a limited site survey, previous studies (Flametree Ecological 2014, Connell Wagner 2008b, 2005, etc) and a literature review.

KSC have requested that Naturecall prepare a concise peer review of the ecological assessments and comment on its adequacy in supporting the conclusions of the ecological assessment, and providing the Joint Regional Planning Panel (JRPP) with sufficient information to address all considerations eg the Principle of Uncertainty.

1.2. Ecological Context

Kempsey Shire Council engaged Connell Wagner (2008a) to undertake a Local Environmental Study (LES) of approximately 110ha of land (including the subject site) between Phillip Drive and Belle O'Connor St, to assess the environmental capability of the land to accommodate urban development.

After a preliminary survey (Connell Wagner 2005), a further targeted study was undertaken to provide detailed information on the distribution and abundance of Wallum Froglets on land identified as Lot 19 DP 882848, Lot 52 DP 831284, Lot 509 DP 850963, and Lot 84 DP 792945 (incorporating the current subject land), and hence the constraints this threatened species imposed.

The objectives of the Wallum Froglet study (Connell Wagner 2008b) were to:

- Investigate the distribution and abundance of the Wallum Froglet in South West Rocks and, in particular, on the study site;
- Present information on the habitat requirements of the Wallum Froglet;
- Identify and map Wallum Froglet habitat on the study site;
- Identify land use constraints on the study site with regard to the Wallum Froglet; and
- Identify management actions that will facilitate the maintenance of the Wallum Froglet population and habitat in perpetuity.

This further study identified that the site contained a significant extent of Wallum Froglet habitat which varied in quality due to disturbance (a significant portion of the site was converted from presumably wet heath into a tea-tree plantation in the 1990s). Figure 1 in this peer review shows the extent of actual and modelled Wallum Froglet habitat on the LES study site determined by Connell Wagner (2008b).

The LES considered that development of the site could be permitted with securing of the central area of important Wallum Froglet habitat, with appropriate buffers and mitigation measures (Connell Wagner 2008a). This area generally consisted of the common overlap of the estuary/wetland buffer zone recommendations (WBM 2006) and the least disturbed Wallum Froglet habitat (see Figure 2). This area was adopted in the LES as the location of the E2 Environmental Conservation zone, with other land zoned R1- General Residential or RU2 - Rural Landscape. This and the distribution of Wallum Froglets is shown in the following figures.

The Concept Plan provided by the proponent thus applies to the land identified as potentially suitable for future development in the LES. In regards to future development, Connell Wagner (2008b) state on p15:

> "Extensive residential development within the study site could potentially result in substantial impacts on the sub-population of Wallum Froglet detected in the area if not appropriately managed. Such development could involve loss of breeding, shelter and forage habitat, habitat fragmentation, the creation of sub-population isolates and the introduction of threats that have the potential to rapidly reduce the size of the Wallum Froglet sub-population, eg road fatalities

(Goldingay and Taylor unpublished literature). An Assessment of Significance under Section 5A of the *Environment Planning and Assessment Act 1979* (EP&A Act), as amended by the *Threatened Species Conservation Act 1995* (TSC Act) has not been undertaken for this study but will need to be undertaken for any future applications for development of the site should the zoning proceed. It is considered likely that such an assessment could conclude that the impacts of residential development across the entire site may be significant enough to warrant a Species Impact Statement (SIS) and concurrence from DEC.

Therefore, areas of the site significantly constrained by the Wallum Froglet populations are recommended to be excluded from those areas proposed to be rezoned for residential purposes. In this context, it is important to identify a boundary and buffer that excludes development from within the area identified as important to the Wallum Froglet. Hence, all development, including roads, houses and infrastructure should be constructed outside of this buffer area".

The LES also states the following on page 81:

"However, further investigations and the preparation of 7-part tests under the EP&A Act will be required at the Development Application stage to confirm that a suitable design can be prepared which minimises impacts to the Wallum Froglet population and its habitat on site. Further land reserved for conservation purposes may be required as a result of 7-part tests and this could be included as part of the subdivision design."

Connell Wagner (2008b) also make the following key statement in section 7.2 (p15):

"…the cumulative impacts of development within the South West Rocks area will need to be considered by Kempsey Council in determining future applications for development in the area. development within the South West Rocks area will need to be considered by Kempsey Council in determining future applications for development in the area".

Connell Wagner (2008b) recommended the following to maintain the value of the identified important habitat for the Wallum Froglet:

- *Wetland buffers*: To be 50m horizontal distance from the outer edge of the potential distribution of Wallum Froglet habitat identified in Figure 7.1. This is confusing (perhaps due to terminology) as the grey area in Figure 1 (below) appears to be potential habitat, and this covers most of the site.
- *Corridor retention*: Non-specifically refers to a linkage to be retained to maintain genetic diversity, and notes that connection south was likely to be severed by future development.

KSC is thus justified in requiring a Section 5A assessment for the Stage 1 and concept approval.

The above are considered in review of the proposal.

2.0 Peer Review of Ecological Assessments

2.1. Relevant Literature and Guidelines

In preparing this report, the following have been reviewed or considered in addition to the reviewing ecologist's professional experience, knowledge and qualifications:

- Connell Wagner (2008a). Saltwater Developments Area – Phillip Drive & Belle O'Connor St, South West Rocks – Local Environmental Study. Unpublished report to Kempsey Shire Council. Connell Wagner, Sydney.
- Connell Wagner (2008b). South West Rocks LES Investigations - Detailed Wallum Froglet Study on Lot 19 DP 882848, Lot 52 DP 831284, Lot 509 DP 850963, and Lot 84 DP 792945, South West Rocks. Unpublished report to Kempsey Shire Council. Connell Wagner, Sydney.
- Connell Wagner (2005). Flora and Fauna Report – South West Rocks LES. Unpublished report to Kempsey Shire Council. Connell Wagner, Sydney.
- DECC (2007) Threatened Species Assessment Guidelines: The Assessment of Significance.
- DEC (2004). Threatened Species Survey and Assessment – Guidelines for Developments and Activities – Draft for Comment. NSW Department of Environment and Conservation, Hurstville.
- Douglas Partners (2013). Report on Groundwater Impact Assessment for Proposed Stage 1 – Saltwater Development, South West Rocks. Unpublished report prepared for SW Rocks Development Pty Ltd. Douglas Partners Pty Ltd, Warabrook.
- Fanning (2015a). Saltwater Residential Development, South West Rocks – Proposed Stage 1 and Concept Plan Section 5A Assessments of Significance. Unpublished report to Geoff Smyth & Assoc. Gunninah Environmental Consultants, Sydney.
- Fanning (2015b). Saltwater Residential Development, South West Rocks – Proposed Stage 1 and Concept Plan Section 5A Assessments of Significance – Appendix A Photographs of the Stage 1 DA Site. Unpublished report to Geoff Smyth & Assoc. Gunninah Environmental Consultants, Sydney.
- Fanning (2015c). Saltwater Residential Development, South West Rocks – Proposed Stage 1 and Concept Plan Section 5A Assessments of Significance – Appendix A Photographs of the Concept Plan Area. Unpublished report to Geoff Smyth & Assoc. Gunninah Environmental Consultants, Sydney.
- Geoff Smyth & Assoc. (2015a). Letter to KSC – Staged Development Application T6-14-62 'Saltwater' Residential Subdivision.
- Geoff Smyth & Assoc. (2015b). Letter to KSC – DA T6-14-62 Subdivision Part Lot 35 DP 1167775, Waianbar Avenue, South West Rocks.
- Geoff Smyth & Assoc. (2015c). Statement of Environmental Effects for Staged Subdivision – Saltwater, Waianbar Avenue, South West Rocks.
- Kempsey Shire Council (2015). Letter to Geoff Smyth & Assoc – Staged Development Application T6-14-63 'Saltwater' Residential Subdivision With Stage 1 Comprising of 29 Lots.
- NSW Office of Environment and Heritage (2015). Letter to KSC – DA T6-14-62, Lot 35 DP 1167775, 32 Waianbar Ave, South West Rocks Staged Development Applications – "Saltwater" Residential Subdivision – Stage 1 Comprising 29 Lots.

Figure 1: Connell Wagner (2008b) Wallum Froglet habitat

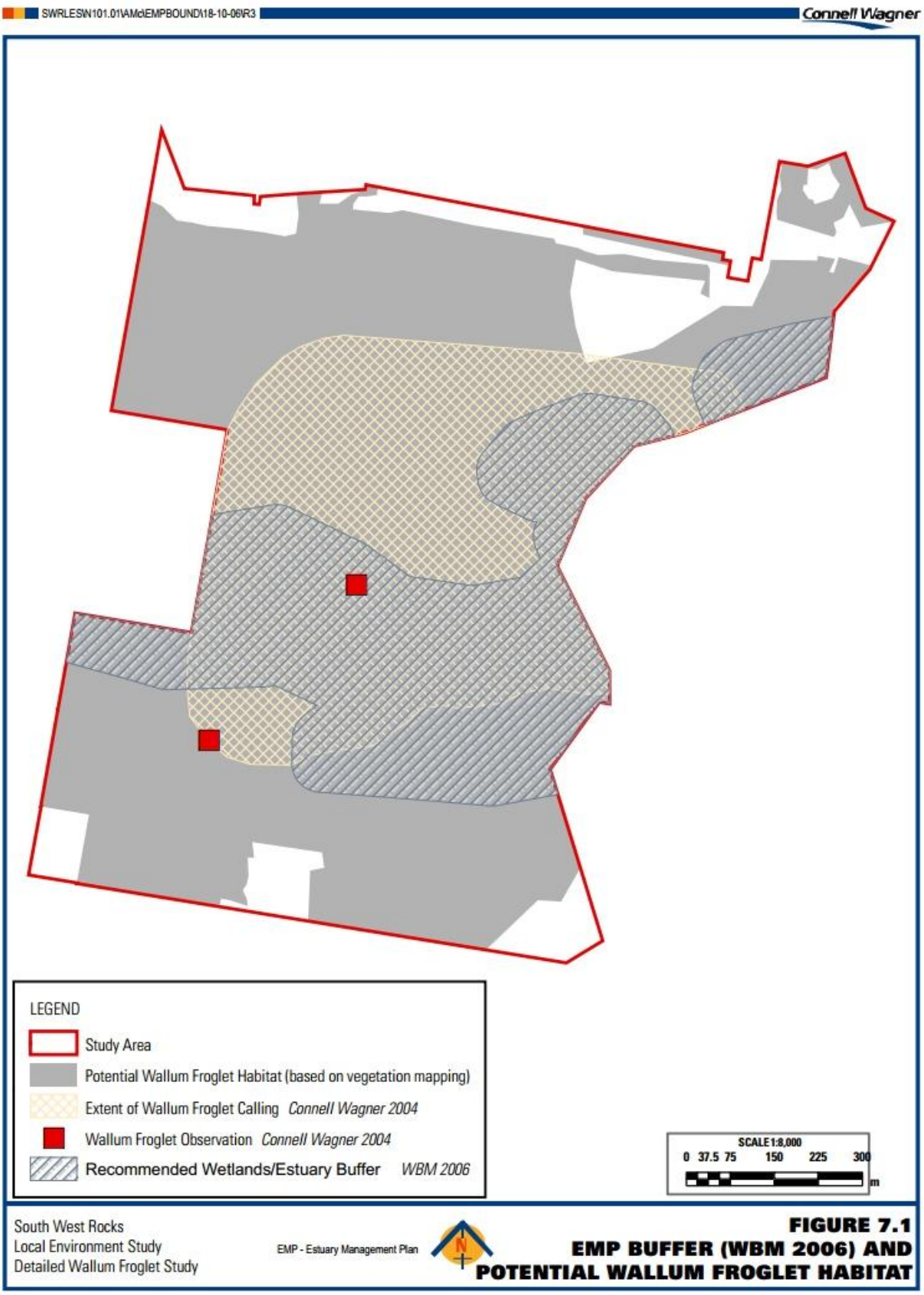
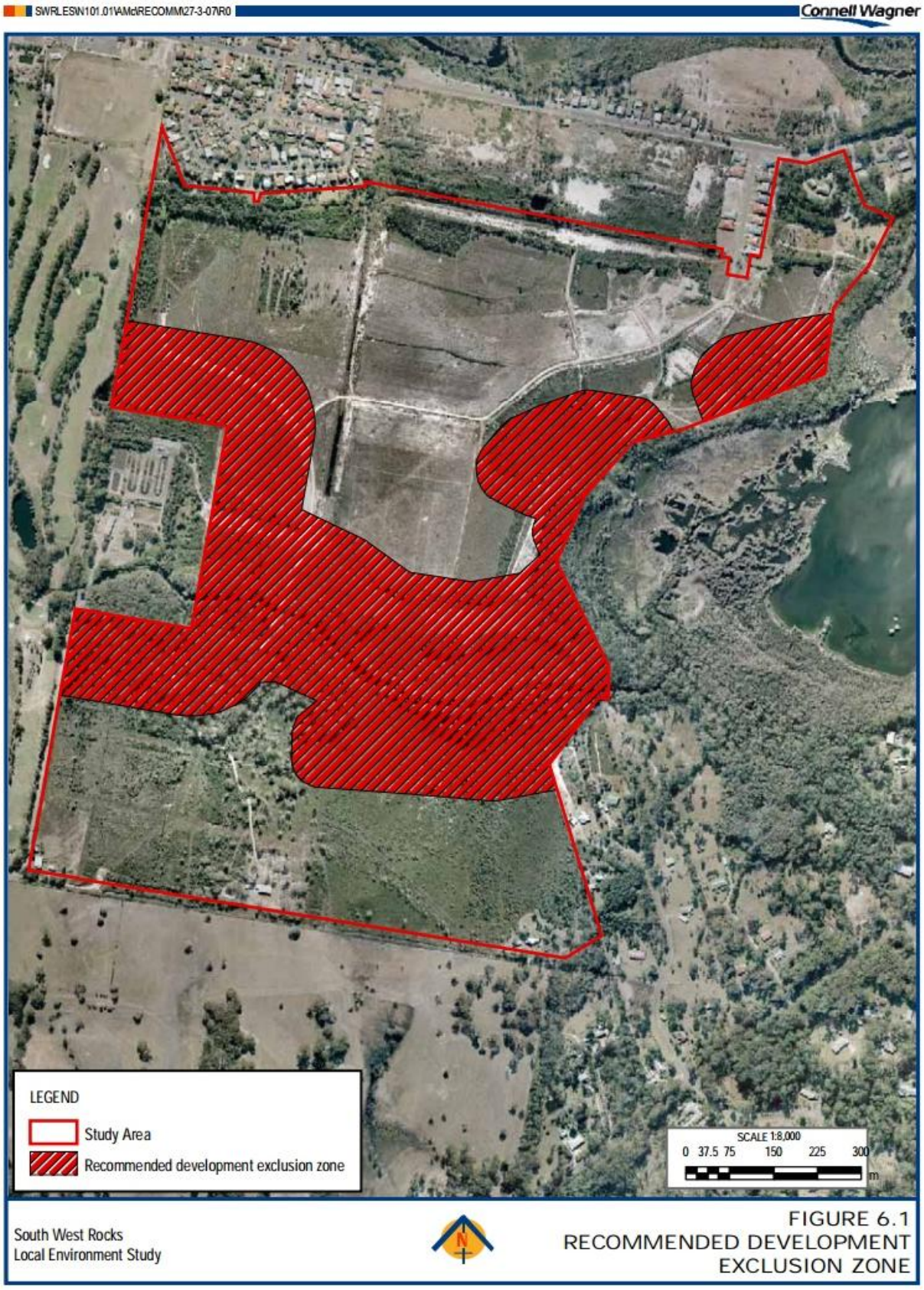


Figure 2: LES recommended development exclusion zone



The DECC (2007) guidelines have statutory recognition under the *Threatened Species Conservation (Amendments) Act 2002*, and are the benchmark against which a statutory ecological impact assessment is both to be undertaken and measured by.

These guidelines define the following key terms:

- **Subject site** means the area directly affected by the proposal.
- **Study area** means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account.
- **Direct impacts** are those that directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or develop.
- **Indirect impacts** occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.
- **Life cycle**: the series or stages of reproduction, growth, development, ageing and death of an organism.
- **Viable**: the capacity to successfully complete each stage of the life cycle under normal conditions.
- **Risk of extinction**: the likelihood that the local population will become extinct either in the short-term *or* in the long-term as a result of direct or indirect impacts on the viability of that population.
- **Local population**: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.
  - The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
  - The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

- The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time.

When reference is made to these terms in this review, they are according to these definitions.

2.2. Review of Fanning 2015

2.2.1. Compliance with DECC Guidelines

Fanning (2015a) acknowledges the DECC (2007) guidelines as having statutory relevance to the assessment. Despite this, a key error is noted in the interpretation and use of the term 'locality' in his assessment.

On page 7, under the explanation of how to assess part (d) of the Seven Part, the DECC (2007) guidelines define locality as follows:

> *"Locality:* the same meaning prescribed to local population of a species or local occurrence of an ecological community."

As detailed by Fanning (2015a) and the DECC (2007) guidelines, the local population for fauna is those animals within or using habitat within the study area. Hence, under the DECC (2007) guidelines, the locality is identical to the extent of the study area (which is defined as the limit of indirect and direct impacts).

Fanning (2015a) defines 'locality' and applies this definition in the Seven Part Test assessment as follows (p13):

> "… an area of 5 kilometre radius around the "subject site".

This is not the DECC (2007) definition, and it is not supported by an adequate impact analysis to determine the limit of direct and indirect impacts of either the Stage 1 or Concept Plan.

2.2.2. Assessments of Significance

2.2.2.1. General

Fanning (2015a) duly acknowledges that the Wallum Froglet is known to range from core or refuge habitat (areas of native vegetation consistently subject to moist conditions even in drought) into adjacent ephemeral habitats to forage, seek refuge and even breed. The reviewing consultant has personally observed this phenomenon eg ranging into flooded pasture from adjacent swamp forest.

Fanning (2015a) acknowledges that this may occur on site under suitable conditions, with potential breeding occurring in localised depressions and drains/swales particularly in the tea-tree plantations (presumably these areas are difficult to slash hence refugia remains for the Froglet). He also makes a valid point that without the adjacent refuge habitat, this phenomenon would probably not occur: but in some situations, it is also possible that a relic population can be present in a disturbed landscape if suitable refugia remains. Furthermore, apart from Connell Wagner's (2008b) data, there is no quantifiable or qualified analysis (eg via survey during a peak breeding event) undertaken to determine the distribution of breeding habitats both in protected and unprotected habitats in the study area, and the distribution of the population. This information would assist in determining certainty that there will be more

than sufficient breeding habitat remaining in the study area post-development.

Fanning (2015a) also considers that given current use of artificial features such as shallow drains/swales on site by the Wallum Froglet as habitat (foraging, refuge and breeding), that urban stormwater control structures such as swales and detention basins will also be suitable for the froglet post-development. This is a flawed assumption as:

- Current use of swales and drains in the tea-tree plantation is not an indication of adaptability: it is a relic of previous habitat being modified, but habitat conditions (eg acid water and dense vegetation) still maintaining values (depending on season and disturbance regime) and retaining sufficient connectivity with source habitat.
- The Wallum Frog is specifically adapted to breed in acidic (pH<6) water (Meyer et *al* 2005, Anstis 2002). Such water is acidic due to the lack of flow, soil type/chemistry, and *in situ* organic matter decay. Stormwater detention basins and swales are intended to collect and allow infiltration of rainwater runoff. Rainwater is typically neutral in pH. Hence there is no assurance that the pH of the swale or detention basin water on the urban fringe will be suitable for this ecological specialist. Furthermore, such conditions may benefit other frogs which may have negative impacts eg predation and competition (Meyer *et al* 2005).
- The Wallum Froglet is sensitive to water quality (Meyer *et al* 2005), as acknowledged by Connell Wagner (2008b). Personal observations have noted this species to avoid stormwater runoff from the Pacific Highway directed into a SEPP 14 wetland south of Kew. A review of the stormwater management report (de Groot & Benson 2015) notes that water quality targets will be met for identified parameters ie gross pollutants (ie litter, heavy sediment) and nutrients such as phosphorus and nitrogen. The latter are important as wallum heath vegetation is sensitive to nutrient enrichment which can cause toxic chemical changes and support weed invasion (Meyer *et al* 2005). No details are however provided to indicate that other pollutants (eg petrochemical residues from roads and tyres, cement residues, herbicides, etc) will not impact the habitat value of these stormwater treatment structures, or adjacent habitats.
- The swales and basins are designed to be dry at most times to minimise breeding habitat for mosquitoes (Smyth 2015c), and may also be routinely maintained via mowing and slashing. The former thus suggests that breeding is unlikely to be viable (ie insufficient time for tadpole metamorphosis) and the latter suggests refuge values will be minimal.

2.2.2.2. Definition of Viable Local Population

In addition to the population on site and the study area which may fluctuate in distribution and abundance with long term climatic patterns, Fanning (2015a) also identifies other populations within his definition of the 'locality'. While these records and sub-populations exist, this information is of limited relevance to the 7 Part Tests given the legal definition of 'locality' under DECC (2007) guidelines is different to his (see section 2.2.1 above).

While South West Rocks contains a number of other Wallum Froglet populations, the subject of the Seven Part Test is only the local population, which is limited to the study area (DECC 2007).

For the purpose of Seven Part Assessments for Stage 1 and 2, Fanning (2015a) defines the local viable population (forming the subject of the Seven Part Assessment) as the population in and around Saltwater Creek and Saltwater Lagoon, including on the subject land, lands to the south, and south and east of Saltwater Lagoon.

This definition is not in line with the DECC (2007) guidelines. As detailed in section 2.1, the local population is those animals within the study area: with the study defined as the area affected by direct and indirect impacts associated with the proposal (Stage 1 in this instance).

Fanning (2015a) does not provide sufficient information (eg an impact analysis identifying all possible direct and indirect impacts, and their potential geographic extent) to justify the limits of the study area for his assessment. The definition used suggests the limit of indirect impacts associated with the proposal will extend >1km to the east. No description of direct and indirect impacts extending over this area are provided to substantiate this definition, hence this is not in line with DECC (2007).

2.2.2.3. Stage 1 Seven Part Tests Assessment

This section of Fanning (2015a) assesses the impacts associated with Stage 1, which covers an area of 3.24ha in the north and northeast of the site.

As noted by Fanning (2015a) and also documented by Connell Wagner (2008a, 2008b), this area has been extensively modified by an earlier tea-tree plantation established in the early 1990s, over what was likely to have formerly been mostly heath and sedgeland (given recorded high watertable and current floristics), and hence suitable habitat for the Wallum Froglet (de Groot & Benson 2015, Fanning 2015a).

Prior to this conversion to a tea-tree plantation, this area thus would have formed part of the local population's normal range. Fanning (2015a) acknowledges that the Wallum Froglet may use at least some parts of this area, as reported by Dr White, depending on seasonal maintenance, watertable levels and rainfall. This is in line with its likely historical habitat values to the local population.

Part (a) Assessment

Despite being specifically required by the DECC (2007) guidelines, this section provides no detailed review of direct and indirect impacts to illustrate/justify the definition of the study area and hence distribution of the local population as relevant to Stage 1 and its associated impacts; or how the various aspects of the species lifecycle may be impacted.

By Fanning's (2015a) current impact analysis, the study area would be determined to be quite localised to the proximity of the Stage 1 footprint given the limited range and extent of identified impacts (eg the main identified indirect impact is impacts on water quality, which are argued to be effective to avoid offsite impacts). Hence the local population would be similarly limited in extent, and this is the entity which is supposed to be assessed as per DECC (2007).

Notwithstanding these shortcomings, the Stage 1 proposal, while having a range of negative effects on the local Wallum Froglet population, is not likely to have a net impact of sufficient order of magnitude to place a local viable population at risk of extinction given:

- While some foraging, seasonal refuge and ephemeral breeding habitat may/will be removed, the majority of breeding habitat likely to be used by the majority of the local population relevant to Stage 1 appears to fall within intact and predominantly wetter habitat in the directly adjacent E2 zone (Connell Wagner 2008b), and is protected by zoning including a buffer zone as per Connell Wagner (2008a).
- As noted by Smyth (2015a), Asset Protection Zones and all infrastructure is located outside the E2 zone. This will allow recovery of currently marginal habitat presumably currently subject to slashing in the E2 zone.
- The proposed urban area is relatively small, hence pollutants not targeted by stormwater systems will be limited to impacting a localised area, assumedly with buffering vegetation likely to reduce the penetration over into interior habitats. Consequently, most of the E2 zone and its habitats are not affected directly or indirectly.
- Connectivity for the local population will be reduced to the north which is of no consequence as no habitat lies in this direction. The connection required for long term genetic viability is protected in the E2 zone, and no new road bisecting this corridor is proposed.
- The cumulative loss of habitat, while an increment, is minor in comparison to the extent of habitat in the E2 zone which is protected from future development. Linkage at this time still remains to habitat in the northwest.
- Assuming at this stage that development does not proceed in removing the remaining ephemeral habitat in the remainder of the site, there is still the option to investigate the risks and if need be, retain habitat for future habitat migration in the event of Climate Change impacts degrading the habitat currently protected in the E2 zone (this issue is discussed further below).

Part (d) Assessment

The key issues with this section is the argument that the stormwater treatment infrastructure will offer potential habitat; and the interpretation of the legal term 'locality'.

The issues with assuming the stormwater treatment infrastructure will provide suitable habitat is provided above.

The misinterpretation of the 'locality' undermines the soundness of the assessment of this part, but notwithstanding this error, the area of habitat removed by the proposal is not likely to be significant to the local population for the reasons given above.

Part (g) Key Threatening Processes

An issue not explicitly considered by Fanning (2015a) or possibly by Connell Wagner (2008a, 2008b) is the issue of Climate Change and its long term implications for coastal wetlands and associated fauna.

Anthropogenic Climate Change is listed as a Key Threatening Process (KTP) under the NSW *Threatened Species Conservation Act 1995*.

While the proposal itself is arguably unlikely to have a significant influence on this KTP, there is no consideration of the impacts of sea level rise on the long term viability of Wallum Froglet habitat in the E2 zone and its implications for future development.

It is noted in Smyth (2015a) that sea level rise has been given consideration in the subdivision's urban layout and maximum flooding for location of dwellings, but there is no analysis of the effects in regards to ecological impacts of sea level rise and the viability of the E2 habitat to maintain the Wallum Froglet population.

Douglas Partners (2013) predict that with a 0.9m sea level rise by 2100, the typical lagoon level of RL 1.2m will rise to 2.2m AHD; and that watertables around the lagoon will also rise (eg from RL 1.7m AHD to 2.6m). This may see brackish/estuarine water (which has a neutral to weakly alkaline pH) entering Wallum Froglet breeding areas from the Lagoon, as well as major changes in the succession of aquatic and terrestrial vegetation due to the rising watertable, with associated impacts on water quality, vegetation floristics and structure, and habitability for the Wallum Froglet.

This is a key issue given the habitat enclosed in the E2 zone will become 'land-locked' by proposed development under the Concept Plan and other approved development to the south (eg the Malbec land as shown in Smyth 2015c has effectively severed the link to Hat Head National Park and will remove a substantial area of potential habitat identified by Connell Wagner 2008b); and research and modelling (eg DSE 2013, Jin *et al* 2009, Lemckert and Penman 2012, Mackey *et al* 2008, Morley *et al* 2012) has shown that there will be some delay in 'migration' of currently low-lying vegetation communities (via succession due to new edaphic conditions) and associated consequences for fauna dependant on currently low lying habitats and their ability to cope with this rapid ecological change.

This issue thus needs due consideration under Parts (a) and (d) to ensure the overall proposal will not have the cumulative effect of land-locking the local population and hence compromise its long term viability under currently accepted planning scenarios for sea level rise. This is also in-line with Connell Wagner's (2008b) statement that cumulative impacts need to be considered eg the land-locking to the south by approved development.

2.2.2.4. Concept Assessment

Part (a) Assessment

This section again provides no detailed review of direct and indirect impacts to justify the definition of the study area and hence local population as relevant to the Concept Plan and its associated impacts.

This is deficient given Connell Wagner (2008b) show a substantial part of this area has been recorded to be used by Wallum Froglets for breeding (see Figure 1); and the masterplan shows residential areas directly adjoining the E2 zone. The latter induces the risk of other edge effects such as contaminated

runoff entering adjacent breeding habitat; encroachment over the long term by residents into the E2 zone (eg parking trailers and boats, extending lawns via mowing and installing playground equipment, etc); greenwaste dumping; and arson (due to perception of fire risk or threats posed by snakes). These indirect impacts and their extent as well as significance need to be quantified and qualified.

In the absence of such an analysis, it is thus unclear where the actual distribution of the local population is eg where are the key breeding areas and are they secured? This is insufficient to allow certainty. A more detailed analysis is required to clarify certainty in line with DECC (2007).

Most importantly, as discussed above, the issue of the long term security of the local population under the currently accepted Climate Change scenarios needs to be duly considered under this part given the potential/unknown implications of water table and lagoon level rises upon the habitability of the habitat retained within the E2 zone.

In-line with the previous discussion, it needs to be demonstrated that:

- Sufficient habitat will remain in the E2 zone to provide ample habitat for all lifecycle stages of the local population; and to support a genetically viable population under Climate Change predictions for sea level and watertable rises. At the least, this will need an analysis of predicted lagoon water level heights over the E2 zone and some indication of water quality in the inundated areas eg brackish.
- Breeding habitat in the E2 zone is unlikely to become capable of supporting fish (eg Plague Minnow) which may undermine its value as foraging, refuge or more importantly breeding habitat.
- Sufficient connectivity will remain in the E2 zone to:
  - maintain ranging and dispersal, which are essential to allow movement (eg contraction in drought, expansion in flood) under all seasonal conditions;
  - maintain genetic diversity (ie connectivity between all sub-populations identified by Fanning 2015a);
  - ensure that no sub-populations may become isolated; and
  - allow habitat migration/retreat in the event of worst-case scenario sea level rises, and that sufficient area has been retained to allow for this outcome.

In addition to the above, Fanning (2015a) relies on the assumption that the majority of breeding habitat occurs in the E2 zone. This assumption may be valid, but there is insufficient information in the studies to date (eg Connell Wagner 2008b) to validate this fact. There is the uncertainty that the current refuge habitat may not be suitable for effective breeding (eg presence of Plague Minnow), and that the more important breeding sites may be ephemeral habitat outside this area (eg due to being free of Plague Minnow). Similarly, there is no data to clearly indicate the size or distribution of the majority of the population (eg it is assumed to be in higher density in the E2 zone), and hence its viability after contraction of its habitat on site and to the south. Again this information is vital to assess the long term impacts in the event of Climate Change as well.

It thus cannot be determined on the current analysis that a significant impact is unlikely in the long term based on the current information provided.

Part (d) Assessment

The response to this part of the Seven Part Tests again needs to be reviewed in terms of the legally correct definition of the 'locality', and consider the issues of Climate Change which may impact parts (ii) and (iii).

Sub-part (iii) in particular will need to demonstrate that the currently disturbed habitat known or potentially used by the Wallum Froglet is not important to the long term survival of the species in the locality (as discussed above), especially in the event of Climate Change predictions eg for potential migration of the population due to loss of habitat in the E2 zone.

This requirement is valid as the DECC (2007) guidelines state under this factor:

> "When applying this factor, consideration must be given to all short- and long-term impacts (direct and indirect) on habitat which are likely to support threatened species, populations and ecological communities regardless of whether the habitat occurs on the subject site. This applies to both occupied and unoccupied habitat because the recovery of threatened species, populations and ecological communities relies on them having access to suitable habitat to move into as numbers increase."

While not considered by Fanning (2015a) presumably as it is not shown in the Concept Plan but is an issue raised by the RMS and KSC, the reviewing consultant also supports the view (Smith 2015b) that a formal north-south road link from the site to adjoining developments south across Saltwater Creek would have a highly negative impact on the local and overall Saltwater Creek Wallum Froglet population. As noted by Connell Wagner (2008b), roads through Wallum Froglet habitat can induce very high levels of mortality via road kills (Richard 2008, Goldingay and Taylor 2005). In addition to the physical barrier and mortality threat, they are also a source of pollutants (eg petrochemical and tyre residues) and edge effects (eg weed invasion, nutrient enrichment, predation). Given connectivity and minimising disturbance of the E2 zone is a key condition of maintaining the larger population's viability, no such road link should be established. If such a link is to be established, it must be assessed as part of the Concept Plan.

Similarly, the masterplan (Fanning 2015c) also suggests pathways and cycleways through the E2 zone and adjacent National Park. These will result in a range of impacts such as loss of habitat, improved access for foxes and cats, as well as ambush points for predators, weed invasion of new edges, etc. If forming part of the Concept Plan, the incremental and cumulative impacts of these features also need to be considered.

3.0 Recommendations and Conclusion

This peer review has identified a number of issues with various aspects of the ecological assessment for Stage 1 and the Concept Plan.

These issues are less significant in regards to Stage 1, and the reviewing consultant concurs that this extent of proposed development (subject to the conditions above) is unlikely to have a significant impact on the Wallum Froglet.

The Concept Plan assessment however has a number of issues including:

- Failure to undertake a proper due diligence assessment for all impacts and significance in line with DECC (2007).
- Lack of data to clarify uncertainty of the significance of ephemeral habitats over the entire site to the ecology of the local population.
- Failure to consider long term impacts of Climate Change, particularly the risk of 'land-locking', as its associated impacts and implications for the long term viability of the local population.

In the absence of the proponent addressing these issues for the Concept Plan, the consent authority is bound by the Precautionary Principle, and will have to require a Species Impact Assessment to adequately assess the significance of the impacts of the proposal, and determine if they can be effectively mitigated.

If you have any further queries regarding these issues, please contact the undersigned.

Yours faithfully,

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