Proposed Residential Development, Warner Road, Warner

Ecological Assessment

16 October 2015

Report to Ausbuild

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1.0 Introduction

1.1 Background and Purpose of this Report

28 South Environmental has been engaged by Ausbuild (Applicant) to provide advice on ecological and bushfire management issues for a proposed residential development at Warner, in the south of the Moreton Bay Regional Council local government area. **Figure 1** shows that the Site is in a locality where residential development occurs to the north and south, and industrial development occurs to the east. The rural residential suburb of Cashmere occurs to the west of the Site.

The Site is largely cleared, and has been so for many years. For the most part it is now used for low intensity grazing, although some sites are not used at all, and as a consequence contain rank grassland and weedy regrowth. Conflagration Creek, running through the southeast of the Site's is its most prominent geographic feature. The boundaries of the Site and its constituent properties are shown in **Figure 2**. The character of the Site is further depicted in **Plates 1 – 40**.

The Applicant seeks to establish an urban residential development of the form and extent shown in **Figure 3**. Further detail is provided in **Attachment 1**. On 31 July 2015, the Applicant and its design team held an initial workshop with Council to discuss the proposal, and has since completed further detailed site investigation and design. Further detail on the proposed development is provided in the town planning report, and other technical reports accompanying this submission.

The purposes of this report are to: (i) present the findings of our investigations in regard to the ecological values and bushfire risks associated with the Site; (ii) describe the expected impacts of the proposed development, and the proposed mitigation and / or management measures; and (c) discuss compliance with relevant Commonwealth, State and Moreton Bay Regional Council (MBRC) environmental planning instruments[1].

This report is current as at 16 October 2015. This report is provided to Ausbuild for the purpose for which it was commissioned. This report is not to be relied upon by any other party. All parts of this report are to be read together, including all attachments and figures.

2 Matters for Consideration

2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. These are defined under the EPBC Act as 'Matters of National Environmental Significance' (MNES). Under the EPBC Act, a referral to the Department of the Environment (DoE) will be required if the proposed development could cause a Significant Impact on MNES. The determination of whether a Significant Impact will arise is made with reference to the Matters of National Environmental Significance Significant Impact Guidelines 1.1 (DoE 2013) and other EPBC Act policy statements[2].

[1] Noting that the proposed development will be assessed against the New Moreton Bay Planning Scheme, which at the time of writing remains in draft form.

[2] Including significant impact guidelines for individual threatened species, groups of species and threatened ecological communities (refer http://www.environment.gov.au/epbc/publications/guidelines.html)

A search[3] of the Protected Matters Search tool (PMST) indicates the likely or potential occurrence of MNES in the locality (**Attachment 2**). The Wildlife Online database was searched to determine confirmed records of MNES within a 5km radius of the Site. The search also identifies confirmed records of species listed as Endangered, Vulnerable or Near Threatened under the *Nature Conservation Act 1992* (NC Act). Results are provided in **Attachment 3**.

2.2 State Development Assessment Provisions

2.2.1 Module 5 – Fisheries Resources

State Assessment Referral Agency (SARA) mapping shows that Conflagration Creek is defined as a "*Qld waterways for waterway barrier works*" (low value) (**Attachment 4**). The development layout (**Figure 3** and **Attachment 1**) shows that a culvert[4] is to be established across Conflagration Creek. Under the *Sustainable Planning Act 2009* (SPA), the construction or raising of temporary or permanent waterway barrier works is classed as development (operational work).

The proposed road crossing could establish temporary or permanent waterway barrier structures. If the works are constructed in accordance with the Department of Agriculture, Fisheries and Forestry (DAFF) Code for self-assessable development - Minor waterway barrier works Part 3: culvert crossings (WWBW01 April 2013), then no further approval is required. If the works cannot meet the requirements of the code, then an application for a development approval will need to be lodged. Assessment would be made against Module 5.2 (Constructing or raising waterway barrier works in fish habitats state code) of the State Development Assessment Provisions (SDAP).

2.2.2 Module 8 – Native Vegetation Clearing

SARA mapping shows that areas defined as Category B on the Regulated Vegetation Management Map (RVMM) extend into the north of Lot 2 on RP195936, and that remnant vegetation adjoins the western boundary of Lot 3 on RP79062 (**Attachment 5**). The areas of regulated vegetation and their constituent regional ecosystems are more clearly shown by the RVMM and the associated Vegetation Management Supporting Map (**Attachment 6**). The relationship between the proposed development and regulated vegetation is shown in **Figure 4**.

Proposed development in the north of Lot 2 on RP195936 will extend into the mapped boundary of the regulated vegetation by approximately 21m. However, it is apparent on the ground that the regulated vegetation is entirely confined to the adjoining Lot 3 on SP174984, and there will in fact be no direct clearing of regulated vegetation as a result of the proposed development. A property map of assessable vegetation (PMAV) will be submitted to the Department of Natural Resources and Mines (DNRM) to correct this anomaly. Further discussion is provided in the vegetation analysis. Notwithstanding, there is still a requirement to demonstrate that bushfire buffers associated with the proposed development will not require clearing of vegetation in the adjoining Lot 3.

Similarly, while Lot 3 on RP79062 (far west of the Site) does not support regulated vegetation, there will be a requirement to demonstrate that there is no need to clear into the adjoining Lot 2 on RP79062 to establish adequate bushfire buffers. These matters will be addressed through a response to Table 8.1.3 of Module 8 (Queensland vegetation management state code) of the SDAP.

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[3] A 5km radius around the point -27.32326 152.95597was specified.
[4] Preliminary design indicates that the structure will be comprised of 5 culverts of 3600mm X 1500mm.

2.2.3 Module 11 – Wetland Protection Areas

SARA mapping shows that the Site does not support any wetland protection areas (**Attachment 7**). There is no requirement to address Module 11 of the SDAP.

2.3 Koala SPRP

Maps supporting the Southeast Queensland Koala Conservation State Planning Regulatory Provisions (Koala SPRP) shows that the Site is within the Priority Koala Assessable Development Area (PKADA) (**Attachment 8**). The relationship between the proposed development and areas of koala habitat is shown in **Figure 5**. The habitat map shows that the Site falls largely within the medium and low value rehabilitation habitat designations. The mapping shows that High value bushland and Medium value bushland habitat extend into the northern portions of Lot 2 on RP195936, but field survey shows that the High value bushland habitat is entirely confined to the adjoining Lot 3 on SP174984, and the Medium value bushland habitat to Lot 3 on SP174984 and Lot 4 on SP174985.

There is a small area of mapped High value bushland in the southwest of Lot 3 on RP79062. This area has been subject to significant historical disturbance, and while supporting Non-Juvenile Koala Habitat Trees (NJKHT) does not exhibit the qualities of bushland habitat. Further discussion in provided in the vegetation analysis.

The southwestern extent of Conflagration Creek supports an area of mapped Medium Value bushland habitat. Field survey indicates that the bushland habitat polygon is of different extent to that shown on the habitat map (of lesser extent in some areas and of greater extent in others). There is also an area of reasonably mature regrowth in the north of Lot 2 on RP118172 which could be also reasonably identified as Medium value bushland habitat.

The residential component of the proposed development requires assessment against Division 6 of the Koala SPRP, while the sewer and water infrastructure components require assessment against Division 4. Assessment Criteria 1 of Division 6 requires that "*Site design does not result in clearing of non juvenile koala habitat trees in areas of bushland habitat.*" This requirement significantly restricts the establishment of development in bushland habitat areas, and so the validity of the mapped Bushland habitat areas requires careful consideration. The requirements of Division 4 are less restrictive, but careful consideration is still required to minimise impact on areas of koala habitat.

We will request that Council consider and resolve the mapping anomalies identified by this assessment through the process set out under Division 9 of the Koala SPRP.

2.4 New Draft Moreton Bay Planning Scheme

2.4.1 Zoning

The New Draft Moreton Bay Planning Scheme (herein the planning scheme) assigns components of the Site to the south of Warner Road (and some to the north) to the Rural Residential designation. Lot 2 on RP195936 is assigned to the Light Industry designation. However, we understand that the entirety of the Site is to be assessed as if it were assigned to the Emerging Community Area designation.

2.4.2 Environmental Areas and Corridors Overlay Map

The Environmental Areas and Corridors Overlay map[5] identifies small areas in the west and north of the Site, and in the Conflagration Creek riparian zone as Matters of State Environmental Significance (MSES) (**Attachment 9**). The mapped polygons bear strong resemblance to the Koala SPRP bushland habitat polygons (**Figure 5**). Similarly, the MSES (Koala Offsets) designation bears strong resemblance to the areas of Medium value rehabilitation habitat shown on the Koala SPRP mapping. The validity of these designations will be assessed in tandem with the koala habitat map.

A small area in the north of Lot 2 on RP195936 is assigned to the Matters of Local Environmental Significance (MLES) designation. There is little on-ground evidence of any ecological significance in this locality, and a similar situation applies to other small MLES-mapped areas adjoining Conflagration Creek in the Site's south. These designations will be critiqued by this assessment.

Conflagration Creek, and the lower section of its northern tributary are identified as a W3 Waterway.

2.4.3 Riparian and Wetland Setbacks Overlay Map

The Riparian and Wetland Setbacks Overlay map[6] identifies Conflagration Creek and the lower section of its northern tributary as a W3 Waterway (**Attachment 10**). The overlay map identifies a desirable setback buffer to waterway.

2.4.4 Environmental Offset Receiving Areas Overlay Map

The Environmental Offset Receiving Areas Overlay Map[7] identifies Conflagration Creek as a component of the Strathpine-Eatons Hill (west) corridor (**Attachment 11**). Site assessment indicates this designation to be generally appropriate. The overlay map shows that areas in the west and far northwest of the Site are within the Brendale-Eatons Hill Corridor. Site assessment indicates this designation (as it relates to the Site) to be questionable. Further analysis and discussion will be provided by this assessment.

2.4.5 Bushfire Hazard Overlay Map

The Bushfire Hazard Overlay Map[8] shows that area of Medium Potential Bushfire Intensity surround and extend marginally into the Site, while the Potential Impact Buffer affects more significant parts of the Site (**Attachment 12**). Site assessment indicates the mapping designations to be generally appropriate. However, consideration also needs to be given to the extent that proposed offset and enhancement planting will increase fire risk to internal parts of the Site, in particular to areas adjoining Conflagration Creek.

[5] At the time of writing, in draft form and subject to ministerial approval.
[6] At the time of writing, in draft form and subject to ministerial approval.
[7] At the time of writing, in draft form and subject to ministerial approval.
[8] At the time of writing, in draft form and subject to ministerial approval.

3 Flora Assessment

3.1 Desktop Assessment

Section 2 of this report outlines the results of the desktop assessment, and provides scope for the vegetation survey and analysis.

3.2 Pre-clear Vegetation and Historic Disturbance

Queensland Herbarium pre-clear regional ecosystem mapping[9] shows that the Conflagration Creek floodplain and the lower end of its associated tributaries historically supported regional ecosystem RE 12.3.11. The adjoining slopes (comprising the remainder of the Site) supported a mosaic of RE 12.9-10.17 / 12.9-10.19a[10]. A description of these RE's is provided in **Attachment 13**.

The earliest available aerial photography (1955) shows that parts of the Site were already cleared at this time (**Figure 6a**). By 1978, the Site had been almost completely cleared[11], and cultivation was evident on Lot 3 on RP79062 in the Site's west (**Figure 6b**). The remnants of this cultivation remain apparent today. By 1987, regrowth had become more advanced in that part of the Site to the north of Warner Road, and scattered regrowth had begun to emerge to the south of Warner Road (**Figure 6c**). By 1997, further regrowth had emerged on sites to the south of Warner Road. To the north of Warner Road, substantially thinning of the formerly dense regrowth had occurred (**Figure 6d**). By 2008, the Site was cleared to a similar extent to which it is today (**Figure 6e**).

It is clear that the Site's historic disturbance has significantly affected its ecological values, and reduces the likely occurrence of many species (in particular forest-dependent species reliant on intact and contiguous habitat).

3.3 Site Survey

Vegetation survey was undertaken between 9 and 13 October 2015. The assessment involved:

- Ground-truthing the RVMM, and in particular ensuring that: (a) the boundaries of the remnant polygons were correct in relation to the Site and proposed development; and (b) the regional ecosystem identifiers were reflective of the vegetation present. Data was collected to prepare a map amendment PMAV for the northern portions of Lot 2 on RP195936;

- Ground-truthing the Koala SPRP habitat map, and in particular assessing the accuracy of the bushland habitat designations and their boundaries. Data was collected [12] to propose alternate habitat designations as per the requirements of Division 9 of the Koala SPRP;

- Locating all Non-Juvenile Koala Habitat Trees[13], and other trees of potential significance within and immediately adjoining the development footprint[14];

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[9] Sourced from the pre-clear dataset.
[10] At a mosaic ratio of 85% / 15%.
[11] Note that the vegetation evident in Lot 1 on RP92508 appears to the regrowth.
[12] GPS survey points and polygons were captured with a Trimble Geoexplorer GPS accurate to +/- 1m.
[13] As defined by the Koala SPRP.
[14] GPS survey points were captured with a Trimble Geoexplorer GPS accurate to +/- 1m

- Searching for Threatened Ecological Communities and flora species listed as MNES under the EPBC Act. Communities and species known from the locality were a particular focus of the survey;

- Searching for flora species listed as Endangered, Vulnerable and Near Threatened under the NC Act. Species known from the locality were a particular focus of the survey;

- Searching for flora species listed as Priority Species for Moreton Bay (PSMB) under Section 14 of Environmental Areas and Corridors Planning Scheme Policy[15]. Species known from the locality were a particular focus of the survey;

- Determining the composition, condition and conservation value of vegetation in the area proposed for development and across the Site more broadly.

3.4 Survey Results

3.4.1 General Description

(a) Riparian Vegetation on Conflagration Creek

Despite significant historic disturbance (**Figures 6a-6e**), riparian vegetation on Conflagration Creek is the most mature and structurally intact vegetation at the Site. Pre-clear regional ecosystem mapping indicates that the entirety of the floodplain was dominated by RE 12.3.11, but site assessment indicates that areas subject to more frequent inundation (lower levees) are likely to have supported RE 12.3.6. The higher (and drier) levees are likely to have supported RE 12.3.11. The present character of the Conflagration Creek floodplain vegetation is shown in **Plates 1-9**. Areas along Conflagration Creek are excluded from the RVMM, but there two regrowth patches which are now quite mature.

This first patch (Regrowth Patch 1) extends from the central portions of Lot 2 on SP121774 to the rear of Lot 6 on RP79062 (**Figure 7a**). Within this patch there is an emergent layer of Queensland blue gum (*Eucalyptus tereticornis*) over a canopy of Broad-leaved paperbark (*Melaleuca quinquenervia*) and Swamp turpentine (*Lophostemon suaveolens*). There is occasional Umbrella cheese tree (*Glochidion sumatranum*) and Cheese tree (*Glochision ferdinandii*). The shrub layer is of moderate density, and dominated by Smooth lolly bush (*Clerodendrum floribundum*), Wild may (*Leptospermum polygalifolium*) and Poison peach (Trema tomentosa). Regrwoth wattle (*Acacia* spp.) and Lantana (*Lantana camara*) dominate the edges[16]. The ground layer is dominated by Bungwall fern (Blechnum indicum), Harsh ground fern (*Hypolepis muelleri*), Wandering jew (*Commelina diffusa*) and Shade grass (*Ottochloa gracillima*). Pasture grasses occur in scattered areas, but with infill planting to increase shading could be largely excluded in time. No species of conservation significance were recorded by the survey, but the vegetation is a regrowth example of the Of Concern RE 12.3.6.

Six of the species recorded in Regrowth Clump 1 are listed as Class, 2 or Class 3 Declared Plants under *the Land Protection (Pest and Stock Route Management) Act 2002*, 4 of which are considered Weeds of National Significance. A plant species list for Regrowth Clump 1 is provided in **Attachment 14**.

The second patch (Regrowth Patch 2) is located in the north of Lot 2 on RP11872 (**Figure 7a**). Historic aerial photography shows that this area was largely cleared in 1955, with further areas of clearing evident in 1978. However, there appears to have been consistent regrowth since 1978 (**Figures 6a-6e**). The canopy of Regrowth

[15] Consultation Draft 1 July 2015.
[16] Lantana is most common on the more sun-exposed northern edge.

Patch 2 contains Queensland blue gum, Northern grey ironbark (*Eucalyptus siderophloia*), Pink bloodwood (*Corymbia intermedia*) and Brown bloodwood (*Corymbia trachyphloia*). The sub-canopy layer contains juvenile canopy species and Broad-leaved paperbark. The shrub layer is dominated by Bracken fern (*Pteridium esculentum*) and Tie bush (*Wikstroemia indica*). The ground layer consists of herbaceous natives and weeds. The main channel of Conflagration Creek is dominated by a dense growth of Typha (*Typha orientalis*). One PSMB was recorded in Regrowth Clump 2, Moreton bay fig (*Ficus macrophylla*). The vegetation is close to achieving remnant status for the Of Concern RE 12.3.11. Five of the species recorded in Regrowth Clump 2 are listed as Class 2 or Class 3 Declared Plants under the *Land Protection (Pest and Stock Route Management) Act 2002*, 2 of which are considered WONS. A plant species list for Regrowth Clump 2 is provided in **Attachment 14**.

The remaining floodplain areas to the south of Warner Road support scattered Queensland blue gum, Swamp turpentine and Broad-leaved paperbark over rank grassland. These more scattered trees were located by GPS, and are recorded by species identity in **Figure 7a**, and by size in **Figure 7b**.

(b) Paddocks with Scattered Trees, and Domestic Landscaping

Figure 2 shows that most of the Site is comprised of open grassland with scattered trees. By cross-referencing the historic aerial photography it can be clearly seen that most of the vegetation now present is reasonably young regrowth. Field survey indicates that much of the regrowth is dominated by Brush ironbark wattle (*Acacia aulacocarpa*) and Black wattle (*Acacia leiocalyx*).

GPS survey was undertaken to record NJKHT and other native species of potential local value. Species commonly encountered by the survey were Queensland blue gum, Small-fruited grey gum (*Eucalyptus propinqua*), Northern grey ironbark, Spotted gum (*Corymbia citriodora* subsp. *variegata*), Tallowwood (*Eucalyptus microcorys*), White mahogany (*Eucalyptus acmenoides*), Swamp turpentine, Scribbly gum (*Eucalyptus racemosa*) and Umbrella cheese tree. Landscape species such as Mango (*Mangifera indica*) and Norfolk island pine (*Araucaria heterophylla*) were encountered occasionally in paddocks, but these and other landscape species become more common around the Site's dwellings. A small orchard is also present.

A tributary of Conflagration Creek in the north of Lot 1 on RP92508 contains soaks and dams supporting Jointed twig-rush (*Baumea articulata*), Juncus (*Juncus usitatus*) and Snowflake (*Nymphoides indica*). Waterways (outside of Conflagration Creek) in the south of the Site are simple grassed overland flow paths, with little to no differentiation from adjoining grassland areas.

The character of these paddocks and domestic landscape areas is shown in **Plates 10-36**. A plant species list is provided in **Attachment 14**.

3.4.2 Communities, Species and Features of Conservation Significance

- The Site does not support any flora communities or species listed as MNES under the EPBC Act;
- The Site does not support any EVNT flora species listed under the NC Act;
- One PSMB – Moreton bay fig (*Ficus macrophylla*) was recorded in Regrowth patch 2. This specimen is well-removed from the area proposed for development.
- Regrowth Patch 1 in Conflagration Creek represents advanced regrowth of the Of Concern RE 12.3.6. Data from Acaad and Neldner (2015) shows that in the Moreton Bay Regional Council LGA, approximately 31% of the pre-clear extent of this RE remains (**Attachment 15**). Regrowth Patch 2 represents advanced regrowth (bordering on remnant) RE 12.3.11 (**Figure 7a**). Data from Acaad and

Neldner (2015) shows that in the Moreton Bay Regional Council LGA, approximately 11% of the pre-clear extent of this RE remains. Both patches could also be justifiably mapped as Bushland Habitat on the Koala SPRP habitat map;

- A small area in the southwest of Lot 3 on RP79062 is mapped as Bushland Habitat by the Koala SPRP habitat mapping (**Attachment 8**). However, as shown by the historic aerial photography (**Figures 6a-6e**), this area was under cultivation until 1987, and even by 1997 supported only very sparse regrowth. The GPS tree survey recorded a grouping of young NJKHT from this area, but the area is considered more properly identified as Rehabilitation Habitat than Bushland Habitat. This character is further illustrated by **Plates 37-40**. The Applicant will request that the area be considered rehabilitation habitat rather than bushland habitat.

- A small area adjoining the northern boundary of Lot 2 on RP195936 is mapped as regulated vegetation (Least Concern regional ecosystem) on the RVMM (**Attachment 6**). Tree survey (**Figure 7a**) shows that there is in fact only widely scattered trees along this boundary. This finding provides strong evidence for a map amendment through the PMAV process. Similarly, the tree survey also calls into question the MLES designation in this area shown on the Environmental Areas and Corridors Overlay Map (**Attachment 9**).

- The mapped area of Medium value bushland habitat in the southwest of the Site is of different extent to that shown on the koala habitat map. The ground-truthed extent is shown in **Figure 7a**.

- The Site does not support other trees of outstanding natural or landscape character, for example large pine trees (Hoop, Norfolk island, Kauri or Bunya) or large fig trees.

4 Fauna Assessment

4.1 Methods

4.1.1 Establish a Target Species Shortlist

Given the defined nature of the proposed footprint and proximity to urban environments, it is feasible to undertake habitat assessment surveys, condition assessments and inspections throughout the entirety of the Site and footprint of the proposed development. In addition to the broad habitat assessments, targeted surveys for key threatened fauna species were undertaken adopting relevant survey guidelines for each species. These surveys focused on specific vegetation communities and habitat features found on site which were deemed the most likely to support the threatened fauna species in representative areas across the Site.

The protected matters search tool database (**Attachment 2**) and the Wildlife Online database (**Attachment 3**) indicate that there are species of conservation significance within a 5km radius of the Site. The Environmental Areas and Corridors Planning Scheme Policy also lists MLES fauna species for the Moreton Bay Regional Council LGA. In order to develop a working list of target species for the assessment, the habitat requirements for each species were assessed, and a review of local records undertaken. Where is was found that suitable habitat was absent from the Site and adjoining areas, and there was lack of local records[17], it was deemed that the species was a highly unlikely occurrence. In these instances, no further survey effort was employed. Where it was found that there were local records of conservation-significant species, and the habitat was broadly suitable, it was deemed necessary to undertake further survey. The Precautionary Principle was invoked in making such decisions.

A further process of sieving occurred whereby species which are rare in the landscape and not readily detected by single surveys were assumed to occur at the Site in the longer term. For example, Swift parrot is a rare winter migrant to Southeast Queensland. During its over-wintering visit, Queensland blue gum is an important blossom resource for Swift parrot. Queensland blue gum occurs at the Site, and Swift parrot is tolerant of habitat fragmentation. Therefore, when assessed over time it is reasonable to assume that Swift parrot could utilise the Site's habitats. In our view there in no value in conducting targeted surveys for such species.

Shortlisting identified the following species for targeted fauna survey: Tusked frog, Great-barred frog, Lewin's rail, Glossy-black cockatoo, Powerful owl, Koala and Squirrel glider. Habitat assessment found Spotted-tailed quoll to be an unlikely occurrence, but adopting an abundance of caution, it was included in the shortlist.

4.1.2 Field Survey

Amphibians

Amphibian surveys targeted the permanent-water and temporary swampy edge habitats associated with Conflagration Creek, and its smaller swampy tributary to the north of Warner Road. Surveys were conducted

[17] This was determined by way of Wildlife Online database searches established 2km, 4km and 10km radii from the Site and a range of other sources, including: Aerial photography; Soil mapping; Publicly available ecological reports; EPBC Protected Matters Search Tool; Atlas of Living Australia threatened species mapping/modelling; Queensland Museum records; Regional Ecosystem mapping; Threatened flora trigger mapping; Wetland Protection Area mapping; SARA mapping and planning scheme mapping.

over 4 nights (9-12 October 2015 inclusive). The survey was undertaken during Spring, but reasonable rainfall had been received in the month before the survey, and was received on the night that surveys commenced. Weather data[18] is provided in **Attachment 15**.

Reptiles

Reptile surveys involved targeted ground search of areas with dense leaf litter (Regrowth Clumps 1 and 2 in Conflagration Creek); rolling rocks, logs, sheets of corrugated iron etc., in paddocks; carefully picking around dilapidated sheds, wood piles and other areas of refuse (**Plates 29 & 30**); spotlighting; and general site traverse.

Birds

The Site was small enough to allow a comprehensive search of the entire area each day over the course of the survey period. Generally, avifauna surveys were conducted between dawn and mid-morning and again between mid-afternoon until spotlighting ceased at approximately 10pm. Survey efforts were focused on stratified areas of habitat to bias efforts towards habitats likely to support cryptic species as well as detect the widest possible array of species possible (e.g. avoidance of excess survey effort in open paddock habitats). A systematic sampling approach was taken, whereby habitats throughout the site were searched at regular intervals over the course of the day and night utilising a combination of survey techniques. Given the size of the overall Site and the isolated nature of habitats, area searches were considered appropriate and comprehensively exhausted habitats present at the time of survey. Techniques included:

- Point census surveys in higher quality habitats;
- Time transects within riparian and higher quality habitats;
- Wetland/dam watches at dawn/dusk;
- Call playback for threatened species which may potentially occur;
- Area searches of higher quality habitats; and
- Flushing of taller rank grasslands and wetlands (flushing surveys involved the use of two ecologists where one remained stationary with a 500mm spotting scope while the other meandered through proximate habitats).

Mammals

Koala scat survey was undertaken in accordance with the Spot Assessment Technique (Phillips and Callaghan 2011). 9 SAT plots were established across the Site to sample habitats in which Koala was considered most likely to occur (**Figure 8**).

[18] Redcliffe is the closest weather station providing data on rainfall, temperature and wind direction. It is acknowledged that slight differences in weather conditions may have been experienced at the Site, but these are unlikely to be significant.

Spotlighting was undertaken from dusk until 10pm on the nights of 9-13 October 2015 (inclusive). Good coverage of the Site was achieved, although greater effort was focused in areas where Koala and Squirrel glider were considered most likely to occur (notably the more intact habitats associated with Conflagration Creek).

Five remote camera detection units were set in riparian habitats along Conflagration Creek and left in position for 10 nights (**Figure 8**). While not specifically set to record Koala, in the experience of the author, they often do so. The camera detection units were set specifically to record Spotted-tailed quoll.

Canopy transect searches were undertaken in Regrowth Patch 1 and 2, and vigilance for koalas was maintained during general site traverse. During the GPS tree survey, a complete canopy scan was conducted at every tenth tree encountered (i.e. tree 1, tree 10, tree 20 etc.)

Spotlighting survey in October 2014[19] had already identified Squirrel gliders from the north of Lot 2 on RP118172, and so surveys targeted the area of next most suitable habitat on Conflagration Creek. 18 arboreal Elliot traps were set, and monitored for 4 nights (**Figure 8**).

The following methods were adopted: (i) spot assessment technique; (ii) canopy transect search in Regrowth Patch 1 & 2, and a complete canopy scan of every tenth NJKHT located by GPS survey; (iii) sp

4.2 Findings

4.2.1 Amphibians

Neither the Protected Matters Search Tool nor the Wildlife Online database indicate the occurrence of conservation significant Amphibians in this locality, but the shortlisting assessment determined that Tusked frog (*Adelotus brevis*) and Great-barred frog (*Mixophyes fasciolatus*) should be considered in further detail.

Ten common species of Amphibian (including the exotic Cane toad) were recorded by the survey (**Attachment 16**). The Conflagration Creek riparian zone was the most significant habitat for this group, with negligible records obtained from other areas. It is likely that other common species known from the locality (refer Wildlife Online data – **Attachment 3**) will also occur in the Conflagration Creek riparian zone. Neither Tusked frog nor Great-barred frog were recorded during the survey, but both are considered possible occurrences.

Rowland (2013) notes that Tusked frog occurs in farm dams and garden ponds. Conflagration Creek and associated swampy edge habitats are suitable for this species. Tusked frog persists in highly urbanised streams in Brisbane City (Mott Creek, Greenslopes) (BCC 2010), and (if present) is likely to persist at the Site post-development due to the significant waterway buffers to be provided (retaining suitable habitat), and water sensitive urban design stormwater management are encouraged to retain the Site's habitat value for this species.

Atlas of Living Australia (2015) notes that Great-barred frog typically inhabits rainforests, wet sclerophyll forests and woodlands, but can also be found in disturbed areas and farmlands. The author has also observed Great-barred frog in highly disturbed farmland areas. Great-barred frog may be more sensitive to urban development,

[19] During a preliminary appraisal of the Site's values, one night of spotlighting survey was undertaken in the area deemed to be the Site's best Koala habitat. Koala was not recorded from this area during that survey, but Squirrel glider was recorded.

but retention, buffering and enhancement of riparian vegetation, and water sensitive urban design are encouraged to retain the Site's habitat value for this species.

4.2.2 Reptiles

Neither the Protected Matters Search Tool nor the Wildlife Online database indicate the occurrence of conservation significant Reptiles in this locality, and habitat assessment indicates that the Site is unlikely to support any MNES-MSES-MLES reptile species.

Reptile surveys recorded 8 species (**Attachment 16**), all of which are common in the rural and peri-urban habitats of this locality. None of the species recorded are MNES-MSES-MLES, and the available habitats for such species at the Site are poor. Surveys found the riparian habitats of Conflagration Creek to be the most important for this group. It is expected that this is in response to the diversity of habitats and cover in this area, and the diversity of suitable prey species. The remaining open grassland areas are of generally low value for this group, although there are values around dilapidated outbuildings, wood piles and other anthropogenic features for common rural species. It is considered likely that other common rural and peri-urban inhabitants known from the locality will also occur at the Site (refer Wildlife Online data – **Attachment 3**).

4.2.3 Birds

The Wildlife Online database indicates the presence of a diverse bird community in this locality. The protected matters search tool indicates the occurrence of several MNES, but habitat assessment indicates that these species are either unlikely to occur, or can be predicted as possible occurrences by habitat assessment.

38 species of bird were recorded by the survey (**Attachment 15**), all of which are common in the rural and peri-urban habitats of the broader locality. The greatest diversity and density of bird species was found in the Conflagration Creek riparian zone. This area contains the greatest diversity of habitats and cover, and if enhanced could support a greater diversity of species. The Site's remaining areas will be of low value for this group, providing habitat for only common open country species. It is considered likely that other common rural and peri-urban inhabitants known from the locality will also occur at the Site (refer Wildlife Online data – **Attachment 3**). Targeted survey was undertaken for three MSES species.

Lewin's rail (*Lewinia pectoralis*) - surveys involved call playback in potentially suitable habitat on Conflagration Creek. Surveys were conducted over four nights without recording this species. It is however still considered a possible occurrence, and it is recommended that habitat enhancement works be undertaken to improve the values of Conflagration Creek for this species.

Glossy black cockatoo – (*Calyptohynchus lathamii*) - searches were undertaken for potential nest trees, and for areas of sheoak forage habitat. Due to the highly cleared nature of the Site, few large trees were located (**Figure 7b**). All large trees were closely assessed for potentially suitable nesting hollows, but suitable hollows were located. Similarly, searches for areas of forage habitat[20] were unsuccessful. The Site does not provide significant habitat for the Glossy black cockatoo.

Powerful owl (*Ninox strenua*) – Powerful owl is known to utilise highly fragmented landscape and even urban areas if suitable nesting sites and prey is available. Due to the highly cleared nature of the Site, few large trees

[20] Stands of Black sheoak (*Allocasuarina liitoralis*) and Forest oak (*Allocasuarina torulosa*)

were located (**Figure 7b**). All large trees were closely assessed for potentially suitable nesting hollows, but no suitable hollows were located. Surveys found that the Site supports several prey species of Powerful owl, notably: Common ringtail possum, Squirrel glider, Black flying fox and Grey-headed flying fox. Riparian habitats associated with Conflagration Creek provide the most important habitat for Powerful owl prey species, and are consequently the Site's most important habitat for Powerful owl at the Site. It is highly unlikely that the Site is sufficiently productive to form an important component of a larger Powerful owl home range. However, if retained and enhanced, the riparian habitats of Conflagration Creek would continue to be used by Powerful owl (even if embedded in an urban area).

4.2.4 Mammals

The Wildlife Online database indicates the presence of a diverse mammal community in this locality. The protected matters search tool indicates the occurrence of several MNES, two of which were recorded by the survey (Koala and Grey-headed flying fox). Several of the species identified by the database search are considered highly unlikely to occur at the Site, and were assessed no further (False water rat, Long-nosed potoroo), or could be determined by way of habitat assessment[21]. 11 species of mammal were recorded by the survey, including four MNES-MSES-MLES species.

Preliminary assessment of the Site in 2014 identified the presence of Koala by scat survey. The Site is also located within the PKADA, and near the suburb of Cashmere, where koala densities are known to be high. On this basis it was considered prudent to complete detailed assessment of the Site in accordance with the EPBC Act Koala Referral Guideline. Further detail on the methods adopted is set out in Section 4.1.2.

The area of greatest koala activity was associated with Conflagration Creek, and in particular Regrowth Patches 1 and 2. These areas support the primary koala habitat tree, Queensland blue gum, and to a lesser extent Tallowwood. They are also dominated by sclerophyll species providing more general forage habitat and shelter values. For the purpose of addressing the Koala SPRP, Regrowth Patches 1 and 2 could be considered Medium value bushland habitat. Other more scattered trees along Conflagration Creek will be important and movement habitat.

Koala was not recorded outside of the Conflagration Creek riparian area by direct means (camera detection or spotlighting), but scat surveys did indicate use (as expected) of the Site's more widely scattered koala habitat trees (refer **Figure 7a** for species locations). While Conflagration Creek provides the Site's most important habitat, it is likely that individual Koalas at the Site occupy home ranges largely based on scattered paddock trees. The loss of these home ranges to accommodate development will need to be addressed by the provision of offsets (as required by the Koala SPRP). There is significant opportunity for the establishment of offsets in Conflagration Creek. Further discussion on offsets is provided on Section 6.4.

In October 2014, Squirrel glider was detected by spotlighting survey in Regrowth Patch 2. This area continues to provide high value Squirrel glider habitat, and so efforts to determine Squirrel glider presence focused on Regrowth Patch 1 further to the west. Squirrel glider was readily detected by arboreal Elliot traps and spotlighting survey in Regrowth Patch 1, and it is considered that this patch is also important for Squirrel glider conservation at the Site. Spotlighting survey failed to locate Squirrel glider in any of the more isolated patches and trees across the Site, but very occasional use of these areas for seasonal foraging or dispersal cannot be discounted. Retention and enhancement of the Conflagration Creek riparian zone is of significant importance

[21] For example the Large-eared pied bat is a cave roosting species. The Site does not support suitable caves or other subterranean structures, but could roost in the locality and forage over the entirety of the Site.

for this species. The palette adopted for the offset planting in this area should focus on establishing a diversity of species providing a blossoming continuum.

The MNES-MLES Grey-headed flying fox, and the MLES Black-flying fox were both recorded by the survey. Flying fox camps (which are typically raucous and readily detected) were not found at the Site. Both species could forage across the Site, with use dependent on the seasonal blossom or fruiting resource available at the time. However, the winter blossoming habitats associated with Conflagration Creek (comprising the Autumn to Spring blossoming Broad-leaved paperbark, Queensland blue gum and Northern grey ironbark) will be of greatest value to this group, as winter is a time of "blossom bottleneck". Nonetheless, the value of other species at the Site should not be ignored, and it is suggested that the palette adopted for the offset planting in this area should focus on establishing a diversity of species providing a blossoming continuum.

4.2.5 Corridor Values

The Environmental Offset Receiving Areas Overlay Map[22] identifies Conflagration Creek as a component of the Strathpine-Eatons Hill (west) corridor (**Attachment 11**). Site assessment indicates that this is a valid designation, and that efforts should be made to retain the integrity of the corridor, and improve its values through revegetation.

The overlay map shows that areas in the west and far northwest of the Site are within the Brendale-Eatons Hill Corridor. Site assessment indicates this designation (as it relates to the Site) to be questionable, because the affected parts of the Site are poorly vegetated, and do not contribute to corridor function to the same degree as the adjoining well-vegetated lands (which appear to be appropriately identified as corridor).

5 Impacts and Mitigation

5.1 Background

The 'avoid – mitigate – offset' principle is a common tenet of conservation planning in development settings, and is a standard against which development performance is assessed by all levels of government. The following discussion outlines the way the principle has been adopted by the proposed development.

5.2 Way Impacts have been avoided

The proposed development is located on land which has been subject to significant historic disturbance. It is now dominated by regrowth vegetation with occasional larger trees. The area proposed for development does not support any conservation-significant plant communities or flora, and is of generally low value for conservation significant fauna. By contrast, the area proposed for conservation and rehabilitation through offset planting supports plant communities of conservation significance, and provides significant habitat for a number of MNES-MSES-MSES fauna species, including Koala.

5.3 Way Impacts will be mitigated

5.3.1 Civil Works guided by a Vegetation Management Plan

The proposed development will require the clearing of mainly scattered trees. In some areas development will occur in proximity to vegetation proposed for retention. In order to ensure minimal impact on vegetation

[22] At the time of writing, in draft form and subject to ministerial approval.

proposed for retention it is proposed that the civil works program be guided by a vegetation management plan which clearly set out the vegetation to be retained and removed, and the mechanisms to protect retained vegetation such as construction exclusion zones, exclusion zone fencing and clearing protocols. The vegetation management plan will also provide guidance for the spotter-catcher overseeing the clearing program. The vegetation management plan will be provided at the Operational Works stage.

5.3.1 Internalising clearing requirements

The Site has been largely cleared, and much of the future proposed development will not be subject to fire threat. Further consideration of fire management has been given to areas adjoining retained bushland, and where possible esplanade roads have been provided to accommodate asset protection zones. In some cases esplanade roads could not be provided, and in these circumstances dwellings will be protected by requiring construction to be undertaken to certain BAL construction requirements under AS 3959-2009 (Construction of Buildings in Bushfire Prone Areas). Infrastructure associated with the proposed development will be almost wholly accommodated within the area proposed for residential lots.

5.4 Offsetting the Residual Impact

The Site is within the PKADA, and the proposed development is required to demonstrate compliance with Table 6 of the Koala SPRP. Assessment Criteria 2 in Table 6 requires that Site design must avoid clearing non-juvenile koala habitat trees in areas of high value rehabilitation habitat, and medium value rehabilitation habitat, with any unavoidable clearing minimised and offset in accordance with the Offsets for Net Gain of Koala Habitat in South East Queensland Policy at a ratio of three new koala habitat trees for every one non-juvenile koala habitat tree removed or an equivalent cash contribution.

Non-juvenile koala habitat trees were counted across the area proposed for development. The count reveals that 404 NJKHT's will be removed. This will require an offset of 1212 trees to be provided. It is proposed that the offset planting be established in the cleared floodplain of Conflagration Creek. This is beneficial insofar as providing an offset area immediately proximate to the area of impact, and improving habitat connectivity along Conflagration Creek (identified as the Strathpine-Eatons Hill Corridor).

The SPRP habitat map shows that the Conflagration Creek floodplain is identified as Low Value Rehabilitation habitat, but it is clear that this is a mapping anomaly because the floodplain has the potential to re-establish communities in which the primary koala habitat tree (Queensland blue gum) is a prominent species.

Queensland Herbarium pre-clear regional ecosystem mapping shows that the Conflagration Creek floodplain historically supported RE 12.3.11, but site assessment indicates that RE 12.3.6 is likely to have occurred on the lower (wetter) components of the floodplain. These are the areas where the majority of the offset will be established. For the purpose of analysis, we have assumed that the offset area will accommodate a vegetation mosaic comprised of a 30%-70% mix of RE 12.3.6 and RE 12.3.11. These regional ecosystems contain a high percentage of the primary koala habitat tree Queensland blue gum (*Eucalyptus tereticornis*), and their re-establishment in this locality would improve koala habitat values and connectivity across this floodplain.

Offsets must be established at a density which reflects combined natural tree densities in the emergent (E), canopy (T1) and sub-canopy (T2) layers of the target regional ecosystems[23]. Queensland Herbarium technical descriptions for the target RE's are provided in **Attachment 20**. We note that the combined densities for the target RE's are: (i) RE 12.3.6 – 1336 trees / ha; and (iii) RE 12.3.11 – 864 trees / ha. When applied across a 1ha

[23] *Pers comm* Brett Manning Koala Unit DEHP.

plot using the weighted proportions (30%/70%), an average of 1006 trees/ha is established. At this identified capacity, 1.2 hectares is required to acquit the 1212 tree offset.

There is significant capacity within the Site to accommodate this offset. Excluding Regrowth Patches 1 and 2, there is approximately 8.7 hectares of land suitable for offset planting, indicting considerable over-capacity to accommodate the offset within the Site.

6 Statutory Compliance

6.1 EPBC Act

Assessment indicates that the proposed development is unlikely to cause a Significant Impact on MNES. However, we recognise that the proposed development is of reasonable scale, and near the suburb of Cashmere, where Koala habitat values are known to be high. Out of an abundance of caution, and to remove uncertainty around the EPBC Act approval process, the Applicant will lodge a controlled action referral for the proposed development. Council will remain informed as to the progress of the referral.

6.2 SDAP

6.2.1 Module 5 – Fisheries Resources

The proposed road crossing could establish temporary or permanent waterway barrier structures in Conflagration Creek. If the works are constructed in accordance with the Department of Agriculture, Fisheries and Forestry (DAFF) Code for self-assessable development - Minor waterway barrier works Part 3: culvert crossings (WWBW01 April 2013), then no further approval is required. If the works cannot meet the requirements of the code, then an application for a development approval will need to be lodged. Assessment would be made against Module 5.2 (Constructing or raising waterway barrier works in fish habitats state code) of the State Development Assessment Provisions (SDAP). Further detailed design will be required to assess compliance with the Code.

6.2.2 Module 8 – Native Vegetation Clearing

As planning for the Site progresses, a PMAV will need to be submitted to clarify remnant boundaries on Lot 2 RP159936 (noting that remnant vegetation should be confined to the adjoining Lot 3 on SP174984). The design will also need to provide for appropriate setbacks to this (and other) areas of remnant vegetation on and adjoining Site. Esplanade roads are the most effective design response, but larger lots with appropriate setbacks to building envelopes are also an acceptable design response.

6.3 Koala SPRP

A response to Division 6 of the Koala SPRP is provided in **Table 1** below. The primary considerations regarding the Koala SPRP are: (i) that the proposed development avoids impact on areas of properly-defined bushland habitat; (ii) that offsets will be provided for loss of scattered NJKHT's in areas of rehabilitation habitat; and (iii) that offsets are to be established on-site in Conflagration Creek, thereby benefiting the koala population to be impacted by the proposed development, and improving habitat connectivity through the Site.

6.4 Planning Scheme Code Responses

Final compliance assessment is yet to be completed.

TABLE 1 – RESPONSE TO TABLE 6 OF THE KOALA SPRP

Assessment Criteria for Assessable Development	Development Response
1. Site design does not result in the clearing of non-juvenile koala habitat trees in areas of bushland habitat.	There are small areas of the Site where the proposed development encroaches into mapped bushland habitat. However, the mapping in these areas is incorrect, as indicated by the detailed tree survey (**Figure 7a**). The proposed development will be located wholly outside properly-defined areas of bushland habitat.
2. Site design must avoid clearing non-juvenile koala habitat trees in areas of high value rehabilitation habitat, and medium value rehabilitation habitat, with any unavoidable clearing minimised and offset in accordance with the Offsets for Net Gain of Koala Habitat in South East Queensland Policy at a ratio of three new koala habitat trees for every one non-juvenile koala habitat tree removed or an equivalent cash contribution.	The proposed development will be wholly located in areas of rehabilitation habitat. The required clearing of NJKHT from these areas will need to be offset in accordance with the Offsets Policy (offset ratio of 3:1).
3. Site design provides safe koala movement opportunities as appropriate to the development type and habitat connectivity values of the site determined through Schedule 2.	Safe koala movement opportunities are provided by rehabilitating Conflagration creek, and ensuring appropriate underpass design for the road crossing points.
4. During construction phases: a. measures are taken in construction practices to not increase the risk of death or injury to koalas; and b. native vegetation that is cleared and in an area intended to be retained for safe koala movement opportunities is progressively restored and rehabilitated.	In response to Part (a) – A spotter-catcher will be engaged to plan for and oversee the clearing program; and In response to Part (b) – there is no proposal to retain vegetation within the footprint of the development. Vegetation will be retained in areas closely adjoining the development, and the manner in which this is protected during the civil works phase will be described in a Vegetation Management Plan. The strategy for offset planting will be set out in the Offset Management Plan. Both of these plans will be submitted for assessment at the Operational Works stage.
5. Native vegetation clearing is undertaken as sequential clearing and under the guidance of a koala spotter where the native vegetation is a non-juvenile koala habitat tree.	Vegetation in the development footprint is highly fragmented and there is no need to undertake sequential clearing. A spotter-catcher will be engaged to plan for and oversee the clearing program. This will ensure that koala welfare issues are appropriately addressed.
6. Landscaping activities provide food, shelter and movement opportunities for koalas consistent with the site design.	There is no proposal to provide for koala connectivity through the development footprint. Vegetation will be retained in areas closely adjoining the development, and the manner in which this protected during the civil works phase will be described in a Vegetation Management Plan. The strategy for offset planting will be set out in the Offset Management Plan. Both of these plans will be submitted for assessment at the Operational Works stage.

References

Accad, A. and Neldner, V.J. 2015. *Remnant Regional Ecosystem Vegetation in Queensland, Analysis 1997-2013*. (Queensland Department of Science, Information Technology and Innovation: Brisbane).

Atlas of Living Australia. 2015 Mixophyes fasciolatus Gunther 1864 Great barred frog: Accessed on 16 October 2015 at http://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:3efba49b-92b3-4e01-a31b-7c8137e29d5c

BCC. 2010. *Tusked Frog Conservation Action Statement*: Brisbane City Council.

Department of the Environment.2013. *Matters of National Environmental Significance-Significant Impact Guidelines 1.1*. Australian Government.

Phillips, S and Callaghan, J. 2011. The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas (*Phascolarctos cinereus*): Australian Zoologist: 35(3)

Rowland, J. 2013. *Targeted Species Survey Guidelines – Tusked frog (Adelotus brevis)*. Department of Science, Information Technology, Innovation and the Arts.