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6 August 2018

RE: Greyleigh Drive, Kiama – Ecological Constraints Assessment

Dear Sophie,

This letter has been prepared to outline the methods and results of an Ecological Constraints Assessment (ECA) for Lot 1 // DP995058, Lot 1 // DP1003719, Lot 156, 183, 185, 186, 187, 188, 189 // DP751279, Lots 99 & 100 // DP 1042913, Lot 300 // DP 1059841, Lot 1319 // DP 1060995 Lot 1 // DP1178500, Lot 1320 // DP1060995 and Lot 2 // DP1135218 Greyleigh Drive, Kiama (the 'study area'; **Figure 1**). Since undertaking the field work and investigations on the 'study area', the area to which the Planning Proposal application applies has been revised to the site boundaries as shown in **Figure 2**. The findings of this Ecological Constraints Assessment overlap with the final site area and no additional field work or analysis are required to support the Planning Proposal application.

The study area is located adjacent to residential properties, approximately 6 km from the base of the Illawarra escarpment and 1.5 km from the coastline.

This ECA identifies the ecological values present within the study area and potential constraints for a proposed subdivision of the study area. Specifically, this ECA considers threatened species, populations and ecological communities listed under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Biodiversity Conservation Act 2016* (BC Act).

Methods

A literature review and database review were undertaken for the study area, which included the following sources:

- BioNet Atlas of NSW Wildlife (OEH 2018a)
- Vegetation mapping (Tozer et al 2010)
- Protected Matters Search Tool (DoE 2018)
- SIX Maps (LPI 2018)

Threatened species, populations and migratory species recorded during the literature and database review were consolidated into one list and the likelihood of occurrence of each species was determined by:

- review of available habitat within the study area and surrounding area
- review of the scientific literature pertaining to each species and population
- discussion with council environment staff
- applying expert knowledge of each species

The potential for each threatened species, population and/or migratory species to occur was then considered. Following field surveys and a review of available habitat within the study area, the potential for species to use the study area and be affected directly or indirectly by the proposed action was determined as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years) or in proximity (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area.

A site inspection of the study area was undertaken by Lucas McKinnon (Principal Ecologist, Ecoplanning) on 2 May 2018, over approximately 4 person hours. The purpose of this site inspection was to validate vegetation community mapping, assess the structure and condition of vegetation in the study area and determine if vegetation would be impacted by the proposed works. Additionally, fauna habitat features (i.e. tree hollows, stags, decorticated bark, mature / old growth trees, winter-flowering eucalypts) and indirect signs of fauna use (i.e. scats, owl pellets, fur, bones, tracks, bark scratches, foliage chew marks and chewed capsules) were recorded.

Results

Vegetation communities

Two vegetation types have been mapped across the study area by Tozer et al. (2010); ‘Subtropical Dry Rainforest’ and ‘Warm Temperate Layered Forest’, which are equivalent to Plant Community Type (PCT) descriptions (OEH 2018b), ‘Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (PCT 1300)’ and Sydney Blue Gum x Bangalay -Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion (PCT 1245) respectively (see **Figure 3** and **Table 1**).

Vegetation mapping onsite was revised after field assessment to include two PCTs, ‘Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanics, southern Sydney Basin Bioregion (PCT 720)’ and ‘Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (PCT 1300)’ (**Figure 4**). One other vegetation type, ‘Acacia regrowth – exotic dominated’, was also recorded.

‘Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanics, southern Sydney Basin Bioregion (PCT 720)’ which corresponds to Tozer et al. (2010) map unit ‘Basalt Hilltop Scrub’ was mapped in areas of shrubland vegetation dominated by *Melaleuca armillaris* (Bracelet Honey-myrtle) (**Photo 1**). *Zieria granulata* (threatened flora species) was also recorded within the study area and is generally associated with this vegetation type (**Photo 2**). This PCT is listed as the Endangered Ecological Community (EEC) *Melaleuca armillaris* Tall Shrubland in the Sydney Basin Bioregion under the BC Act (TSSC 2002a). It is not listed under the EPBC Act as a Threatened Ecological Community (TEC).

Areas previously mapped by Tozer et al. (2010), corresponding to ‘Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion (PCT 1245)’, did not contain a Eucalypt canopy and were dominated by *Streblus brunonianus* (Whalebone), *Pittosporum undulatum* (Sweet Pittosporum) and *Alphitonia excelsa* (Red Ash). Consequently, these areas have been reassigned to the PCT Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (PCT 1300) (**Photo 3**). This PCT is a component of Illawarra Subtropical Rainforest (ISR) in the Sydney Basin Bioregion, which is an EEC under the BC Act (TSSC 2002b). This PCT was mapped in a ‘Disturbed/Shrubby’ condition class due to the presence of woody weeds such as *Lantana camara** (Lantana) (**Photo 4**). This community is under consideration by the Commonwealth to be listed as a CEEC under the EPBC Act, and it is expected to be listed in October 2018.

Areas mapped as ‘Acacia regrowth – exotic dominated’ include native species such as *Acacia melanoxylon*, *A. mearnsii* and *A. maidenii* but are dominated by woody weeds such as *Olea europaea* subsp. *cuspidata** (African Olive) and *L. camara** (**Photo 5**). Assigning the vegetation types to plant community type (PCT) descriptions is necessary for the BC Act. Therefore, at the Development Application (DA) stage of this project the ‘Acacia regrowth – exotic dominated’ vegetation will need to be assigned to a PCT following further vegetation analysis.

Table 1: Past and present vegetation mapping for the study area and equivalent PCTs.

SCIVI (Tozer et al. 2010)	PCT (OEH 2018b)	Tozer et al. (2010)	Ecoplanning (2018)	Condition class	EEC (BC Act)	TEC (EPBC Act)
Warm Temperate Layered Forest	Sydney Blue Gum x Bangalay -Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion (1245)	X		NA	No	No
Subtropical Dry Rainforest	Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (1300)	X	X	D/S	Yes ¹	Expected Oct 2018
Basalt Hilltop Scrub	Bracelet Honey-myrtle – Australian Indigo dry shrubland on volcanics, southern Sydney Basin Bioregion (720)		X	D/S	Yes ²	No

¹Component of Illawarra Subtropical Rainforest in the Sydney Basin Bioregion

² *Melaleuca armillaris* Tall Shrubland in the Sydney Basin Bioregion

Flora species

Five records of threatened flora species have been previously recorded within 5 km of the study area; *Cynanchum elegans* (a climber), *Daphnandra johnsonii* (a small tree), *Gossia acmenoides* (shrub), *Pimelea spicata* (a shrub) and *Zieria granulata* (a shrub) (**Table 4** and **Figure 4**). Field survey confirmed the presence of numerous *Zieria granulata* (**Figure 3**). All other species were found to be 'not present' or 'low' likelihood.

Fauna species and habitat

Eleven threatened fauna species have been recorded within 5 km of the study area (**Table 4** and **Figure 5**). The fauna habitat features present in the study area included a structurally intact and multi-layered forest. No hollow bearing trees (HBTs) were recorded within the study area. There were no 'recent records' of any threatened fauna species occurring within the study area and most species were assessed as being 'not present' or having a 'low' likelihood of occurrence within the study area. Grey headed Flying-fox (*Pteropus poliocephalus*) was recorded as having a 'moderate' likelihood of occurrence. Only two microbats – *Falsistrellus tasmaniensis* (Eastern False Pipistrelle) and *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – have been recently recorded in the locality, however, this is likely due to limited survey effort. With improved survey effort further species may be recorded in the locality, however, habitat on site is limited to foraging only.

Creeklines

Four 1st order creeklines run through the study area in a north-westerly direction (Error! Reference source not found.). The northern portion of the main creekline running through the study area is well vegetated and quite steep. A large part of this drainage line is EEC and is considered to have high ecological value. The southern portion of the main creekline, as well as the remaining three 1st order creeks, are not well vegetated and of low relief. Therefore, they are considered to have low ecological value.

Ecological constraints and recommendations

Land zoning in the study area is predominantly RU2 – Rural landscape (**Figure 6**), with some areas in the north-east zoned as E2 – Environmental conservation and E3 – Environmental management. The results of the ecological constraints assessment identified areas of 'high', 'medium' and 'low' ecological value (see **Table 2** and **Figure 7**).

Table 2: Ecological constraints criteria.

Ecological Constraint	Criteria
High	• Areas of native vegetation that are listed as Endangered Ecological Communities (EECs) under the NSW <i>Biodiversity Conservation Act 2016</i> (BC Act) • Areas containing threatened flora records (a 5m buffer has been applied to each record)
Medium	• Well vegetated riparian buffer zones of mapped drainage lines
Low	• Poorly vegetated riparian buffer zones of mapped drainage lines • Areas of mixed native and exotic vegetation that are likely to have a Vegetation Integrity Score >17/100

The remainder of the site is cleared land (~27.6 ha) and has no ecological constraint.

Whilst some areas of the study area are mapped as 'low', if these areas are proposed for clearing at the Development Application (DA) stage, then surveys consistent with the Biodiversity Assessment Method (BAM) will be necessary to determine whether the Vegetation Integrity Score is >17/100 and thereby require an offset in accordance with NSW Biodiversity Offset Scheme (Section 7 of the BC Act).

If at the DA stage the proposed works include the removal of >0.25 ha of native vegetation, a Biodiversity Development Assessment Report (BDAR) prepared by a suitably qualified ecologist will be required to accompany the DA. A key step in all assessments is demonstrating avoidance of impacts in the first instance. Therefore, opportunities to reduce impacts to areas of high ecological value (e.g. EECs/HBTs) should be explored.

Additional targeted surveys may be required during the preparation of the BDAR for some threatened species, including microbats. The timing of such surveys must comply with the survey periods identified in the BAM Credit Calculator, with microbat survey not possible until spring.

During the preparation of the BDAR plots will be undertaken to determine the condition score for each mapped vegetation type. Under the BC Act if the condition score exceeds 17/100, offsetting will be required. Offsetting may be required for all vegetation types (including 'Weeds and exotics' due to the presence of multiple native species).

In addition, impacts within 40 m of the creeklines in the study area would trigger the need to apply for a Controlled Activity Approval. Creek corridors are mapped using Strahler stream order classification (see **Figure 6**). Under the NSW *Water Management Act 2000* (WM Act) DPI guidelines (NoW 2012) 1st order streams require a 10m Vegetated Riparian Zone (VRZ) on both sides of the watercourse (20m riparian corridor). This VRZ has been applied to the centre of the creekline but would need to be buffered from the Top of Bank (ToB) at the Development Application (DA) stage. As such, the top of bank will need to be mapped and a Vegetation Management Plan (VMP) prepared by a suitably qualified ecologist to accompany the DA should impacts to this buffer zone be proposed.

If you have any queries please do not hesitate to contact me.

Yours sincerely,

Lucas McKinnon

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References

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NSW Land and Property Information (LPI) (2018). SIX Maps. Accessed at: <https://maps.six.nsw.gov.au/>

NSW Office of Environment and Heritage (OEH) (2018a). BioNET – the Atlas of NSW Wildlife. Accessed at: <http://www.environment.nsw.gov.au/research/vegetationinformationsystem.htm>

NSW Office of Environment and Heritage (OEH) (2018b). BioNET Vegetation Classification. Accessed at: <http://www.environment.nsw.gov.au/atlasapp/Default.aspx?a=1>

NSW Office of Water (NoW) (2012). Controlled activities on waterfront land - Guidelines for riparian corridors on waterfront land.

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Threatened Species Scientific Committee (TSSC) (2002b) Illawarra subtropical rainforest in the Sydney Basin Bioregion – endangered ecological community listing. NSW Scientific Committee – final determination Accessed at: <http://www.environment.nsw.gov.au/determinations/IllawarraSubtropicalRainforestSydneyBasinEndComListing.htm>

Tozer MG, Turner K, Keith DA, Tindall D, Pennay C, Simpson C, MacKenzie B, Beukers P and Cox S. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* **11**, 359–406.



Figure 1. Location of the study area for field investigations (including crown road reserves).



Figure 2. Location of the area to which the Planning Proposal Application applies.

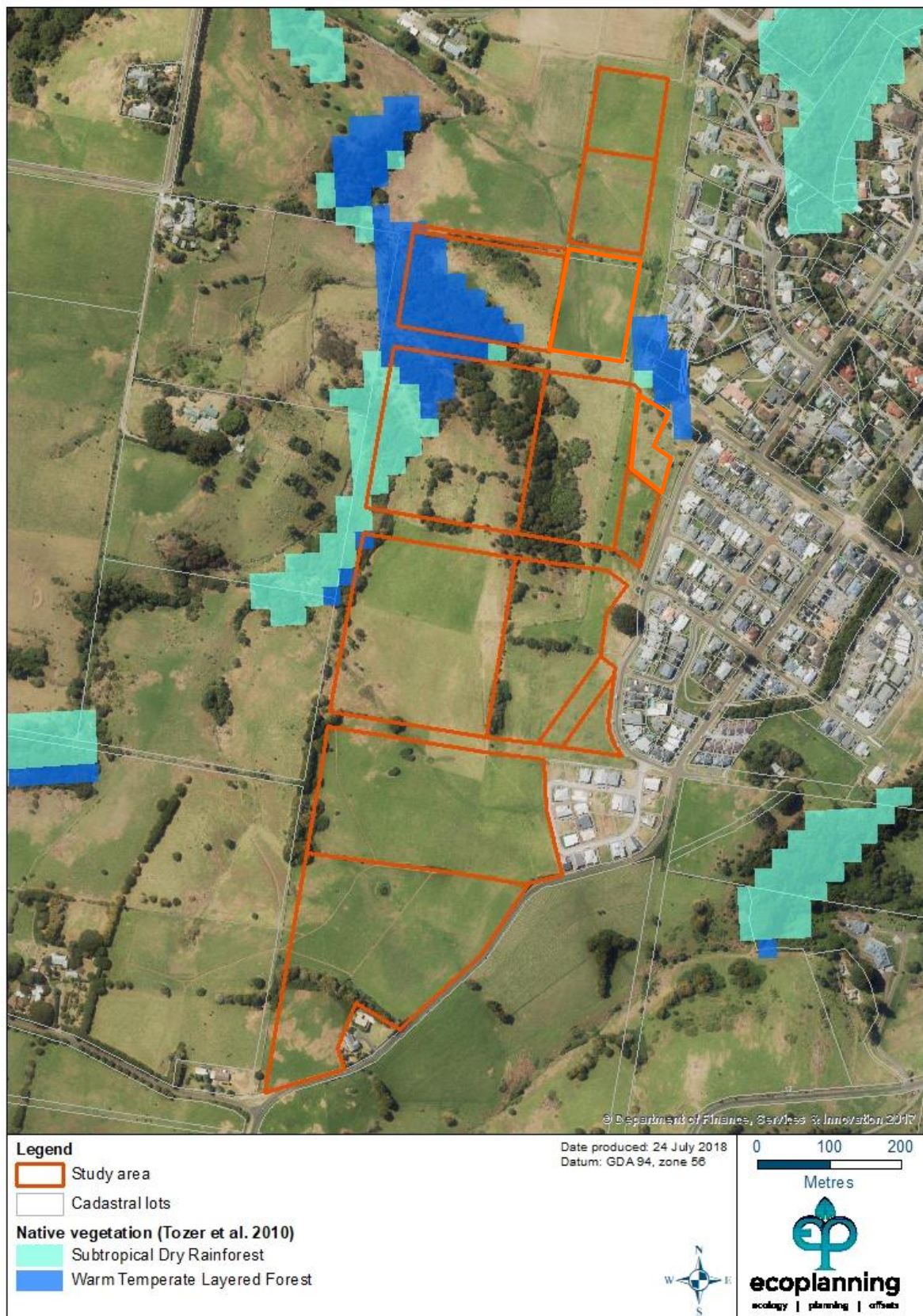


Figure 3: Regional vegetation mapping (Tozer et al. 2010).



Figure 4: Validated vegetation communities within the study area.

Table 4: Threatened flora and fauna records from within 5km of the study area (OEH 2018).

Common name	Scientific name	Number of records >1995	Most recent record	Nearest record (m)	Likelihood of occurrence – post survey
Flora					
White-flowered Wax Plant	<i>Cynanchum elegans</i>	6	5/06/2007	261.60	Low
Illawarra Socketwood	<i>Daphnandra johnsonii</i>	28	24/10/2016	159.90	Low
Gossia acmenoides (population)	<i>Gossia acmenoides</i>	2	6/05/2015	1300.87	Not present
Spiked Rice-flower	<i>Pimelea spicata</i>	2	2/09/2013	4722.87	Not present
Illawarra Zieria	<i>Zieria granulata</i>	64	19/08/2015	203.71	Recent record
Fauna					
Class: Amphibia					
Green and Golden Bell Frog	<i>Litoria aurea</i>	6	19/05/2000	828.69	Not present
Class: Aves					
Australasian Bittern	<i>Botaurus poiciloptilus</i>	1	3/07/1995	1447.91	Not present
Bush Sone-curlew	<i>Burhinus grallarius</i>	1	5/12/2003	4560.96	Not present
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	4	13/01/2016	2859.33	Low
Little Eagle	<i>Hieraaetus morphnoides</i>	2	12/02/2012	1097.17	Low
Powerful Owl	<i>Ninox strenua</i>	2	1/08/2017	4504.82	Low
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	2	31/03/2009	4464.64	Low
Class: Mammalia					
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	5	28/02/2017	908.18	Low
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	1	8/01/1999	3413.19	Low

Common name	Scientific name	Number of records >1995	Most recent record	Nearest record (m)	Likelihood of occurrence – post survey
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	1	27/07/2007	2963.93	Low
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	2	20/07/2014	2283.26	Moderate



Photo 1: Bracelet Honey-myrtle – Australian Indigo dry shrubland- Disturbed/Shrubby.



Photo 2: *Zieria granulata*.



Photo 3: Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (PCT no. 1300) – Disturbed/Shrubby.



Photo 4: Whalebone Tree – Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin (PCT no. 1300) – Disturbed/Shrubby.



Photo 5: Acacia regrowth – exotic dominated.

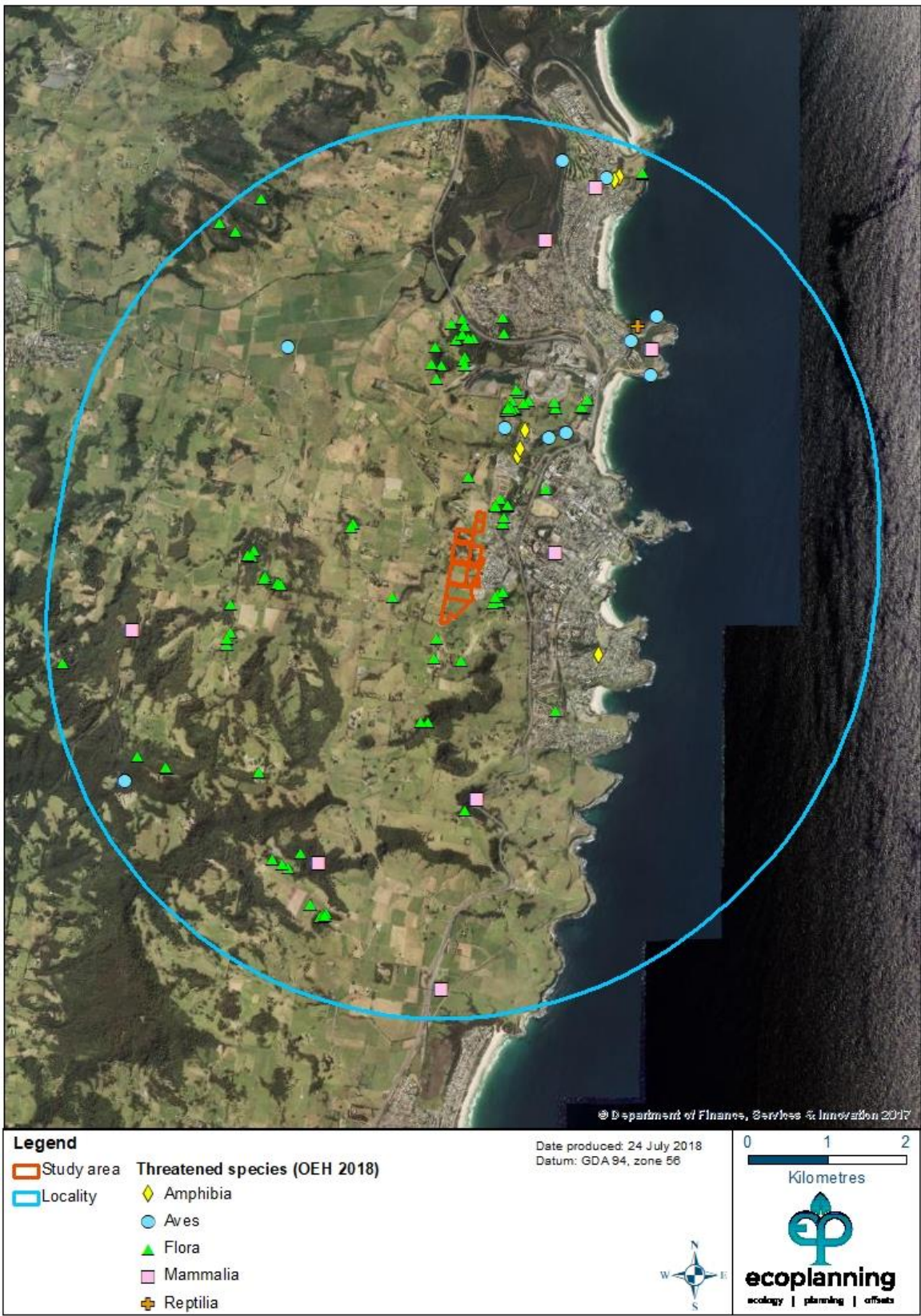


Figure 5: Threatened species records within a 5 km radius of the study area.



Figure 6: Strahler stream order and buffer zones in the study area (DPI Water 2012).

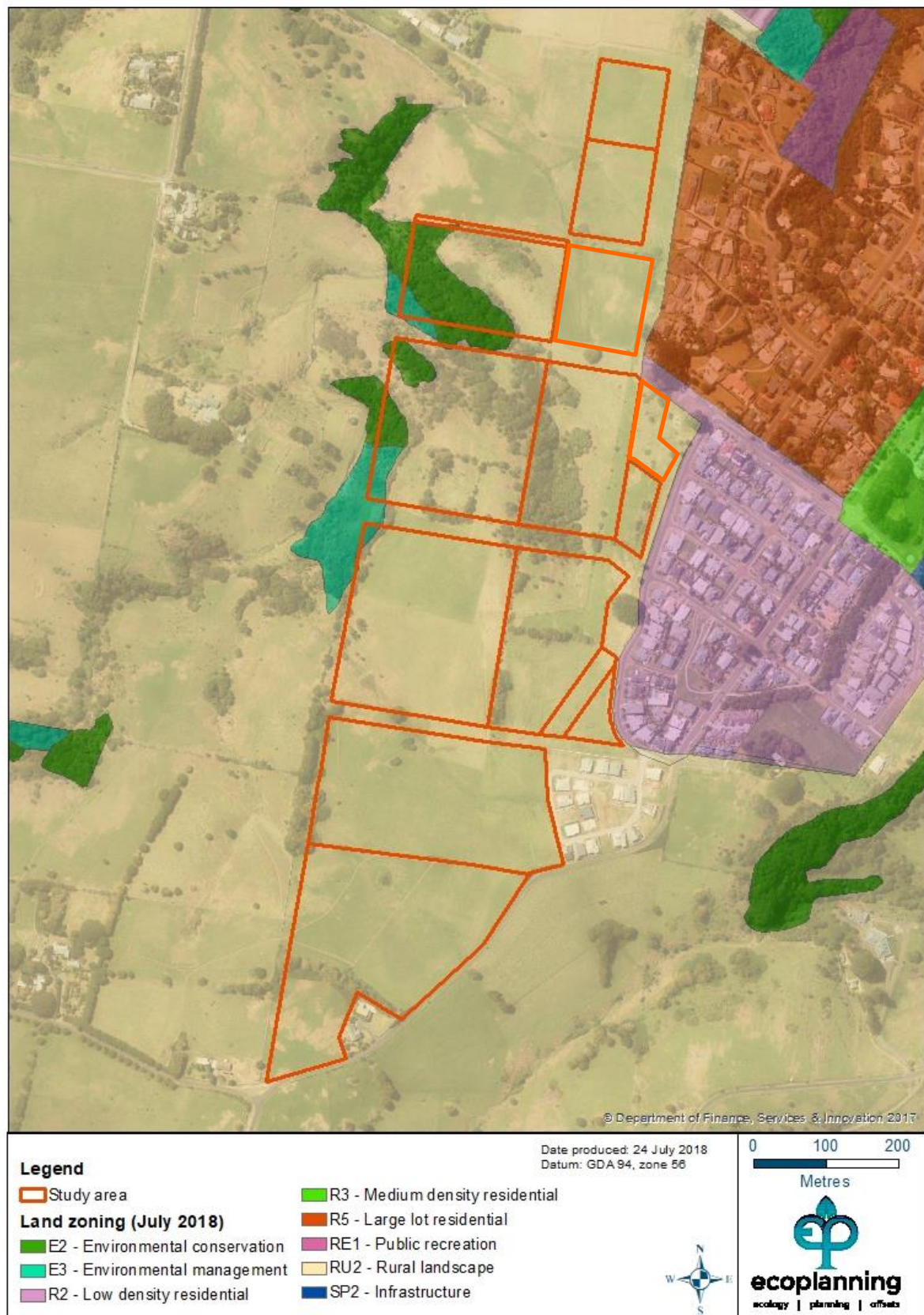


Figure 7: Land zoning in the study area.

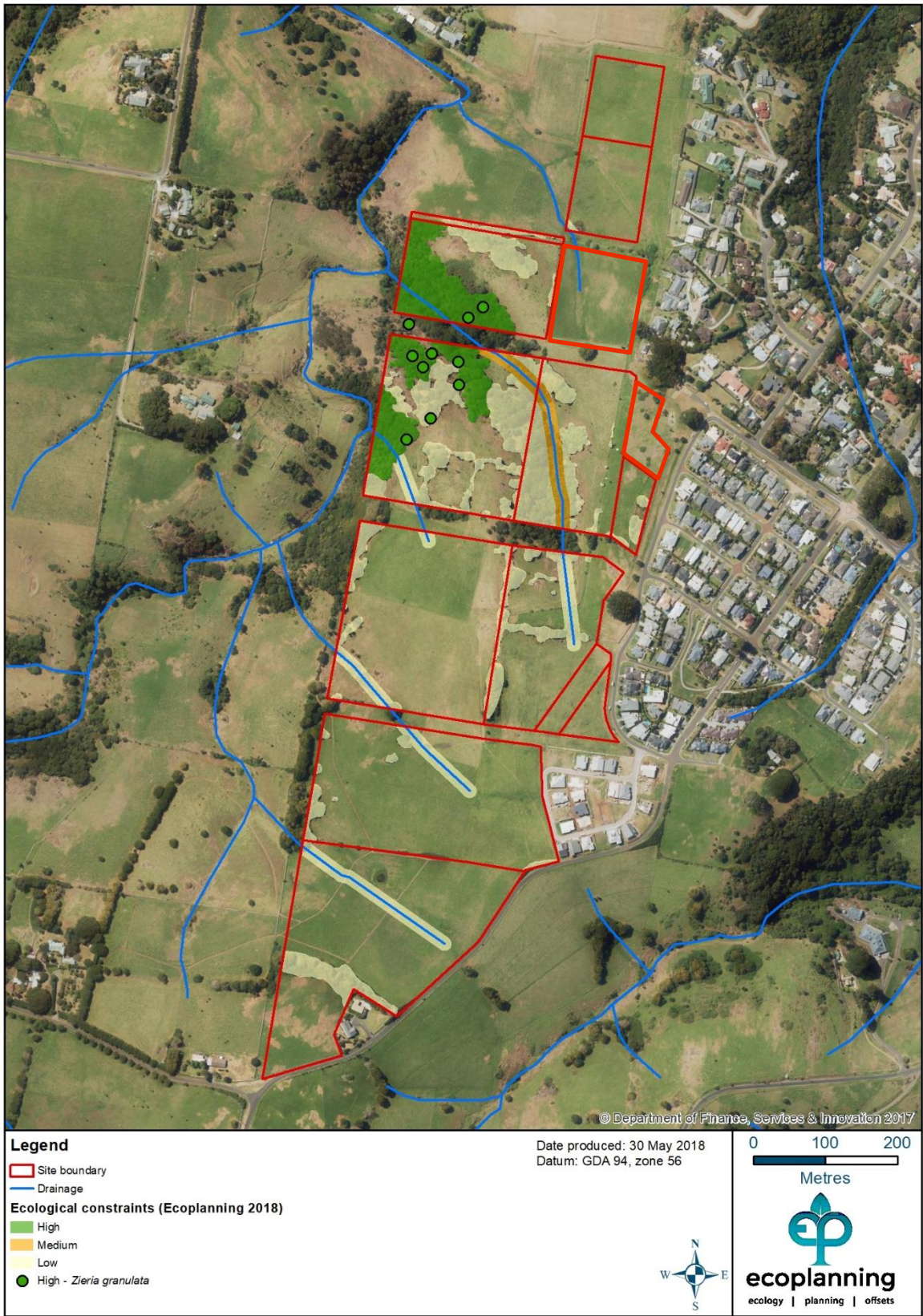


Figure 8: Ecological constraints.