

21 December 2016

Belinda Smith
Strategic Planning Manager
Victorian Planning Authority
Level 25, 35 Collins Street, Melbourne
MELBOURNE VIC 3000
Email: Belinda.Smith@vpa.vic.gov.au

**Re: Berwick Health and Education Precinct – Native Vegetation Assessment
(excluding Southern Drain)**

Project no. 23541

Dear Belinda,

Biosis Pty Ltd. was commissioned by the Victorian Planning Authority (VPA) to provide advice on the extent and condition of native vegetation within the Berwick Health and Education Precinct (BHEP), Berwick (Figure 1). This assessment must be read in conjunction with Appendix 3 to this report, **Berwick Health and Education Precinct- Vegetation assessment - Southern Drain** (Biosis Letter Report, 05/05/2015).

Methods

The assessment was undertaken on 18 November 2016 and a list of plant species observed was collected (#U00J5ZR1). This list will be submitted to the Department of Environment, Land, Water and Planning (DELWP) for incorporation into the Victorian Biodiversity Atlas. Planted species have not been recorded unless they are naturalised.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses' (Clause 72).

The Guidelines classify native vegetation into two categories (DEPI 2013):

- A **remnant patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey cover is native plants.
 - An area with three or more indigenous canopy trees where the tree canopy cover is at least 20 percent.

Remnant patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DELWP.

- A **scattered tree** is defined as (extent measured by number of trees):
 - An indigenous canopy tree that does not form part of a remnant patch of native vegetation.

Biosis Pty Ltd
Melbourne Resource Group

38 Bertie Street
Port Melbourne VIC 3207

Phone: 03 9646 9499
Fax: 03 9646 9242

ACN 006 175 097
ABN 65 006 175 097

Email: melbourne@biosis.com.au

biosis.com.au

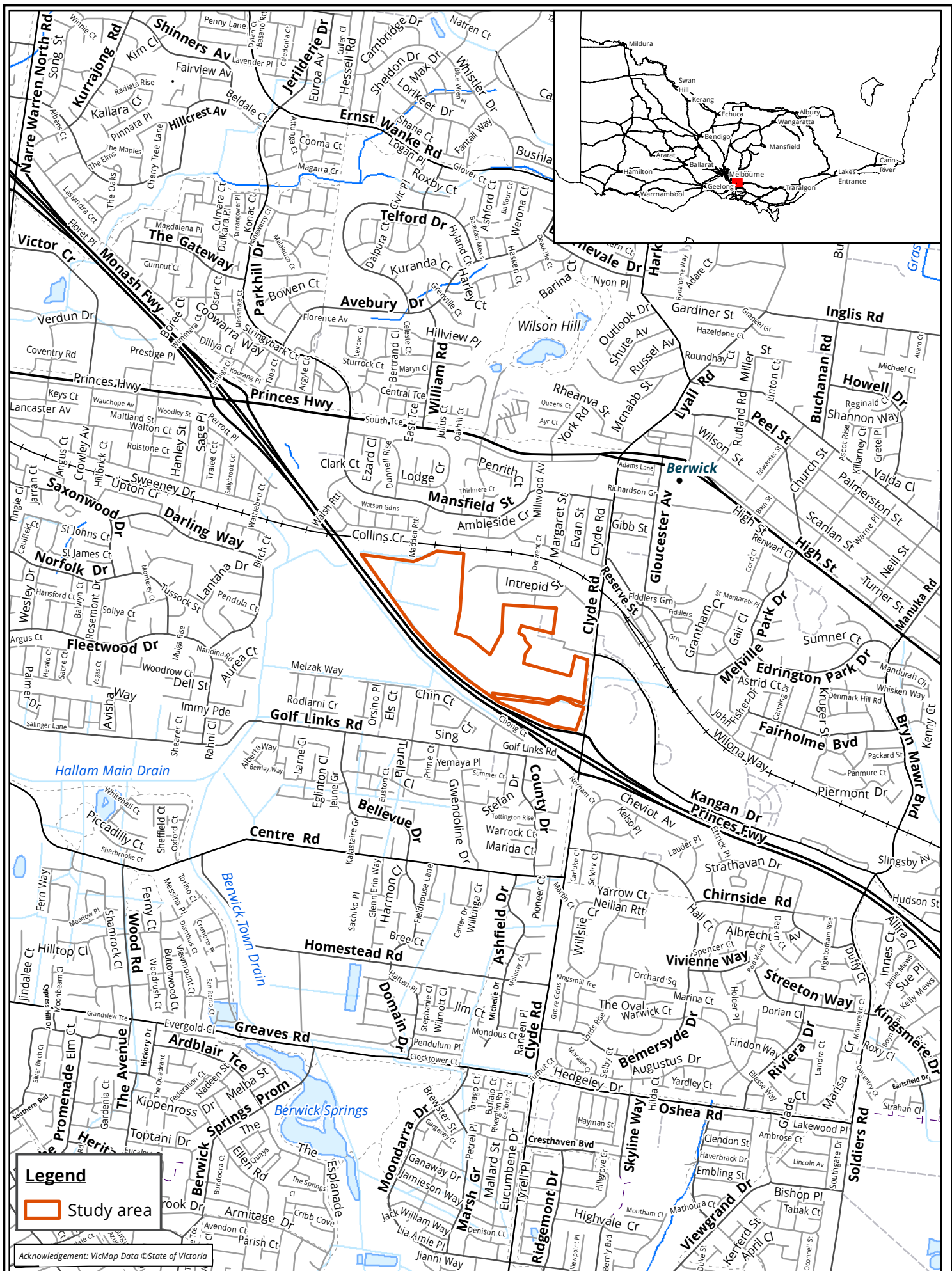
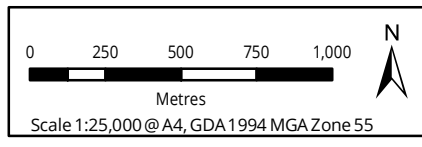
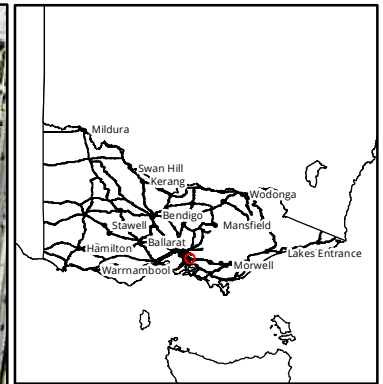
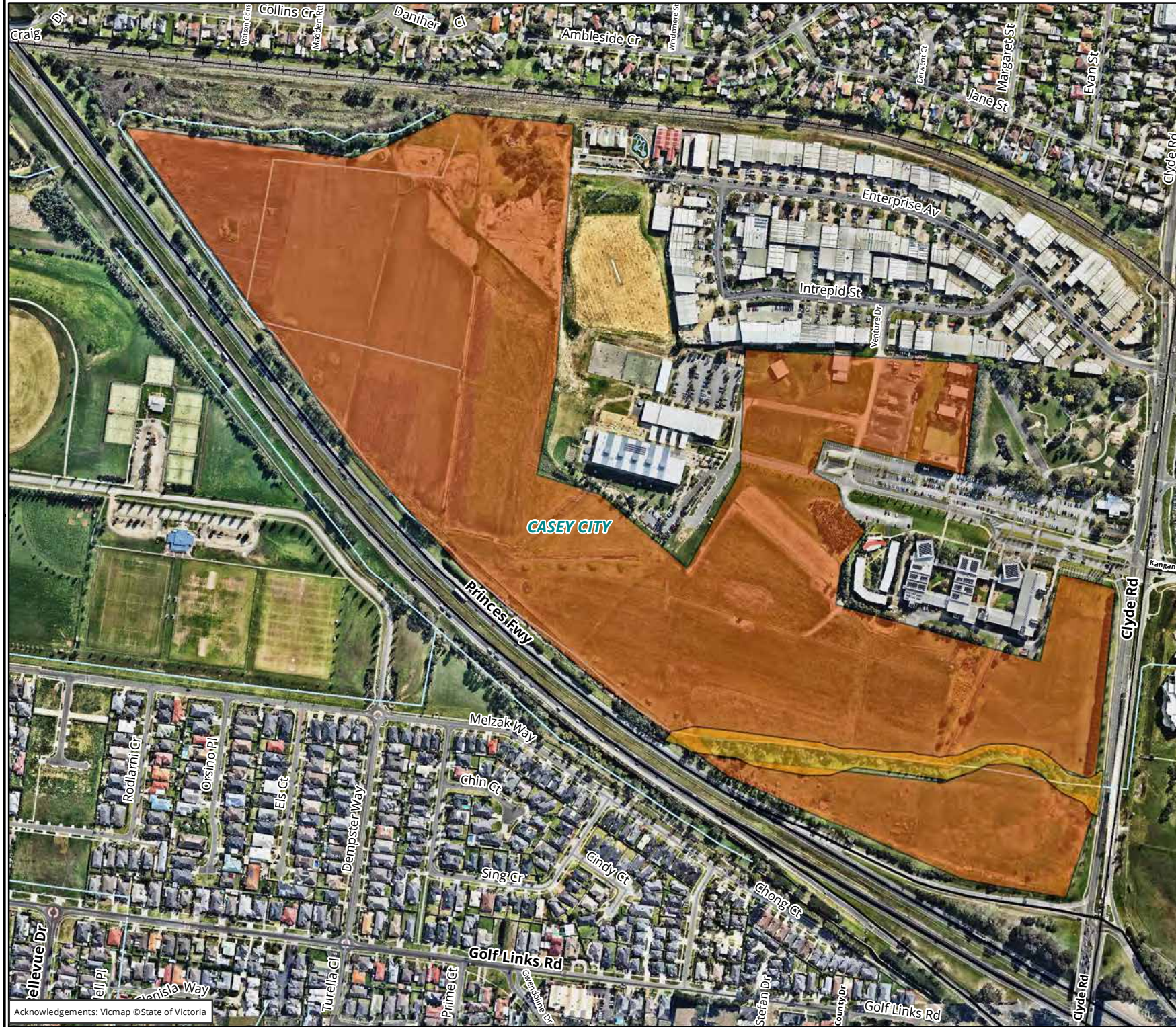


Figure 1: Location of the study area - Berwick, Victoria



Legend
 Study area

Acknowledgement: VicMap Data ©State of Victoria



Legend

- Southern Drain (Biosis letter report, 05/05/2015)
- Native Vegetation Assessment – Excluding southern drain (Biosis letter report, 21/12/2016)

Fig 1B. Study area locations within the Berwick Health and Education Precinct

0 30 60 90 120 150



Metres

Scale: 1:6,000 @ A4

Coordinate System: GDA 1994 MGA Zone 55



Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Hobart, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 23541, Date: 13 February 2017, Checked by: SN,
Drawn by: SSK, Last edited by: srrenberg
Location: P:\23500s\23541\Mapping\23541_FB_StudyAreas

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A condition score and extent is applied to each scattered tree based on information provided by DELWP's NVIM.

Species nomenclature for flora follows the Flora Information System (2016).

Results:

Vegetation of the study area is not mapped as native vegetation according to DELWP's mapping (see the 2005 EVC layer in the Biodiversity Interactive Map 3.2), with the original vegetation (pre 1750) identified as a mosaic of Plains Grassland (EVC 132) and Plains Grassy Woodland (EVC 55) with low lying areas supporting a mosaic of Swampy Riparian Woodland (EVC 83) and Swamp Scrub (EVC 53). Small remnants of this mosaic are identified by DELWP along the Princes Freeway at the southern boundary of the study area.

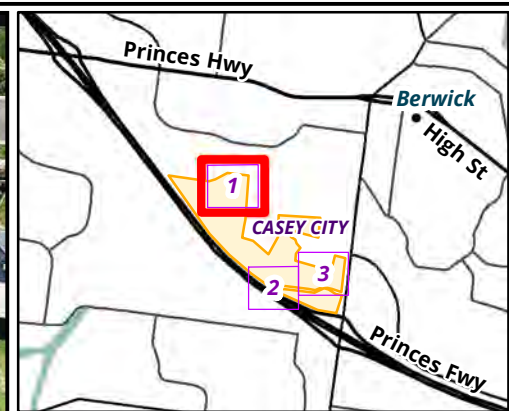
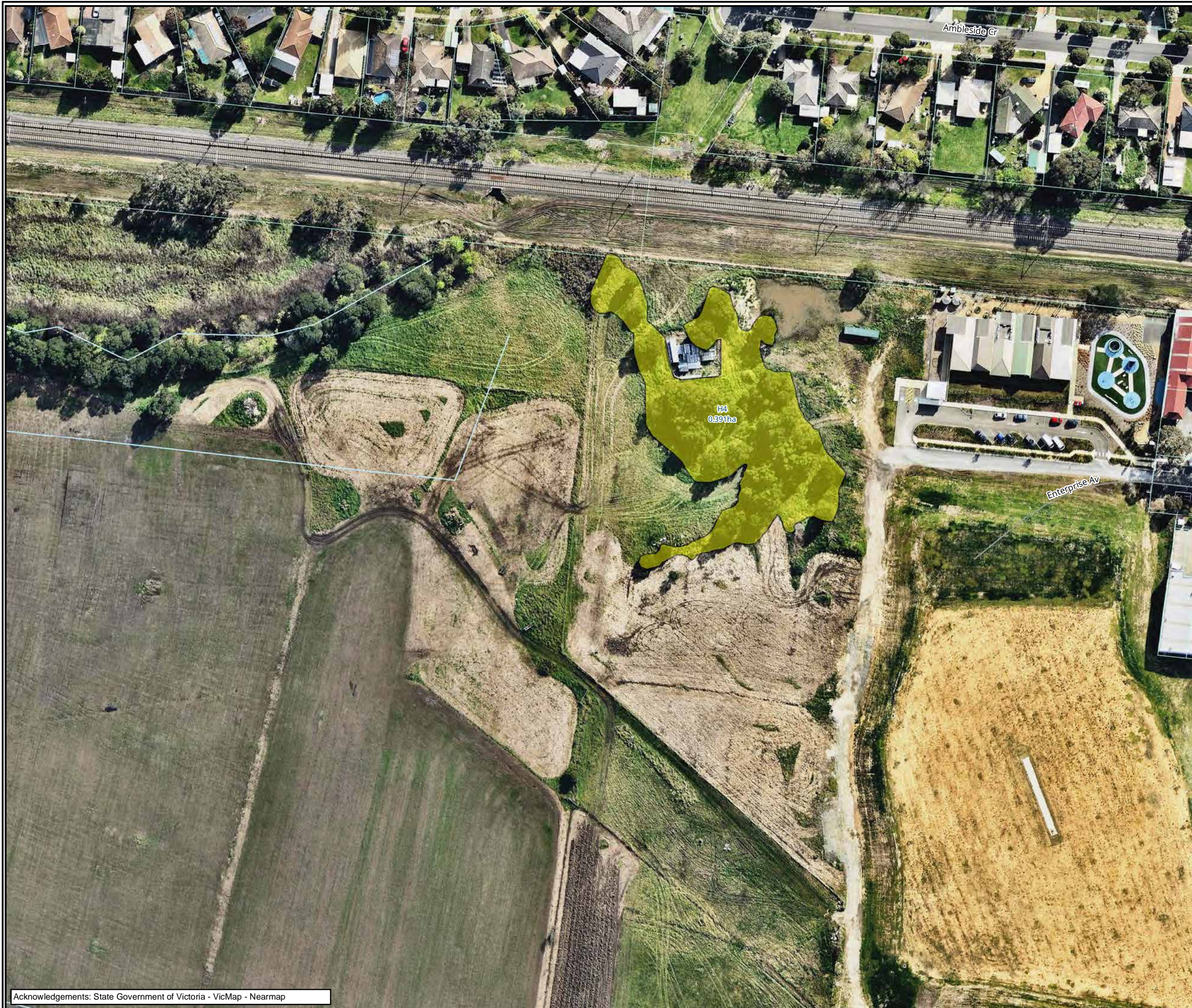
The pre-1750 vegetation of this site would have varied throughout the study area according to topography and soil type. Typically, woodland vegetation types would have had an open canopy of River Red-gum *Eucalyptus camaldulensis* or Swamp Gum *Eucalyptus ovata* and Narrow-leaf Peppermint *Eucalyptus radiata*. The understorey typically consisted of shrubs including Black Wattle *Acacia mearnsii*, Blackwood *Acacia melanoxylon*, Swamp Paperbark *Melaleuca ericifolia* and Black Sheoak *Allocasuarina littoralis* that overtop a species-rich grassy and herbaceous ground layer. Grassland areas would have been dominated by native perennial grasses such as Kangaroo Grass *Themda triandra* and Wallaby-grass *Rytidosperma* spp., interspersed with a diversity of herbs. Low-lying areas would have formed seasonal wetlands dominated by semi-aquatic herbaceous vegetation like sedges (*Carex* spp.) and rushes (*Juncus* spp.).

The vegetation throughout the study area is highly modified from its original condition and degraded due to the extensive land clearing that has occurred within Berwick and its surrounds. Overall, the condition of the vegetation is poor due to a lack of canopy trees, loss of native species diversity, and the presence of a high cover of weeds, including a number of noxious weeds such as Blackberry *Rubus anglocandicans* and Gorse *Ulex europaeus* (Appendix 1). Most of the study area comprises lawn areas with planted amenity vegetation within the Monash campus and destocked paddocks adjacent to the campus supporting exotic pasture (e.g. Toowoomba Canary Grass *Phalaris aquatic* and Ryegrass *Lolium rigidum*) and weeds. Two constructed hydrological features are also included in the study area: an unnamed drainage line draining into the southern drain and a farm dam, which is currently fenced, with access provided by Monash security.

Notwithstanding the above, the site inspection confirms the presence of four patches of native vegetation as defined above. These are mapped in Figure 2a and 2b and described below. These are referred to as Habitat Zones (HZ) and they cover a total area of 0.93 ha. Outside of these patches, native vegetation persists as scattered understorey trees such as Silver Wattle *Acacia dealbata* and Blackwood and Black Wattle (Figure 2b).

- **HZ1. Plains Grassland.** These patches are near a sports field and around the dam. They contain no canopy species or shrubs but the perennial component of the ground-layer vegetation includes native grasses consistent with Plains Grassland (Weeping Grass *Microlena stipoides*, Wallaby-grass and Blown Grass *Lachnograstis filiformis*) so has been assessed as a treeless vegetation type. The characteristic herbs of this EVC are no longer present but some native herbs such as Willow Herb *Epilobium hirtigerum*, Loosetrife *Lythrum hyssopifolia*, Crane's Bill *Geranium* sp. and Cotton Fireweed *Senecio quadridentatus* persist. Weed species typical for the EVC are also found throughout the patch including Cat's Ear *Hypochoeris radicata*, Toowoomba Canary Grass *Phalaris aquatica*, Spear Thistle *Cirsium vulgare* and Ribwort *Plantago lanceolata*.

- **HZ2. Plains Grassy Wetland.** Habitat Zone 2 patch is a small constructed drainage channel that drains into the southern drain. The native vegetation of this patch was observed to largely consist of herbaceous semi-aquatic species including Knob sedge *Carex inversa*, rushes *Juncus* spp., Narrow-leaf Cumbungi *Typha domingensis* and Slender Knotweed *Persicaria decipiens*. Common Onion-orchid *Microtis unifolia* was also found. High weed cover was also present in the patch including Umbrella Sedge *Cyperus eragrostis*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary Grass, Blue Pigroot *Sisyrinchium iridifolium* and Pampas Grass *Cortaderia selloana*. The vegetation was assessment as treeless vegetation and scattered wattles mapped near the patch were not included in the assessment.
- **HZ3. Plains Grassy Woodland.** Habitat Zone 3 is contiguous with the southern drain section previously assessed by Biosis but is separated from the drain by fencing. While none of the characteristic Plains Grassy Woodland canopy species were found in the patch, understorey trees such as Black Wattle and Blackwood and high native perennial ground-layer consistent with this EVC were still present. The quality of the ground-layer varied throughout the patch but in places was dominated by Spear Grass *Austrostipa rudis* with almost 100% cover. Other native perennial grass species observed were Kangaroo Grass, Weeping Grass and Common Tussock-grass *Poa labillardieri*. Some native herbs also persisted including Pale Flax-lily *Dianella longifolia* and Grassland Wood-sorrel *Oxalis perennans*. The ground-layer was degraded in places by the presence of noxious weeds such as Blackberry and Gorse and the invasion of pasture species from the adjoining paddock.
- **HZ4. Plains Grassy Woodland.** Habitat Zone 4 is formed by a mid-layer of Black Wattle consistent with remnants of a Plains Grassy Woodland understorey but the ground-layer and canopy trees of the EVC are no longer present. Instead, the ground-layer is mostly weed and pasture species and includes a high cover of noxious weeds (Blackberry and Gorse). These infestations smother other vegetation and prevent many other species from recolonising the site.

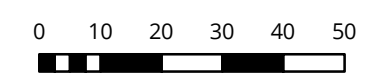


Legend

EVC

 Plains Grassy Woodland

Figure 2C.1: Berwick Health and Education Precinct - Ecological features of the study areas



Scale: 1:1,240 @ A3
 Coordinate System: GDA 1994 MGA Zone 55


 Biosis Pty Ltd
 Ballarat, Brisbane, Canberra, Hobart, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 23541,
 Date: 13 February 2017,
 Checked by: SN, Drawn by: SSK, Last edited by: snerenberg
 Location:\biosisresearch\local\BIO-

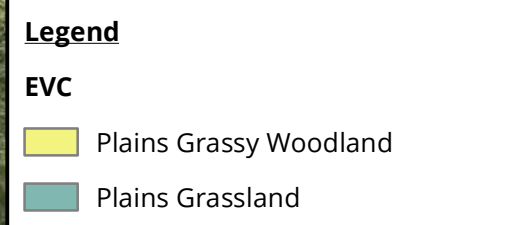
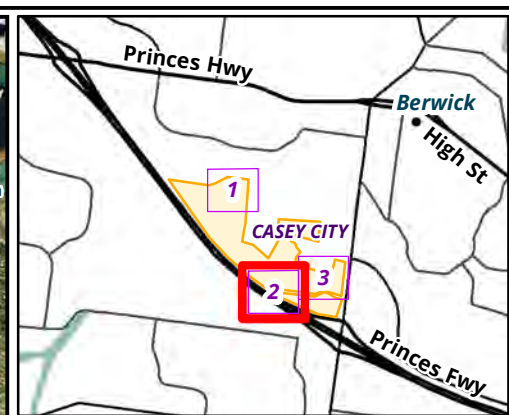
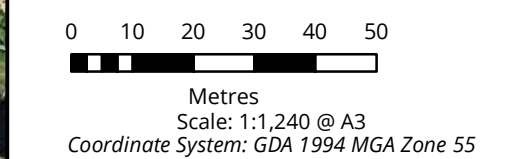


Figure 2C.2: Berwick Health and Education Precinct - Ecological features of the study areas



Acknowledgements: State Government of Victoria - VicMap - Nearmap

Matter: 23541,
 Date: 13 February 2017,
 Checked by: SN, Drawn by: SSK, Last edited by: snerenberg
 Location:\biosisresearch\local\BIO-

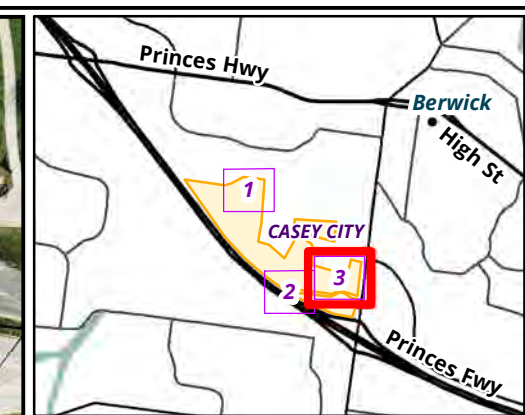
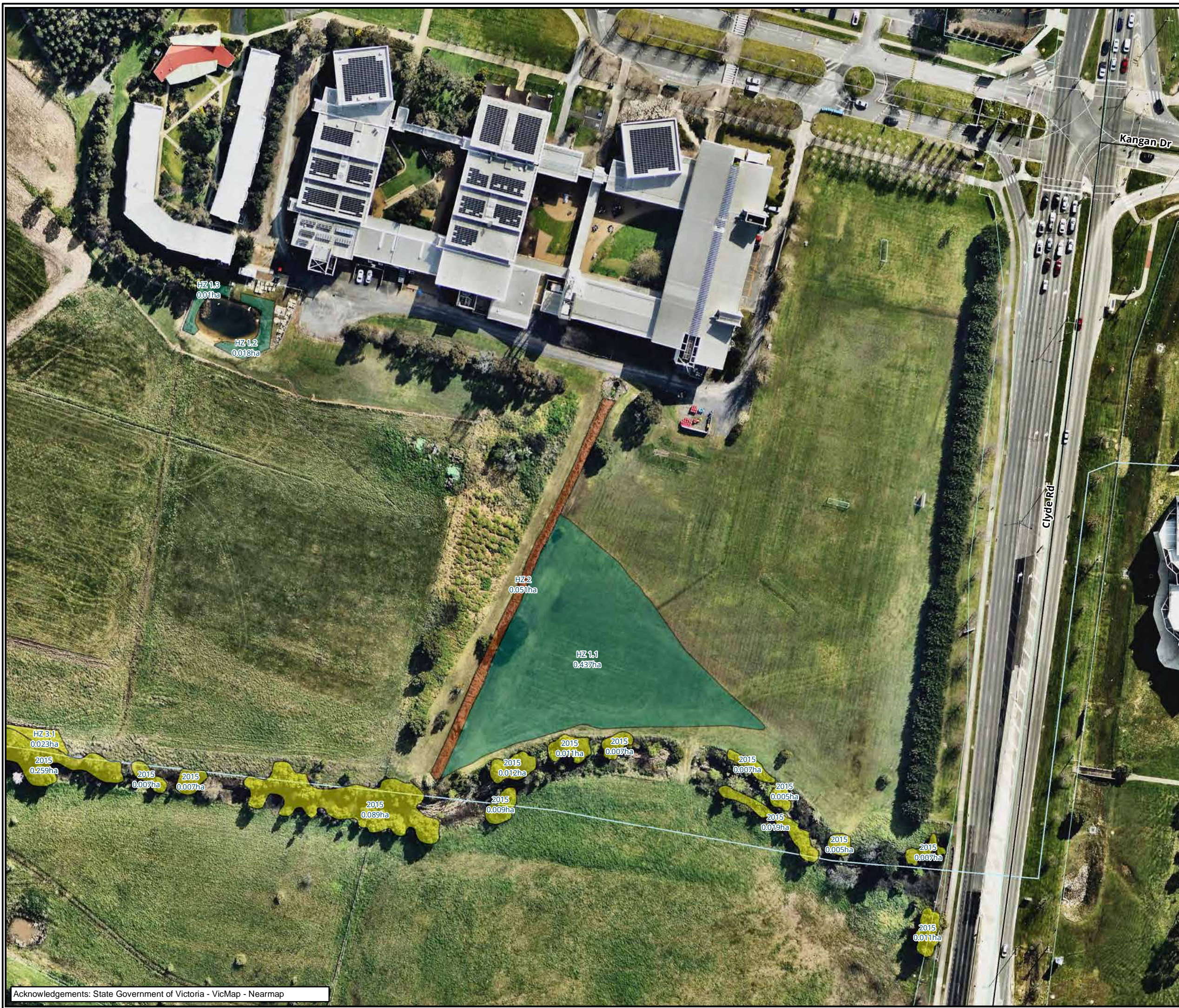
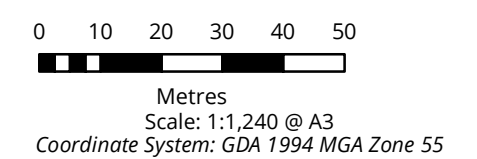
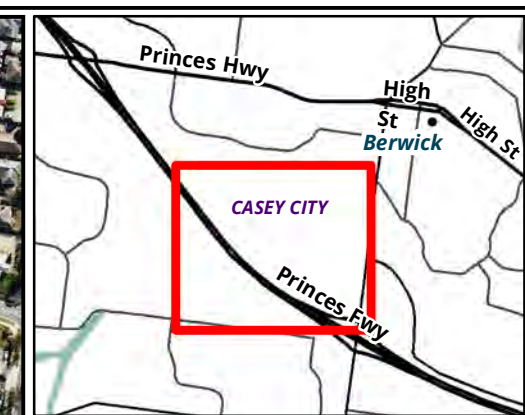


Figure 2C.3: Berwick Health and Education Precinct - Ecological features of the study areas



Acknowledgements: State Government of Victoria - VicMap - Nearmap

Matter: 23541,
 Date: 13 February 2017,
 Checked by: SN, Drawn by: SSK, Last edited by: snerenberg
 Location: \biosisresearch\local\BIO-



- Legend**
- Study Area
 - + Scattered Understorey Tree
 - Plains Grassy Woodland
 - Plains Grassy Wetland
 - Plains Grassland

Figure 2B: Berwick Health and Education Precinct - Ecological features of the study area

0 30 60 90 120 150
 Metres
 Scale: 1:3,841 @ A3
 Coordinate System: GDA 1994 MGA Zone 55

biosis

Biosis Pty Ltd
 Ballarat, Brisbane, Canberra, Hobart, Melbourne,
 Newcastle, Sydney, Wangaratta & Wollongong

Condition and health of native vegetation

The extent of native vegetation patches was mapped within the study area (Figure 2) and the condition was assessed in relation to standard methods provided by DSE (2004). The condition of native vegetation was assessed using the DSE Vegetation Quality Assessment Sheet (DSE 2004) and pre-determined EVC benchmarks: <http://www.dse.vic.gov.au/conservation-and-environment/ecological-vegetation-class-evc-benchmarks-by-bioregion>. DELWP's Native Vegetation Information Management system was also used to determine vegetation extent and condition.

Native vegetation patches were assessed as remnants of the EVCs described above.

Habitat hectares

As noted above, for the purpose of determining vegetation condition, patches are termed 'habitat zones'. Each EVC was assessed as a separate habitat zone. Some habitat zones consist of multiple patches of the same EVC with the same vegetation quality. Where there was a visually assessed difference in 2 or more habitat components, EVCs were divided into separate habitat zones as per DSE (2004). The condition score of the habitat zone is multiplied by the extent of the zone to give a value in Habitat hectares.

Scores allocated to each of the four habitat zones identified within the study area are outlined in Table 1. Total habitat hectares across all HZs is 0.148 as calculated below.

Table 1: Native vegetation Habitat hectares calculations for the BHEP (excluding Southern Drain)

Habitat Zone ID			1	2	3	4	
EVC #: Name			PG (132)	PGWet (125)	PGW (55)	PGW (55)	
		Max Score	Score	Score	Score	Score	Total
Site Condition	Large Old Trees	10	NA	NA	0	0	
	Canopy Cover	5	NA	NA	0	0	
	Lack of Weeds	15	6	6	11	2	
	Understorey	25	5	15	15	5	
	Recruitment	10	3	0	3	1	
	Organic Matter	5	2	4	5	4	
	Logs	5	NA	NA	0	0	
	Treeless standardiser		1.36	1.36	NA	NA	
Total Site Score			22	34	34	12	
Landscape Value	Patch Size	10	2	2	2	1	
	Neighbourhood	10	0	0	0	0	
	Distance to Core	5	1	1	1	1	
	Total Landscape Score			3	3	3	
HABITAT SCORE		100	25	37	37	14	
Habitat points = #/100		1	0.25	0.37	0.37	0.14	
Habitat Zone area (ha)			0.465	0.051	0.023	0.391	0.93
Habitat Hectares (Hha)			0.115	0.019	0.009	0.055	0.148

Notes to table: NA = Not Applicable, PG = Plains Grassland, PGW = Plains Grassy Woodland, PGWet = Plains Grassy Wetland

Vegetation Health

Native vegetation within the study area did not appear to be impacted by any obvious diseases or was otherwise impacted by any obvious insect attack which reduced or would otherwise lead to a conclusion that the vegetation present was in poor health. The two main wattle species present, Blackwood and Black Wattle, were present as a range of age cohorts and appeared to be present as naturally sustaining populations. Some scattered wattles appear to be reaching the end of their natural lifespans and are beginning to die off (senesce).

Implications of the Assessment

Any clearing of native vegetation within the study area may require a permit under the *Planning and Environment Act 1987*. Applications for the clearing of native vegetation are regulated under Victoria's Biodiversity Assessment Guidelines (DEPI 2013) (the Guidelines). DELWP classify most of the study area as Location A although parts of the study area boundary along Princes Freeway is identified as Location B and Location C.

If the study area is proposed to be impacted by development which would result in the clearing of native vegetation then it is likely that proposal would be assessed under the high risk pathway. This assessment includes relevant information for such an application.

Native vegetation patches are subject to offset requirements under a planning permit application, however, the total habitat hectares of the site is very low. Scattered understorey trees outside of patches would still be subject to a planning permit application should they need to be removed but offsets would not be required.

Conclusion

We assessed four habitat zones to be patches of native vegetation as defined under Victoria's Biodiversity Assessment Guidelines. Remaining woody species that formed these remnants appeared to be healthy and were recruiting. The presence of noxious weeds, generally high weed cover and lack of canopy trees in treed EVCs reduced the condition of most of the native vegetation.

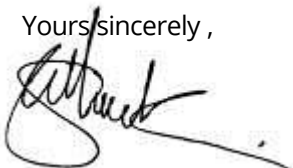
Outside of native patches, native vegetation was present only as scattered understorey trees in various stages from seedlings to aging. Remaining areas were paddocks and lawns of mostly introduced species.

The patches of native vegetation identified occupy a total of 0.93 ha. This native vegetation is considered to be degraded in condition and was assessed to have low habitat scores between 14/100 and 37/100. The vegetation therefore represents a total of 0.148 habitat hectares. NB. This is additional to the 0.13 ha identified in the previous report to make a total of 0.278 habitat hectares for the Berwick HEP.

Clearing of native vegetation patches and understorey trees would require a permit under the *Planning and Environment Act* and it is likely this application would be required to satisfy the information requirements defined under the high risk-based pathway defined by the Guidelines. This report provides the relevant data for any such application.

Please contact me on 8686 4833 or 0429 808 732 if you would like to discuss further.

Yours sincerely,



Steve Mueck
Senior Consultant Botanist

References

DEPI 2013. *Permitted clearing of native vegetation - Biodiversity assessment guidelines*. Victorian Government Department of Environment and Primary Industries, Melbourne (September 2013).

DSE 2004. *Native Vegetation: Sustaining a living landscape. Vegetation Quality Assessment Manual – Guidelines for applying the Habitat hectares scoring method. Version 1.3*. Victorian Government Department of Sustainability & Environment, Melbourne.

Appendix 1: Flora

Table A1.1. Flora species (35 native, 67 weeds) recorded from the study area.

Status	Scientific Name	Common Name
Indigenous species		
	<i>Acacia dealbata</i>	Silver Wattle
P	<i>Acacia mearnsii</i>	Black Wattle
	<i>Acacia melanoxylon</i>	Blackwood
	<i>Alisma plantago-aquatica</i>	Water Plantain
	<i>Austrostipa rudis</i>	Veined Spear-grass
	<i>Carex inversa</i>	Knob Sedge
P	<i>Cassinia arcuata</i>	Drooping Cassinia
P	<i>Cotula australis</i>	Common Cotula
	<i>Cynodon dactylon</i>	Couch
	<i>Dianella longifolia</i> s.l.	Pale Flax-lily
	<i>Eleocharis acuta</i>	Common Spike-sedge
	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
	<i>Gahnia</i> spp.	Saw Sedge
	<i>Geranium</i> spp.	Crane's Bill
	<i>Isolepis hookeriana</i>	Grassy Club-sedge
	<i>Juncus bufonius</i>	Toad Rush
	<i>Juncus</i> sp. (subgenus <i>Genuini</i>)	Rush
	<i>Lachnagrostis filiformis</i> s.l.	Common Blown-grass
	<i>Lemna</i> spp.	Duckweed
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Lythrum hyssopifolia</i>	Small Loosestrife
	<i>Melaleuca ericifolia</i>	Swamp Paperbark
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
P	<i>Microtis unifolia</i>	Common Onion-orchid
	<i>Oxalis perennans</i>	Grassland Wood-sorrel
	<i>Persicaria decipiens</i>	Slender Knotweed
	<i>Poa labillardierei</i>	Common Tussock-grass
	<i>Rumex brownii</i>	Slender Dock
	<i>Rytidosperma pallidum</i>	Silvertop Wallaby-grass
	<i>Rytidosperma</i> spp.	Wallaby Grass
	<i>Schoenus apogon</i>	Common Bog-sedge
P	<i>Senecio quadridentatus</i>	Cotton Fireweed
	<i>Solanum aviculare</i>	Kangaroo Apple
	<i>Themeda triandra</i>	Kangaroo Grass
	<i>Typha domingensis</i>	Narrow-leaf Cumbungi
Introduced species		
	<i>Acetosella vulgaris</i>	Sheep Sorrel
	<i>Agrostis capillaris</i>	Brown-top Bent

	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
	<i>Arctotheca calendula</i>	Cape Weed
	<i>Aster subulatus</i>	Aster-weed
	<i>Avena fatua</i>	Wild Oat
	<i>Bellis perennis</i>	English Daisy
	<i>Brassica rapa</i>	White Turnip
	<i>Briza minor</i>	Lesser Quaking-grass
	<i>Bromus catharticus</i>	Prairie Grass
	<i>Bromus diandrus</i>	Great Brome
	<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
	<i>Cenchrus clandestinus</i>	Kikuyu
	<i>Cerastium glomeratum</i> s.l.	Common Mouse-ear Chickweed
RC	<i>Cirsium vulgare</i>	Spear Thistle
	<i>Conyza bonariensis</i>	Flaxleaf Fleabane
	<i>Cortaderia selloana</i>	Pampas Grass
RC	<i>Crataegus monogyna</i>	Hawthorn
	<i>Cyperus eragrostis</i>	Drain Flat-sedge
	<i>Dactylis glomerata</i>	Cocksfoot
	<i>Daucus carota</i>	Carrot
RC	<i>Echium plantagineum</i>	Paterson's Curse
	<i>Ehrharta erecta</i> var. <i>erecta</i>	Panic Veldt-grass
	<i>Ehrharta longiflora</i>	Annual Veldt-grass
	<i>Erica lusitanica</i>	Spanish Heath
	<i>Festuca arundinacea</i>	Tall Fescue
	<i>Fumaria muralis</i> subsp. <i>muralis</i>	Wall Fumitory
	<i>Galium aparine</i>	Cleavers
	<i>Helminthotheca echioides</i>	Ox-tongue
	<i>Holcus lanatus</i>	Yorkshire Fog
	<i>Hypochaeris radicata</i>	Flatweed
	<i>Isolepis levynsiana</i>	Tiny Flat-sedge
	<i>Lactuca serriola</i>	Prickly Lettuce
	<i>Lolium perenne</i>	Perennial Rye-grass
	<i>Lolium rigidum</i>	Wimmera Rye-grass
	<i>Lotus</i> spp.	Trefoil
	<i>Lysimachia arvensis</i>	Pimpernel
	<i>Malva parviflora</i>	Small-flower Mallow
	<i>Modiola caroliniana</i>	Red-flower Mallow
	<i>Paspalum dilatatum</i>	Paspalum
	<i>Pentameris airoides</i> subsp. <i>airoides</i>	False Hair-grass
	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
	<i>Plantago coronopus</i>	Buck's-horn Plantain
	<i>Plantago lanceolata</i>	Ribwort
	<i>Poa annua</i>	Annual Meadow-grass
	<i>Polygonum aviculare</i> s.l.	Prostrate Knotweed
	<i>Polypogon monspeliensis</i>	Annual Beard-grass

	<i>Prunus cerasifera</i>	Cherry Plum
	<i>Ranunculus spp.</i>	Buttercup
	<i>Romulea rosea</i>	Onion Grass
	<i>Rubus anglocandicans</i>	Common Blackberry
	<i>Rumex conglomeratus</i>	Clustered Dock
	<i>Rumex crispus</i>	Curled Dock
	<i>Sisyrinchium iridifolium</i>	Striped Rush-leaf
	<i>Solanum nigrum</i>	Black Nightshade
	<i>Sonchus asper</i>	Rough Sow-thistle
	<i>Sonchus oleraceus</i>	Common Sow-thistle
	<i>Sporobolus africanus</i>	Rat-tail Grass
	<i>Taraxacum officinale</i> spp. agg.	Garden Dandelion
	<i>Tragopogon porrifolius</i> subsp. <i>porrifolius</i>	Salsify
	<i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
	<i>Trifolium repens</i> var. <i>repens</i>	White Clover
	<i>Trifolium subterraneum</i>	Subterranean Clover
RC	<i>Ulex europaeus</i>	Gorse
	<i>Vicia sativa</i>	Common Vetch
	<i>Vicia</i> spp.	Vetch
	<i>Vulpia bromoides</i>	Squirrel-tail Fescue

Appendix 2: Photos of vegetation within the BHEP



Plate 1: Scattered understorey trees outside of defined native vegetation patches. Some appear to be in good health and flowering (top) while others appear to be in decline (bottom).



Plate 2: Habitat Zone 1: Mown native grass at edge of drains containing Weeping Grass *Microlena stipoides* and Wallaby Grass *Rytidosperma* spp. (top) and dam banks colonized by native herbs and grasses (bottom)



Plate 3: Habitat Zone 2: drain dominated by native rushes and sedges but with weeds also present



Plate 4: Habitat Zone 3: native grasses along boundary of southern drain with native understorey trees



Plate 5: Habitat Zone 4: native understorey trees with weedy ground-layer, including Blackberry infestation (bottom)



Plate 6: Most of the study area is made up of paddocks with introduced pasture species and weeds (top) or lawn and weedy areas within the campus (bottom).

Appendix 3: Berwick Health and Education Precinct - Vegetation Assessment - Southern Drain

05 May 2015

Anna Batters
Senior Precinct Structure Planner
Metropolitan Planning Authority
Level 25, 35 Collins Street, Melbourne
MELBOURNE VIC 3000
Email: anna.batters@mpa.vic.gov.au

Re: Berwick Health and Education Precinct- Vegetation assessment - Southern Drain

Our Ref job # 19994

Dear Anna,

Biosis Pty Ltd. was commissioned by the Metropolitan Planning Authority to undertake a survey of the health and condition of the vegetation in the drainage line in the southern section of the Berwick Health and Education Precinct, 100 Clyde Road, Berwick (Figure 1).

Methods

The survey was undertaken on 24 April 2015 and a list of plant species observed was collected (#T25562). This list will be submitted to the Department of Environment, Land, Water and Planning (DELWP) for incorporation into the Victorian Biodiversity Atlas. Planted species have not been recorded unless they are naturalised.

Native vegetation is defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses' (Clause 72).

The Guidelines classify native vegetation into two categories (DEPI 2013):

- A **remnant patch** of native vegetation (measured in hectares) is either:
 - An area of native vegetation, with or without trees, where at least 25 percent of the total perennial understorey cover is native plants.
 - An area with three or more indigenous canopy trees where the tree canopy cover is at least 20 percent.

Remnant patch vegetation is classified into ecological vegetation classes (EVCs). An EVC contains one or more floristic (plant) communities, and represents a grouping of broadly similar environments. Definitions of EVCs and benchmarks (condition against which vegetation quality at the site can be compared) are determined by DELWP.

- A **scattered tree** is defined as (extent measured by number of trees):
 - An indigenous canopy tree that does not form part of a remnant patch of native vegetation.

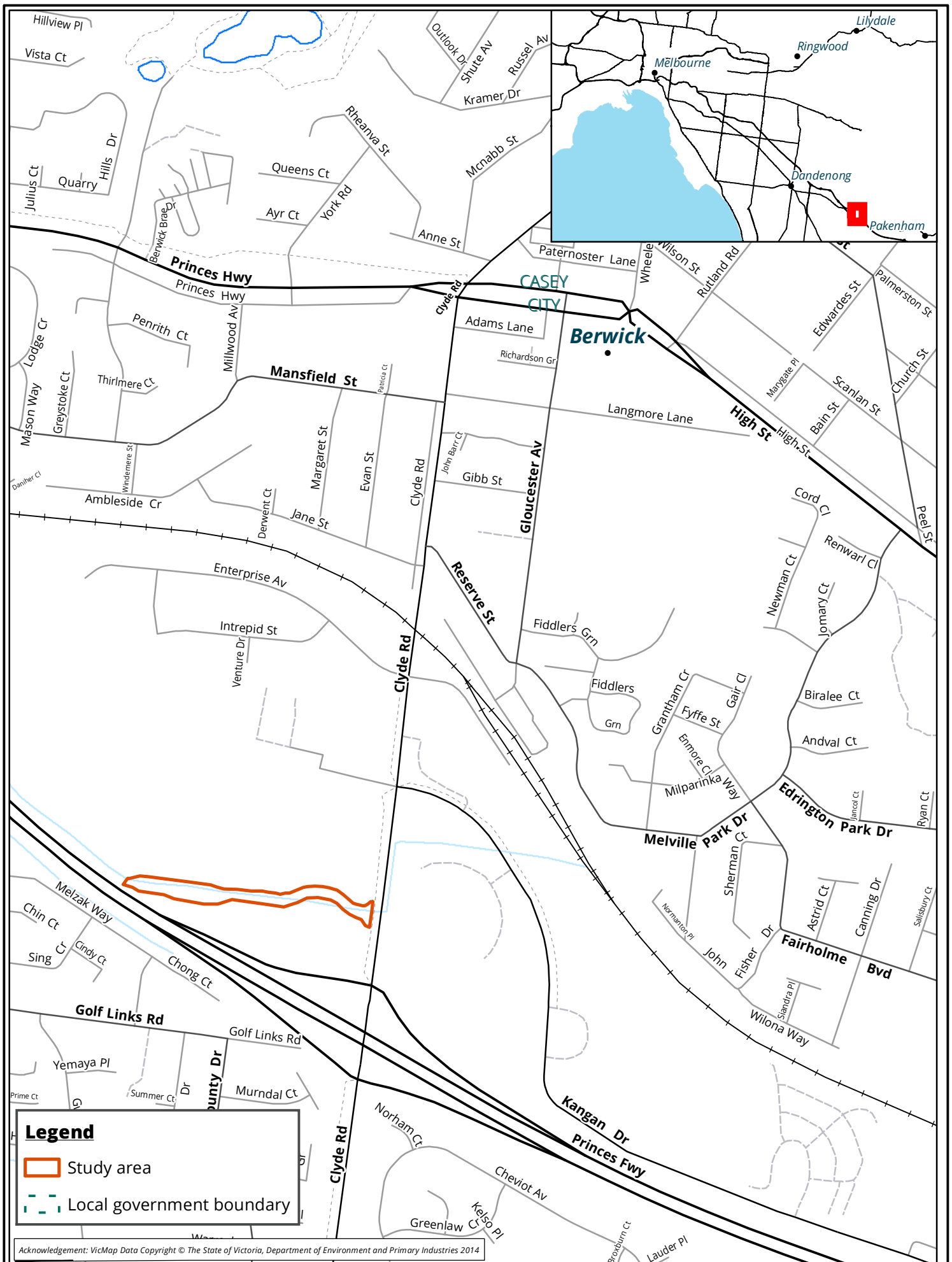


Figure 1: Location of the Study Area - Berwick, Victoria

A canopy tree is a mature tree that is greater than three metres in height and is normally found in the upper layer of a vegetation type. Ecological vegetation class descriptions provide a list of the typical canopy species. A condition score and extent is applied to each scattered tree based on information provided by DELWP's NVIM.

Species nomenclature for flora follows the Flora Information System (FIS 2014 edition).

Results:

Vegetation along the southern drain is not mapped (2005 EVC layer) as native vegetation according to DELWP mapping (see Biodiversity Interactive Map 3.2), with the original vegetation (pre 1750) identified as a mosaic of Plains Grassland (EVC 132) and Plains Grassy Woodland (EVC 55). Small remnants of this mosaic are identified by DELWP along the Princes Freeway in close proximity to the drain.

The pre-1750 vegetation of this site is described as an open eucalypt woodland with a canopy of River Red-gum *Eucalyptus camaldulensis* and Gippsland Red-gum *Eucalyptus tereticornis*. The understorey typically consists of shrubs including Black wattle *Acacia mearnsii*, Blackwood *Acacia melanoxylon* and Black Sheoak *Allocasuarina littoralis* that overtop a species-rich grassy and herbaceous ground layer.

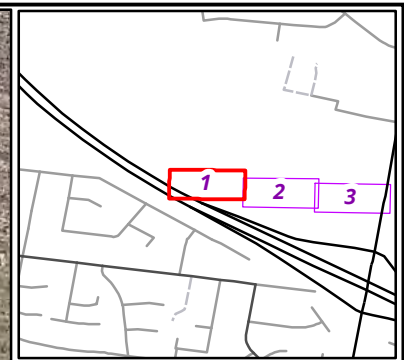
The vegetation along the drain is highly modified and degraded due to the extensive land clearing that has occurred within Berwick and surrounds. The drain itself is not a natural drainage line but an engineered feature that drains directly into the Berwick town drain to the west of the study area.

Overall, the condition of the vegetation along the drain is poor with a high cover of a number of noxious weeds (Appendix 1). Infestations of Blackberry *Rubus fruticosus* spp. agg, Wandering Jew *Tradescantia fluminensis* and Flax-leaf Broom *Genista linifolia* are extensive (Plates 1, 2 & 3). These infestations smother other vegetation and prevent many other species from recolonising the site.

Notwithstanding the above, the site inspection confirms the presence of small remnant patches of native vegetation along the drain (Figure 2). This includes areas dominated by shrubs and understorey trees such as Blackwood *Acacia melanoxylon* and Black Wattle *Acacia mearnsii*, narrow bands of aquatic species such as Narrow-leaf Cumbungi *Typha domingensis* and Slender Knotweed *Persicaria decipiens* and small patches of indigenous grasses including Veined Spear-grass *Austrostipa rudis*, Kangaroo Grass *Themeda triandra*, Weeping Grass *Microlaena stipoides*, Mat Grass *Hemarthria uncinata* and wallaby-grass species *Rytidosperma* spp as well as other herbs.

The vegetation along the slopes of the drain is devoid of any native eucalypts that would normally characterise areas of Plains Grassy Woodland. Rather, the remnant patches of native vegetation are formed by the presence of understorey trees including Blackwood and Black wattle (Plate 4). Scattered occurrences of other shrubs included Hedge wattle *Acacia paradoxa*, Prickly Tea-tree *Leptospermum continentale* and Drooping Cassinia *Cassinia arcuata*. Indigenous groundcover species occur as scattered individuals or small species poor patches.

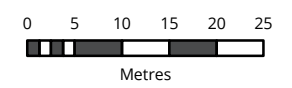
The eastern end of the study area lacks a native ground layer and is dominated by weedy pasture grasses such as Couch *Cynodon dactylon* var. *dactylon* and Kikuyu *Cenchrus clandestinus* (Plate 5). However, a small remnant native grassland is present along the northern bank at the western end of the study area. This grassland is dominated by Kangaroo Grass and Veined Spear-grass *Austrostipa rudis* subsp. *rudis* (Plate 6). Isolated occurrences of herbaceous species that characterise Plains Grassland are also recorded. These include Sheep's Burr *Acaena echinata*, Pale Flax-lily *Dianella longifolia*, Kidney Weed *Dichondra repens* and fireweeds *Senecio* spp.



Legend

- + Scattered tree
- Study area
- Native vegetation

Figure 2.1: Ecological features of the study area

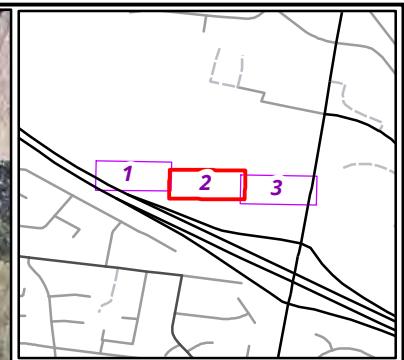


Scale: 1:800 @ A4
 Coordinate System: GDA 1994 MGA Zone 55



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

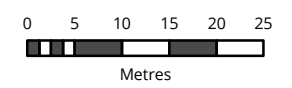
Matter: 19994, Date: 29 April 2015, Checked by: SGM,
 Drawn by: LDM, Last edited by: imilne
 Location: P:\19900s\19994\mapping\19994_f2_EcoFeatures_A4



Legend

- + Scattered tree
- Study area
- Native vegetation

Figure 2.2: Ecological features of the study area

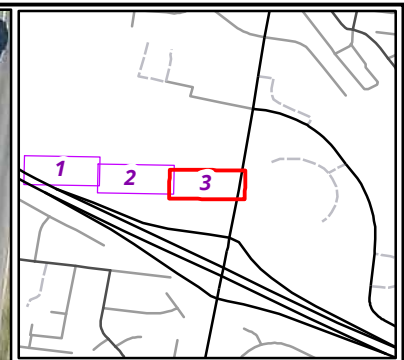
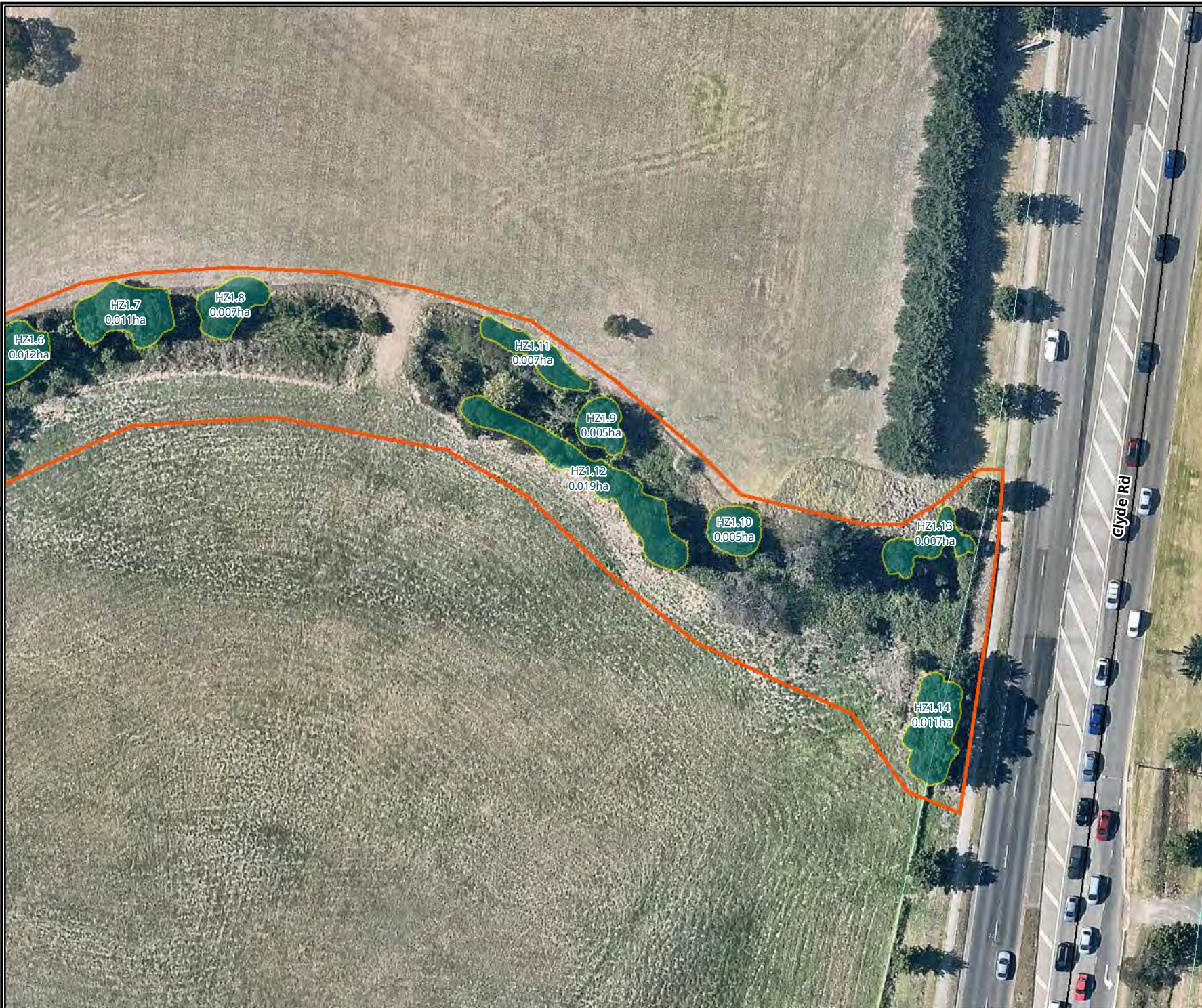


Scale: 1:800 @ A4
 Coordinate System: GDA 1994 MGA Zone 55



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

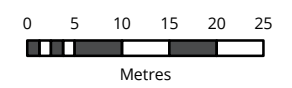
Matter: 19994, Date: 29 April 2015, Checked by: SGM,
 Drawn by: LDM, Last edited by: imilne
 Location: P:\19900s\19994\mapping\19994_f2_Ecofeatures_A4



Legend

- + Scattered tree
- Study area
- Native vegetation

Figure 2.3: Ecological features of the study area



Scale: 1:800 @ A4
 Coordinate System: GDA 1994 MGA Zone 55



Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 19994, Date: 29 April 2015, Checked by: SGM,
 Drawn by: LDM, Last edited by: imilne
 Location: P:\19900s\19994\Mapping\19994_F2_EcoFeatures_A4

The drainage channel and association wetted perimeter also supported patches of native species (Plate 7). Patches of Slender Knotweed *Persicaria decipiens*, Narrow-leaf Cumbungi *Typha domingensis* and Common Spike-sedge *Eleocharis acuta* were located along the drain and extended onto the bank. Isolated herbs in these wetter areas include Shrubby Fireweed *Senecio minimus* and Crane's Bill *Geranium* sp. 14 (Plate 8). These areas were incorporated into patches of vegetation identified as remnants of Plains Grassy Woodland as the cover of these wetland plants was typically overshadowed by wattles.

Condition and health of native vegetation

The extent of native vegetation patches was mapped within the study area (Figure 2) and the condition was assessed in relation to standard methods provided by DSE (2004). The condition of native vegetation was assessed using the DSE Vegetation Quality Assessment Sheet (DSE 2004) and pre-determined EVC benchmarks: <http://www.dse.vic.gov.au/conservation-and-environment/ecological-vegetation-class-evc-benchmarks-by-bioregion>. DELWP's Native Vegetation Information Management system was also used to determine vegetation extent and condition.

All native vegetation patches were assessed as remnants of Plains Grassy Woodland.

Habitat hectares

Patches are termed 'habitat zones'. Due to the relatively degraded nature of the native vegetation present all patches of native vegetation were identified as a single habitat zone. The condition score of the habitat zone is multiplied by the extent of the zone to give a value in Habitat hectares.

Scores allocated to the habitat zone identified within the study area are outlined in Table 1.

Table 1: Habitat hectares of native vegetation within the study area

Site ID		1	
Habitat Zone ID		A	
EVC #: Name		55 Plains Grassy Woodland	
		Max Score	Score
Site Condition	Large Old Trees	10	0
	Canopy Cover	5	0
	Lack of Weeds	15	4
	Understorey	25	10
	Recruitment	10	6
	Organic Matter	5	2
	Logs	5	0
	Total Site Score		22
Landscape Value	Patch Size	10	1
	Neighbourhood	10	0
	Distance to Core	5	1
	Total Landscape Score		2
HABITAT SCORE		100	24
Habitat points = #/100		1	0.24
Habitat Zone area (ha)		0.526	
Habitat hectares (Hha)		0.13	

Vegetation Health

Native vegetation within the study area did not appear to be impacted by any obvious diseases or was otherwise impacted by any obvious insect attack which reduced or would otherwise lead to a conclusion that the vegetation present was in poor health. The two main wattle species present, Blackwood and Black Wattle, were present as a range of age cohorts and appeared to be present as a naturally sustaining population (Plates 1, 4, 5 & 6).

Implications of the Assessment

Any clearing of native vegetation within the study area may require a permit under the *Planning and Environment Act 1988*. Applications for the clearing of native vegetation are regulated under Victoria's Biodiversity Assessment Guidelines (DEPI 2013) (the Guidelines). DELWP classify most of the study area as Location A although the western end of the drain is identified as Location C.

If the study area is proposed to be impacted by development which would result in the clearing of native vegetation then it is likely that proposal would be assessed under the high risk pathway. This assessment includes relevant information for such an application.

Conclusion

The study area supports patches of native vegetation as defined under Victoria's Biodiversity Assessment Guidelines. Many of the species which formed these remnants appeared to be healthy and were actively recruiting.

The patches of native vegetation identified occupy a total of 0.526 ha. This native vegetation is considered to be degraded in condition and was assessed to have a relatively low habitat score (24/100). The vegetation therefore represents a total of 0.13 habitat hectares.

Clearing of this vegetation would require a permit under the *Planning and Environment Act* and would likely be required to satisfy the information requirements defined under the high risk-based pathway defined by the Guidelines. This report provided the relevant data for any such application.

Please contact me on 8686 4833 if you would like to discuss further.

Yours sincerely



Steve Mueck
Senior Consultant Botanist
0429 808 732

References

DEPI 2013. *Permitted clearing of native vegetation - Biodiversity assessment guidelines*. Victorian Government Department of Environment and Primary Industries, Melbourne (September 2013).

Appendix 1: Flora

Table A1.1. Flora species (32 native, 54 weeds) recorded from the study area.

Status	Scientific name	Common name
Indigenous Species		
	<i>Acacia mearnsii</i>	Black Wattle
	<i>Acacia melanoxylon</i>	Blackwood
	<i>Acacia paradoxa</i>	Hedge Wattle
	<i>Acaena echinata</i>	Sheep's Burr
	<i>Acaena novae-zelandiae</i>	Bidgee-widgee
	<i>Amyema pendula</i>	Drooping Mistletoe
	<i>Austrostipa rudis</i> subsp. <i>rudis</i>	Veined Spear-grass
	<i>Carex inversa</i>	Knob Sedge
	<i>Cassinia arcuata</i>	Drooping Cassinia
	<i>Dianella longifolia</i>	Pale Flax-lily
	<i>Dichondra repens</i>	Kidney-weed
	<i>Einadia nutans</i>	Nodding Saltbush
	<i>Eleocharis acuta</i>	Common Spike-sedge
	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
	<i>Geranium</i> spp. (?sp. 14, L. Tozer pers. comm.)	Valley Crane's Bill
	<i>Hemarthria uncinata</i> var. <i>uncinata</i>	Mat Grass
	<i>Juncus</i> spp.	Rush
	<i>Leptospermum continentale</i>	Prickly Tea-tree
	<i>Lomandra filiformis</i> subsp. <i>filiformis</i>	Wattle Mat-rush
	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
	<i>Melaleuca ericifolia</i>	Swamp Paperbark
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
	<i>Oxalis perennans</i>	Grassland Wood-sorrel
	<i>Persicaria decipiens</i>	Slender Knotweed
	<i>Poa labillardierei</i>	Common Tussock-grass
	<i>Rytidosperma caespitosum</i>	Common Wallaby-grass

Status	Scientific name	Common name
	<i>Rytidosperma semiannulare</i>	Wetland Wallaby-grass
	<i>Senecio minimus</i>	Shrubby Fireweed
	<i>Senecio quadridentatus</i>	Cotton Fireweed
	<i>Themeda triandra</i>	Kangaroo Grass
	<i>Tricoryne elatior</i>	Yellow Rush-lily
	<i>Typha domingensis</i>	Narrow-leaf Cumbungi
Exotic Species		
	<i>Acacia iteaphylla</i>	Flinders Range Wattle
	<i>Agrostis capillaris</i>	Brown-top Bent
RR	<i>Allium triquetrum</i>	Angled Onion
	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
RR	<i>Asparagus asparagoides</i>	Bridal Creeper
	<i>Aster subulatus</i>	Aster-weed
	<i>Brassica rapa</i>	White Turnip
	<i>Bromus catharticus</i>	Prairie Grass
	<i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
	<i>Callitriche stagnalis</i>	Common Water-starwort
	<i>Cenchrus clandestinus</i>	Kikuyu
	<i>Centaureum tenuiflorum</i>	Slender Centaury
RC	<i>Cirsium vulgare</i>	Spear Thistle
	<i>Conyza bonariensis</i>	Flaxleaf Fleabane
	<i>Cortaderia selloana</i>	Pampas Grass
RC	<i>Crataegus monogyna</i>	Hawthorn
	<i>Cynodon dactylon var. dactylon</i>	Couch
	<i>Cyperus eragrostis</i>	Drain Flat-sedge
	<i>Dactylis glomerata</i>	Cocksfoot
	<i>Daucus carota</i>	Carrot
	<i>Ehrharta erecta var. erecta</i>	Panic Veldt-grass
	<i>Erica lusitanica</i>	Spanish Heath
	<i>Erigeron karvinskianus</i>	Seaside Daisy
	<i>Euryops abrotanifolius</i>	Winter Euryops

Status	Scientific name	Common name
	<i>Fraxinus angustifolia</i>	Desert Ash
	<i>Fumaria</i> spp.	Fumitory
	<i>Galium aparine</i>	Cleavers
	<i>Gamochaeta purpurea</i> s.s.	Spiked Cudweed
RC	<i>Genista linifolia</i>	Flax-leaf Broom
	<i>Helminthotheca echioides</i>	Ox-tongue
	<i>Holcus lanatus</i>	Yorkshire Fog
	<i>Hypochaeris radicata</i>	Flatweed
	<i>Lonicera japonica</i>	Japanese Honeysuckle
	<i>Malus</i> spp.	Apple
	<i>Nasturtium officinale</i>	Watercress
	<i>Paspalum dilatatum</i>	Paspalum
	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
	<i>Pinus radiata</i>	Radiata Pine
	<i>Plantago lanceolata</i>	Ribwort
	<i>Prunella vulgaris</i>	Self-heal
	<i>Prunus cerasifera</i>	Cherry Plum
	<i>Romulea rosea</i>	Onion Grass
RC	<i>Rubus fruticosus</i> spp. agg.	Blackberry
	<i>Rumex conglomeratus</i>	Clustered Dock
	<i>Rumex crispus</i>	Curled Dock
RR	<i>Salix</i> spp.	Willow
	<i>Solanum nigrum</i> s.s.	Black Nightshade
	<i>Sonchus asper</i> s.s.	Rough Sow-thistle
	<i>Sporobolus africanus</i>	Rat-tail Grass
	<i>Stenotaphrum secundatum</i>	Buffalo Grass
	<i>Tradescantia fluminensis</i>	Wandering Jew
RC	<i>Ulex europaeus</i>	Gorse
	<i>Vicia sativa</i> subsp. <i>sativa</i>	Common Vetch
	<i>Viola odorata</i>	Common Violet

Appendix 2: Photos of vegetation along the Clyde Road drain



Plate 1: A Blackberry infestation along the banks of the drain



Plate 2: A Blackberry infestation along the drain with an introduced wattle flowering in the foreground.



Plate 3: An area of Blackberry infestation with Flax-leaf Broom and Desert Ash



Plate 4: Blackwoods along the banks of the drain determine the extent of Plains Grassy Woodland.



Plate 5: Mown pasture grasses flanking the boundary of the Clyde road drain.



Plate 6: Native grassland at the western end of the study area containing Kangaroo Grass and Veined Spear-grass.



Plate 7: A patch of native vegetation within the drain containing Narrow-leaf Cumbungi and Slender Knotweed.



Plate 8: The banks of the drain support scattered native herbs such as *Geranium* sp. 14.