# Appendices

# Appendix 1: Survey Methods

## A1.1 Aquatic Fauna Assessment Methods

Aquatic fauna survey was conducted under Fisheries Victoria Research Permit RP 1071, FFG Permit 10006240 and Animal Ethics Approval 14.12.

Aquatic habitat assessment (including in situ water quality measurement) and survey was undertaken at 10 sites located on within the proposed alignment (Figure 3). Survey site selection was based on water depth/permanence, waterway connectivity, accessibility and location relative to the study area.

Site features including digital photographs, site coordinates, access information and general habitat features were recorded at all sites. Habitat assessment included in situ measurement of water quality, estimates on physical and biological attributes (e.g. depth, substrate composition, flow, wetted instream cover, aquatic vegetation, riparian vegetation and shading etc.), and notes on existing sources of disturbance.

*In situ* measurements of Dissolved Oxygen (DO), pH, Electrical Conductivity (EC), temperature and turbidity were made at all sites using a calibrated Horiba U52 water quality meter. All water quality measurements were taken in accordance with EPA publication IWRG701: Sampling and analysis of waters, wastewaters, soils and wastes (EPA 2009).


**Legend**

Current alignment
- Field assessment
- Desktop assessment

Alignment 50m buffer
- Field survey
- Desktop assessment
- Alignment 100m buffer
- Aquatic fauna assessment site 2014
- Aquatic fauna assessment site 2010

**Figure 5: Aquatic fauna assessment sites**

0 800 1,600 2,400 3,200 4,000

Metres

Scale: 1:75,000 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N

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

Acknowledgements: Base data (c) State of Victoria

*Matter: 17973,*
*Date: 10 June 2014,*
*Checked by: ADS, Drawn by: JMS, Last edited by: asteelcable*
*Location:P:\17900s\17973\Mapping*
*17973_F5_AquaticFauna_20140506*

# Appendix 2: Flora

Notes to tables:

| | |
|---|---|
| **EPBC Act:**<br>CR - Critically Endangered<br>EN - Endangered<br>VU – Vulnerable<br><br>PMST – Protected Matters Search Tool | **FFG Act:**<br>L - listed as threatened under FFG Act<br>P - protected under the FFG Act (public land only) |
| # - Native species outside natural range | **Noxious weed status:**<br>SP State prohibited species<br>RP Regionally prohibited species<br>RC Regionally controlled species<br>RR Regionally restricted species |

## A2.1 Flora species recorded from the study area

**Table A2.1. Flora species recorded from the study area.**

| Status | Scientific name | Common name |
|---|---|---|
| **Rare or Threatened Indigenous species:** | | |
| r | *Eucalyptus falciformis* | Western Peppermint |
| **Indigenous species:** | | |
| | *Acacia melanoxylon* | Blackwood |
| | *Acacia myrtifolia* | Myrtle Wattle |
| | *Acacia verticillata* | Prickly Moses |
| | *Acaena novae-zelandiae* | Bidgee-widgee |
| | *Acrotriche serrulata* | Honey-pots |
| | *Allocasuarina paludosa* | Scrub Sheoak |
| | *Alternanthera denticulata* | Lesser Joyweed |
| | *Asperula conferta* | Common Woodruff |
| | *Banksia marginata* | Silver Banksia |
| | *Baumea juncea* | Bare Twig-sedge |
| | *Bursaria spinosa* subsp. *spinosa* | Sweet Bursaria |
| | *Calystegia sepium* subsp. *roseata* | Large Bindweed |
| | *Carex appressa* | Tall Sedge |
| | *Carex breviculmis* | Common Grass-sedge |
| | *Clematis aristata* | Mountain Clematis |
| | *Crassula helmsii* | Swamp Crassula |
| | *Daviesia ulicifolia* | Gorse Bitter-pea |
| | *Dianella revoluta* var. *revoluta s.l.* | Black-anther Flax-lily |
| | *Dianella spp.* | Flax Lily |
| | *Eleocharis acuta* | Common Spike-sedge |
| | *Epilobium billardierianum* | Variable Willow-herb |
| | *Eucalyptus obliqua* | Messmate Stringybark |
| | *Eucalyptus ovata* | Swamp Gum |
| | *Eucalyptus viminalis* | Manna Gum |
| | *Euchiton japonicus* | Creeping Cudweed |
| | *Exocarpos strictus* | Pale-fruit Ballart |

| Status | Scientific name | Common name |
|---|---|---|
| | *Ficinia nodosa* | Knobby Club-sedge |
| | *Gahnia filum* | Chaffy Saw-sedge |
| | *Gahnia sieberiana* | Red-fruit Saw-sedge |
| | *Gahnia* spp. | Saw Sedge |
| | *Geranium potentilloides* | Soft Crane's-bill |
| | *Gonocarpus humilis* | Shade Raspwort |
| | *Gonocarpus tetragynus* | Common Raspwort |
| | *Goodenia geniculata* | Bent Goodenia |
| | *Goodenia ovata* | Hop Goodenia |
| | *Hypericum gramineum* spp. agg. | Small St John's Wort |
| | *Hypolaena fastigiata* | Tassel Rope-rush |
| | *Imperata cylindrica* | Blady Grass |
| | *Juncus pallidus* | Pale Rush |
| | *Juncus* spp. | Rush |
| | *Juncus subsecundus* | Finger Rush |
| | *Juncus usitatus* | Billabong Rush |
| | *Lemna disperma* | Common Duckweed |
| | *Lepidosperma gunnii* | Slender Sword-sedge |
| | *Lepidosperma laterale* | Variable Sword-sedge |
| | *Lepidosperma longitudinale* | Pithy Sword-sedge |
| | *Leptospermum continentale* | Prickly Tea-tree |
| | *Leptospermum lanigerum* | Woolly Tea-tree |
| | *Leucopogon australis* | Spike Beard-heath |
| | *Leucopogon parviflorus* | Coast Beard-heath |
| | *Lomandra longifolia* | Spiny-headed Mat-rush |
| | *Lythrum hyssopifolia* | Small Loosestrife |
| | *Melaleuca squarrosa* | Scented Paperbark |
| | *Microlaena stipoides* var. *stipoides* | Weeping Grass |
| | *Myoporum insulare* | Common Boobialla |
| | *Notelaea ligustrina* | Privet Mock-olive |
| | *Oxalis exilis* | Shady Wood-sorrel |
| | *Oxalis perennans* | Grassland Wood-sorrel |

| Status | Scientific name | Common name |
|---|---|---|
| | *Ozothamnus ferrugineus* | Tree Everlasting |
| | *Persicaria decipiens* | Slender Knotweed |
| | *Phragmites australis* | Common Reed |
| | *Poa labillardierei* | Common Tussock-grass |
| | *Poa morrisii* | Soft Tussock-grass |
| | *Poa tenera* | Slender Tussock-grass |
| | *Pteridium esculentum* | Austral Bracken |
| | *Rhagodia candolleana* subsp. *candolleana* | Seaberry Saltbush |
| | *Rubus parvifolius* | Small-leaf Bramble |
| | *Rytidosperma* spp. | Wallaby Grass |
| | *Schoenus apogon* | Common Bog-sedge |
| | *Solanum laciniatum* | Large Kangaroo Apple |
| | *Tetrarrhena juncea* | Forest Wire-grass |
| | *Themeda triandra* | Kangaroo Grass |
| | *Triglochin striata* | Streaked Arrowgrass |
| | *Typha domingensis* | Narrow-leaf Cumbungi |
| | *Urtica incisa* | Scrub Nettle |
| | *Villarsia reniformis* | Running Marsh-flower |
| | *Viola hederacea* | Ivy-leaf Violet |
| | *Xanthorrhoea australis* | Austral Grass-tree |
| | *Xanthorrhoea minor* subsp. *lutea* | Small Grass-tree |
| **Introduced species:** | | |
| | *Acacia longifolia* subsp. *longifolia* | Sallow Wattle |
| | *Agrostis capillaris* | Brown-top Bent |
| | *Anthoxanthum odoratum* | Sweet Vernal-grass |
| | *Atriplex prostrata* | Hastate Orache |
| | *Bromus catharticus* | Prairie Grass |
| | *Callitriche stagnalis* | Common Water-starwort |
| RC | *Chrysanthemoides monilifera* | Boneseed |
| RR | *Cirsium vulgare* | Spear Thistle |
| | *Cortaderia selloana* | Pampas Grass |
| RR | *Crataegus monogyna* | Hawthorn |

| Status | Scientific name | Common name |
|---|---|---|
| | *Cynodon dactylon* var. *dactylon* | Couch |
| | *Cyperus eragrostis* | Drain Flat-sedge |
| | *Dactylis glomerata* | Cocksfoot |
| | *Helminthotheca echioides* | Ox-tongue |
| | *Holcus lanatus* | Yorkshire Fog |
| | *Hypochaeris radicata* | Flatweed |
| | *Juncus articulatus* subsp. *articulatus* | Jointed Rush |
| | *Lolium perenne* | Perennial Rye-grass |
| | *Nasturtium officinale* | Watercress |
| | *Paspalum dilatatum* | Paspalum |
| | *Paspalum distichum* | Water Couch |
| | *Phalaris aquatica* | Toowoomba Canary-grass |
| | *Plantago lanceolata* | Ribwort |
| | *Polypogon monspeliensis* | Annual Beard-grass |
| RC | *Rosa rubiginosa* | Sweet Briar |
| RC | *Rubus fruticosus* spp. agg. | Blackberry |
| | *Rumex conglomeratus* | Clustered Dock |
| | *Rumex crispus* | Curled Dock |
| | *Trifolium repens* var. *repens* | White Clover |
| | *Vicia sativa* | Common Vetch |
| | *Zantedeschia aethiopica* | White Arum-lily |

## A2.2 Listed flora species

The following table includes the listed flora species that have potential to occur within the three sections of the study area (east, west and central). The list of species is sourced from the Victorian Flora Information System and the Protected Matters Search Tool (DoE; accessed on 11.06.14). Significant flora species recorded within 5 km of the study area is shown in Figure 3.

**Table A2.2. Listed flora species recorded / predicted to occur within 5 km of the study area.**

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| **National Significance** | | | | | | | | | | | | | |
| *Caladenia brachyscapa* | Short Spider-orchid | EX | x | L | 1959 | - | 1959 | - | - | - | Grey sandy soil in lowland forest near Warrnambool; presumed extinct. | Low | Considered extinct. Unlikely in heavily disturbed remnants. |
| *Glycine latrobeana* | Clover Glycine | VU | v | L | 2010 | PMST | 2006 | PMST | No date | - | Grasslands and grassy woodlands, particularly those dominated by *Themeda triandra*. | Low | Unlikely in heavily disturbed remnants. |
| *Haloragis exalata* subsp. *exalata* var. | Square Raspwort | VU | v | | - | - | 1966 | - | 1966 | - | Damp riparian habitats. | Low | Unlikely in the west. Possible in more protected riparian zones. |
| *Prasophyllum frenchii* | Maroon Leek-orchid | EN | e | L | No date | - | No date | - | No date | - | Grassland and grassy woodland environments on sandy or black clay loam soils that are generally damp but well drained. | Low | Unlikely in heavily disturbed remnants. |
| *Prasophyllum spicatum* | Dense Leek-orchid | VU | e | L | No date | - | No date | - | No date | - | Heath and heathy woodlands. | Low | Unlikely in heavily disturbed remnants. |
| *Pterostylis cucullata* | Leafy Greenhood | VU | v | L | 1984 | PMST | 1984 | PMST | No date | - | Coastal and inland subspecies have differing habitat characteristics. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |
| *Pterostylis tenuissima* | Swamp Greenhood | VU | v | | 2009 | PMST | 2009 | PMST | No date | - | Swamp Scrub with a dense canopy and open understorey, often on or beside animal tracks. | Low | Unlikely in heavily disturbed remnants. |
| *Thelymitra epipactoides* | Metallic Sun-orchid | EN | e | L | 2010 | PMST | 2006 | PMST | No date | - | Moist or dry sandy loams or loamy sands, primarily in coastal heaths, grasslands and woodlands, but also in similar communities at drier inland sites. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |
| *Thelymitra matthewsii* | Spiral Sun-orchid | VU | v | L | No date | - | No date | - | - | - | Typically on well-drained soils on slightly elevated sites, but also on coastal sandy flats. Often in open situations following disturbance. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| **State Significant** | | | | | | | | | | | | | |
| *Amphibromus sinuatus* | Wavy Swamp Wallaby-grass | | v | | - | - | 2010 | - | 2010 | - | Confined to permanent swamps in cool sites. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |
| *Australina pusilla* subsp. *pusilla* | Small Shade-nettle | | r | | - | - | 2009 | - | - | - | Grows in moist undergrowth of wet forests or scrub in heavy shade. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |
| *Baumea laxa* | Lax Twig-sedge | | r | | 2009 | - | 2009 | - | - | - | Wet sandy areas in heathlands and heathy swamps. | Medium | Potential habitat in more protected riparian areas. |
| *Caladenia vulgaris* | Slender Pink-fingers | | r | | 2000 | - | 2000 | - | - | - | In heathland on damp sandy soil. | Medium | Potential habitat along more intact roadside vegetation. |
| *Cardamine papillata* | Forest Bitter-cress | | r | | - | - | 1966 | - | 1966 | - | Hilly forest areas across Victoria. | Medium | Potential habitat in more protected riparian areas. |
| *Cladium procerum* | Leafy Twig-sedge | | r | | - | - | 2004 | - | - | - | Waterlogged soils, often along slow-flowing streams and lake margins. | Medium | Potential habitat in more protected riparian areas. |
| *Diuris palustris* | Swamp Diuris | | v | L | 1985 | - | 1985 | - | - | - | Grasslands and open woodlands, often in swampy depressions; confined to the west of the State. | Low | Unlikely in heavily disturbed remnants. |
| *Eucalyptus falciformis* | Western Peppermint | | r | | - | - | 2003 | - | 2003 | - | Usually occurs on impoverished, well-drained sandy soils in a variety of habitats across the moist, temperate regions of South-west Victoria, as well as the Grampian Ranges, and adjacent areas of South Australia, from the Otway Ranges in the east to Millicent in the west. Whilst populations in the Grampians occur as high as 1000 m altitude, others occur in undulating terrain or on cliff tops close to the ocean. | Recorded | Found in Damp Heathy Woodland and scrub adjacent to East and West Road. |
| *Exocarpos syrticola* | Coast Ballart | | r | | - | - | No date | - | - | - | Calcareous sands near the coast. Confined to coastal dunes and cliffs on and west of Wilsons Promontory. | Low | No suitable habitat. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Hibbertia truncata* | Port Campbell Guinea-flower | | r | | - | - | 2010 | - | 2010 | - | Growing on sandy soil or sometimes sand dunes, often locally common, usually associated with limestone in coastal heath, rarely more inland. | Low | No suitable habitat. |
| *Lachnagrostis scabra* subsp. *curviseta* | Rough Blown-grass | | e | | - | - | - | - | 1966 | - | A poorly known Victorian endemic annual. Likely from damp heathy environments. | Low | No recent records and unlikely in highly disturbed environments typically associated with stream crossings in the study area |
| *Lasiopetalum schulzenii* | Drooping Velvet-bush | | r | | - | - | 1996 | - | - | - | Confined to cliff-top and dune woodland and heathland near Port Campbell and Portland favouring sandy soils derived from limestone. | Low | No suitable habitat. |
| *Lobelia beaugleholei* | Showy Lobelia | | r | | 2009 | - | 2009 | - | - | - | Waterlogged sites near swamps and other wetlands. Occurring almost exclusively on black loam soils in the vicinity of swamps and drainage lines, rarely on red clays. | Low | No optimal habitat. Unlikely in heavily disturbed remnants. |
| *Logania ovata* | Oval-leaf Logania | | r | | - | - | 1966 | - | 1986 | - | Woodlands on rocky, calcareous soils, often near coast but not on beach sands. Sandy soils derived from limestone. | Low | No suitable habitat. |
| *Melaleuca armillaris* subsp. *armillaris* | Giant Honey-myrtle | | r | | - | - | 2007 | - | 2007 | - | Near coastal heath/scrub, rocky coast and foothill outcrops. | Low | Exotic to this region. Any occurrence would be considered as an environmental weed. |
| *Monotoca glauca* | Currant-wood | | r | | 1998 | - | 1998 | - | - | - | Infertile sandy soils at sea-level or on near-coastal high rainfall ranges. Grows in open-forest, heathy woodland, wet closed scrub and margins of cool temperate rainforest. | Low | No suitable habitat. |
| *Orthrosanthus multiflorus* | Morning Flag | | r | | - | - | 1966 | - | 1966 | - | In coastal heathland communities near Cape Nelson and Port Campbell. | Negligible | No suitable habitat. |
| *Pneumatopteris pennigera* | Lime Fern | | e | | - | - | 2005 | - | - | - | Damp, limestone or calcareous soils. | Negligible | No suitable habitat. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Pterostylis lustra* | Small Sickle Greenhood | | e | L | 2002 | - | 2009 | - | 2000 | - | In shaded, damp to wet areas along stream banks, in wet soaks and swamps. | Negligible | No suitable habitat. |
| *Pultenaea canaliculata* | Coast Bush-pea | | r | | 2010 | - | 2010 | - | - | - | Coastal dunes and limestone cliffs. | Negligible | No suitable habitat. |
| *Scaevola calendulacea* | Dune Fan-flower | | v | | 2010 | - | 2010 | - | - | - | Coastal dunes and calcareous sands near the coast. | Negligible | No suitable habitat. |
| *Triglochin minutissima* | Tiny Arrowgrass | | r | | - | - | 1966 | - | 1966 | - | Scattered occurrences on damp saline soils near salt-lakes, and forming part of herbfields in coastal saltmarshes. | Negligible | No suitable habitat. |
| *Xanthorrhoea caespitosa* | Tufted Grass-tree | | r | | - | - | 2003 | - | 2003 | - | Sandy, sometimes rocky soils in mallee and heathland communities. | Moderate | Potential habitat in more protected areas. |
| *Zygophyllum billardierei* | Coast Twin-leaf | | r | | 1999 | - | - | - | - | - | Sandy soils associated with near-coastal hinterland and coastal dunes | Low | No suitable habitat. |

## A2.3 Tree size data

**Table A2.3. Tree size data for trees within central study area.**

The waypoint numbers in the following table correspond to the scattered tree numbers identified in Figure 2.

| Waypoint | Species | DBH | Comment |
|---|---|---|---|
| **13** | *Eucalyptus ovata* | 43 | |
| **14** | *Eucalyptus ovata* | 45 | |
| **15** | *Eucalyptus ovata* | 80 | |
| **16** | *Eucalyptus ovata* | 40 | |
| **20** | *Eucalyptus ovata* | 121 | |
| **21** | *Eucalyptus ovata* | 42 | |
| **22** | *Eucalyptus ovata* | 60 | |
| **25** | *Eucalyptus falciformis* | 26 | Trees were part of a larger stand of dead trees. Only those within the 50m alignment were marked. |
| **26** | *Eucalyptus falciformis* | 37 | |
| **27** | *Eucalyptus falciformis* | 28 | |
| **28** | *Eucalyptus falciformis* | 24 | |
| **35** | *Eucalyptus ovata* | 81 | |
| **36** | *Eucalyptus ovata* | 57 | |
| **37** | *Eucalyptus ovata* | 74 | |
| **38** | *Eucalyptus ovata* | 17 | |
| **39** | *Eucalyptus ovata* | 41 | |
| **40** | *Eucalyptus ovata* | 54 | |
| **41** | *Eucalyptus ovata* | 90 | |
| **42** | *Eucalyptus ovata* | 48 | |
| **44** | *Eucalyptus ovata* | 59 | |
| **45** | *Eucalyptus ovata* | 51 | |
| **46** | *Eucalyptus ovata* | 107 | |
| **47** | *Eucalyptus ovata* | 52 | |
| **48** | *Eucalyptus ovata* | 17 | |
| **49** | *Eucalyptus ovata* | 23 | |
| **50** | *Eucalyptus ovata* | 27 | |

| | | | |
|---|---|---|---|
| **51** | *Eucalyptus ovata* | 30 | Large tree laying down |
| **52** | *Eucalyptus viminalis* | 85 | |
| **53** | *Eucalyptus ovata* | 75 | |
| **54** | *Eucalyptus ovata* | 75 | |
| **55** | *Eucalyptus ovata* | 72 | |
| **60** | *Eucalyptus ovata* | 28 | |
| **61** | *Eucalyptus ovata* | 27 | |
| **62** | *Eucalyptus ovata* | 37 | |
| **71** | *Eucalyptus obliqua* | 10 | |
| **72** | *Eucalyptus obliqua* | 10 | |
| **73** | Dead Tree | | |
| **74** | Dead Tree | | |
| **75** | *Eucalyptus obliqua* | 52 | |
| **76** | *Eucalyptus obliqua* | 47 | |
| **78** | *Eucalyptus ovata* | 56 | |
| **82** | *Eucalyptus ovata* | 43 | |
| **83** | *Eucalyptus ovata* | 36 | |
| **84** | *Eucalyptus ovata* | 65 | |
| **85** | *Eucalyptus ovata* | 55 | |
| **86** | *Eucalyptus ovata* | 47 | |
| **87** | *Eucalyptus ovata* | 66 | |
| **88** | *Eucalyptus ovata* | 47 | |
| **89** | *Eucalyptus ovata* | 23 | |

# Appendix 3: Fauna

Notes to tables:

| **EPBC Act:** | **FFG Act:** |
|---|---|
| EX - Extinct<br>CR - Critically Endangered<br>EN - Endangered<br>VU - Vulnerable<br>CD - Conservation dependent<br><br>PMST – Protected Matters Search Tool | L - listed as threatened under FFG Act<br>N - nominated for listing as threatened<br>I - determined ineligible for listing |
| * - introduced species<br>** - pest species listed under the CaLP Act<br># - species predicted to occur based on natural distribution and suitable habitat despite lack of database records | |

Fauna species in these tables are listed in alphabetical order within their taxonomic group.

## A3.1 Fauna species recorded from the study area

**Table A3.1. Terrestrial fauna recorded from the central study area (present field assessment)**

| Status | Scientific name | Common name | Observation type |
|---|---|---|---|
| | **Mammals** | | |
| ** | *Lepus europeaus* | European Hare | Visual |
| ** | *Oryctolagus cuniculus* | European Rabbit | Visual / scats |
| | *Phascolarctos cinereus* | Koala | Visual |
| | *Wallabia bicolor* | Black Wallaby | Visual / scats |
| | **Birds** | | |
| | *Acanthiza lineata* | Striated Thornbill | Visual / aural |
| | *Anas castanea* | Chestnut Teal | Visual |
| | *Anas gracilis* | Grey Teal | Visual |
| | *Anas superciliosa* | Pacific Black Duck | Visual |
| | *Anthochaera carunculata* | Red Wattlebird | Visual / aural |
| | *Anthus novaeseelandiae* | Australasian Pipit | Aural |
| | *Aquila audax* | Wedge-tailed Eagle | Visual |
| | *Ardea pacifica* | White-necked Heron | Visual |
| vu | *Aythya australis* | Hardhead | Visual |
| | *Cacatua tenuirostris* | Long-billed Corella | Visual |
| * | *Carduelis carduelis* | European Goldfinch | Visual |
| | *Chenonetta jubata* | Australian Wood Duck | Visual |
| | *Colluricincla harmonica* | Grey Shrike-thrush | Visual / aural |
| | *Cormobates leucophaea* | White-throated Treecreeper | Aural |
| | *Corvus mellori* | Little Raven | Visual / aural |
| | *Coturnix pectoralis* | Stubble Quail | Visual |
| | *Cracticus tibicen* | Australian Magpie | Visual / aural |
| | *Cracticus torquatus* | Grey Butcherbird | Visual / aural |
| | *Cygnus atratus* | Black Swan | Visual |
| | *Dacelo novaeguineae* | Laughing Kookaburra | Visual / aural |
| | *Egretta novaehollandiae* | White-faced Heron | Visual |
| | *Eolophus roseicapillus* | Galah | Visual / aural |
| | *Eopsaltria australis* | Eastern Yellow Robin | Visual |
| | *Falco peregrinus* | Peregrine Falcon | Visual |
| | *Fulica atra* | Eurasian Coot | Visual |

| Status | Scientific name | Common name | Observation type |
|---|---|---|---|
| | *Gallinula ventralis* | Black-tailed Native-hen | Visual |
| | *Grallina cyanoleuca* | Magpie-lark | Visual / aural |
| | *Hirundo neoxena* | Welcome Swallow | Visual |
| | *Lichenostomus leucotis* | White-eared Honeyeater | Aural |
| | *Malurus cyaneus* | Superb Fairy-wren | Visual / aural |
| | *Manorina melanocephala* | Noisy Miner | Aural |
| | *Neochmia temporalis* | Red-browed Finch | Visual |
| | *Ocyphaps lophotes* | Crested Pigeon | Visual / aural |
| * | *Passer domesticus* | House Sparrow | Visual |
| | *Petroica boodang* | Scarlet Robin | Visual |
| nt | *Phalacrocorax varius* | Pied Cormorant | Visual |
| | *Phylidonyris novaehollandiae* | New Holland Honeyeater | Visual / aural |
| | *Platalea flavipes* | Yellow-billed Spoonbill | Visual |
| | *Platycercus elegans* | Crimson Rosella | Visual / aural |
| | *Platycercus eximius* | Eastern Rosella | Visual |
| | *Poliocephalus poliocephalus* | Hoary-headed Grebe | Visual |
| | *Rhipidura albiscapa* | Grey Fantail | Visual / aural |
| | *Rhipidura leucophrys* | Willie Wagtail | Visual / aural |
| | *Sericornis frontalis* | White-browed Scrubwren | Visual / aural |
| | *Strepera versicolor* | Grey Currawong | Visual / aural |
| * | *Sturnus vulgaris* | Common Starling | Visual / aural |
| | *Tadorna tadornoides* | Australian Shelduck | Visual |
| * | *Turdus merula* | Common Blackbird | Visual / aural |
| | *Vanellus miles* | Masked Lapwing | Visual / aural |
| | *Zosterops lateralis* | Silvereye | Visual / aural |
| | **Frogs** | | |
| | *Crinia signifera* | Common Froglet | Aural |

Note: Details on the location of species recorded during the aquatic surveys are provided in A3.2 below.

## A3.2 Aquatic Assessment

The aquatic assessment incorporated aquatic habitat assessment (including water quality measurement) at 11 sites on waterways within the alignment. Survey site selection was based on suitability for target species, water depth/permanence, waterway connectivity, accessibility and location relative to the study area. Bait traps were deployed at site HS-AQ7 in accordance with the federal survey guidelines for Australia's threatened fish; Yarra Pygmy Perch. Ten bait traps were set overnight at site HS-AQ7. A glow stick was placed inside all bait traps to serve as an attractant. The results of the trapping survey are presented in Table A3.2.1.

Measurements of Dissolved Oxygen (DO), pH, Electrical Conductivity (EC), temperature and turbidity were made at all sites using a calibrated Horiba U22-XD Water Quality Monitor. All water quality measurements were taken in accordance with EPA publications 604.1 (2003) and 441 (2000). Results of water quality measurements are presented in Table A3.2.2.

**Table A3.2.1: Aquatic fauna (trapping) survey results from the present assessment.**

| Status | Scientific name | Common name | Notes | Site HS-AQ7 |
|---|---|---|---|---|
| | **Fishes** | | | |
| | *Galaxias brevipinnis* | Broad-finned Galaxias | D | 2 |
| | *Galaxias maculatus* | Common Galaxias | D | 7 |
| | *Nannoperca australis* | Southern Pygmy Perch | | 13 |
| | **Decapod Crustacea** | | | |
| | *Geocharax gracilis* | Otway Bush Yabby | | 18 |
| | *Engaeus* spp. | Burrowing Crayfish | P | |

Table notes:

D - Diadromous species – species which migrate between fresh and salt water at specific parts of their lifecycle (includes anadromous, catadromous and amphidromous species).

N - Declared noxious species under the *Fisheries Act 1995*

P - Present – abundance not recorded (e.g. burrow observations for *Engaeus* spp.)

**Table A3.2.2: Water quality readings at assessment sites.**

| Site | Temperature (°C) | pH | Dissolved Oxygen (mg/L) | Dissolved Oxygen (%) | Electrical Conductivity (µS/cm) | Turbidity (NTU) |
|---|---|---|---|---|---|---|
| HS-AQ5 | 19.9 | 7.91 | 6.84 | 83.3 | 22,600 | 1.9 |
| HS-AQ7 | 16.4 | 7.63 | 7.24 | 76.5 | 936 | 0 |
| HS-AQ10 | 14.16 | 7.88 | 14.21 | 143 | 1,170 | 1 |
| HS-AQ11 | 12.7 | 7.9 | 9.86 | 102.1 | 1,430 | 3 |
| SEPP (WoV) objectives for Cleared Hills and Coastal Plains | N/A | ≤ 8.3<br>≥ 6.5 | N/A | ≥ 85 | ≤ 1,500 | ≤ 10 |
| SEPP (WoV) objectives for Open Coasts | N/A | N/A | N/A | 80 | N/A | N/A |

## A3.3 Listed fauna species

The following table includes a list of the listed fauna species that have potential to occur within the study area. The table includes species from the three sections of the study area (east, west and central). The list of species is sourced from the Victorian Biodiversity Atlas and the Protected Matters Search Tool (DoE; accessed on 11.06.2014). Significant fauna species recorded within 5 km of the study area is shown in Figure 4.

**Table A3.3. Listed fauna species recorded, or predicted to occur, within 5 km of the study area.**

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| **Mammals** | | | | | | | | | | | | | |
| *Antechinus minimus maritimus* | Swamp Antechinus | | nt | L | - | - | - | # | - | # | Predominantly found in near-coastal habitat characterised by dense wet heath, tussock grassland or sedgeland with relatively open ground vegetation. | Low | Limited and marginal habitat present. |
| *Arctocephalus forsteri* | New Zealand Fur Seal | - | vu | | - | PMST | - | PMST | - | - | Breeds on islands off the southern Australian coast. | Negligible | No habitat present. |
| *Balaenoptera musculus* | Blue Whale | EN | cr | L | - | PMST | - | PMST | - | - | Found throughout the Southern Ocean, though migration paths appear to be diffuse and widespread. Often enters coastal waters, including Victoria. | Negligible | No habitat present. |
| *Dasyurus maculatus maculatus* | Spot-tailed Quoll | EN | en | L | - | PMST | - | PMST | - | PMST | Spot-tailed Quolls formerly inhabited a wide variety of natural environments in Victoria from tall forests to dry, open habitats. The species is now extremely rare in Victoria outside of the eastern highlands and is probably functionally extinct in the majority of the State. | Negligible | No records from the local area, limited suitable habitat. |
| *Eubalaena australis* | Southern Right Whale | EN | cr | L | 2008 | PMST | 1985 | PMST | - | - | Migrates between summer feeding grounds in the Southern Ocean to warmer northern waters over winter, where it can be found along the Victorian coastline. | Negligible | No habitat present. |
| *Isoodon obesulus obesulus* | Southern Brown Bandicoot | EN | nt | L | 1988 | PMST | 2005 | PMST | 1968 | PMST | Typically occurs in heathland, shrubland, heathy forest and woodland habitat across southern Victoria. Previously recorded on the outskirts of Stawell and also known from within the Grampians National Park. | High | Remnant vegetation within the road reserves and larger patches of woodland provide potential habitat, mostly within the west and central study area. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Megaptera novaeangliae* | Humpback Whale | VU | vu | L | 2009 | PMST | - | PMST | - | - | Migrate between summer feeding grounds in the Southern Ocean to Northern waters where birthing and mating occurs. Increasingly recorded along the Victorian coast, occasionally entering Port Phillip and Western Port. | Negligible | No habitat present. |
| *Miniopterus schreibersii bassanii* | Southern Bent-wing Bat | CR | en | L | - | PMST | - | PMST | - | PMST / 2009 (Biosis) | Occurs in south-west Victoria, roosting in caves, mine adits or road culverts. Dispersal from the maternity caves at Warrnambool and Naracoorte occurs from April to August. | High | Calls recorded on Baileys Road by Biosis (2009). Likely to forage throughout the study area. No roosting habitat present. |
| *Potorous tridactylus tridactylus* | Long-nosed Potoroo | VU | en | L | 1982 | PMST | 1982 | PMST | - | PMST | Six populations of Long-nosed Potoroo occur in Victoria within a range of habitats from open forests to heathy woodlands. The majority of their habitat is dominated by Eucalypts. | Medium | Known from the region. Potential habitat within Sodas Lane road reserve and larger patches of Lowland Forest within the central study area. Targeted survey for the west study area failed to detect the species in 2009. No suitable habitat within the east study area. |
| *Pseudomys fumeus* | Smoky Mouse | EN | cr | L | - | PMST | - | PMST | - | PMST | Disjunct Victorian distribution with populations in the Snowfields, Eastern Highlands, East Gippsland, Otway Range and the Grampians. Recorded from a variety of vegetation communities ranging form coastal heath and heathy woodland in East Gippsland to subalpine heath and dry forest. | Low | No records from local area. Study area does not provide optimal habitat. |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | VU | vu | L | 1966 | PMST | - | - | - | - | Utilises a wide range of habitats from lowland rainforest in East Gippsland and coastal Stringybark forests to agricultural land and suburban gardens, with permanently established colonies in Melbourne, Geelong and Mallacoota. | Low | No records from the local area. Highly mobile species that may fly over or make occasional use of trees within study area. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Sminthopsis leucopus* | White-footed Dunnart | | nt | L | 1982 | - | 1982 | - | - | - | Occurs along the entire coastline and adjacent plains and foothills, also extending inland along some major river valleys. Preferred habitats include coastal tussock grassland and sedgeland, wet heath, and forest or woodland with a dense heathy understorey or mid-storey vegetation. | Medium | Potential habitat within many road reserves, including Sodas Lane and Old Sawmill Road. Targeted survey within west study area in 2009 failed to detect the species. |
| **Birds** | | | | | | | | | | | | | |
| *Accipiter novaehollandiae* | Grey Goshawk | | vu | L | 2002 | - | 2007 | - | 2007 | - | Favours tall, wet forests in gullies but can occur in woodlands, dry forests, wooded farmlands and suburban parks. Relies on mature forests for breeding. | High | Likely to fly throughout study area. |
| *Actitis hypoleucos* | Common Sandpiper | | vu | | - | - | 1979 | - | 1979 | - | Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March. | Low | Limited and marginal habitat present. |
| *Anas rhynchotis* | Australasian Shoveler | | vu | | 2002 | - | 2002 | - | - | - | Prefers large, permanent lakes and swamps with deep water, stable conditions and abundant aquatic vegetation. Less commonly recorded in small or shallow waters, such as billabongs, sewage ponds, freshwater rivers and densely vegetated farm dams. | Low | The wetlands within the study area do not provide optimal habitat for this species. |
| *Anseranas semipalmata* | Magpie Goose | | nt | L | - | - | 2004 | - | - | - | Uses aquatic and terrestrial habitat, although most activity occurs on wetlands such as those associated with flood plains. Historically occurring in south-eastern Australia, however, loss of wetland habitats meant the species became extinct in Victoria in the early 1900s. Re-introduction attempts have had mixed results. | Low | Limited suitable wetland habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Anthochaera phrygia* | Regent Honeyeater | EN | cr | L | - | PMST | - | PMST | - | PMST | Inhabits dry woodlands and forests dominated by Box Ironbark eucalypts. Distribution currently restricted to the Chiltern - Mt Pilot National Park in north-eastern Victoria following severe range contraction and population decline. | Negligible | No habitat present and study area outside known range. |
| *Ardea modesta* | Eastern Great Egret | | vu | L | 2000 | PMST | 2002 | PMST | 2002 | PMST | Usually found in terrestrial wetland, estuarine and wet grassland habitats particularly permanent well-vegetated water bodies but also use freshwater meadows, channels and larger dams. Uses estuarine mudflats as summer-autumn or drought refuges. | Medium | Suitable but limited wetlands present throughout study area. |
| *Aythya australis* | Hardhead | | vu | | 2002 | - | 2002 | - | 1980 | - | A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Also occurs in brackish wetlands and can be found in deep dams and water storage ponds. | Recorded | Recorded from wetlands within the Bay of Islands Coastal Park in 2009, and from large wetland south of Squibbs Rd during present assessment (Fig. 2.28). |
| *Botaurus poiciloptilus* | Australasian Bittern | EN | en | L | 2002 | PMST | 2002 | PMST | - | PMST | Occurs in wetlands with tall, dense vegetation where it forages in shallow water at the edges of pools or waterways. Prefers permanent freshwater habitats, particularly when dominated by sedges, rushes and reeds. | Low | Targeted survey in the west study area did not detect the species in 2009. Limited suitable wetland habitat present for remainder of the study area. |
| *Chlidonias hybrida* | Whiskered Tern | | nt | | - | - | 2001 | - | 1979 | - | A breeding migrant to Australia from September to March where it occurs in wetlands, lakes, swamps, rivers, and other water bodies with submerged and emergent vegetation such as grasses, sedges, reeds and rushes. Rarely recorded along rivers or creeks. | Medium | Wetlands present provide limited and marginal habitat for this species. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Circus assimilis* | Spotted Harrier | | nt | | - | - | - | - | 2003 | - | Inhabits open and wooded country of inland and sub-inland Australia, where they hunt over flat or undulating country with low vegetation cover. Most common over the Murray Valley with occasional visits to coastal Victoria. | High | Highly mobile species likely to move throughout the study area on a regular basis. |
| *Climacteris affinis* | White-browed Treecreeper | | vu | L | - | - | 1997 | - | | - | Woodland and scrubland habitats generally consisting of mallee, mulga, native pine, and black box, within arid and semi-arid inland areas of north-western Victoria. | Negligible | Outside species range and lack of suitable habitat features. |
| *Dasyornis broadbenti caryochrous* | Rufous Bristlebird (Otways subsp.) | | nt | L | 2001 | - | 2011 | - | 2011 | - | Typically inhabits areas with a low dense shrub cover with clear ground that allows the species to forage, including low dense shrubland and heathland on coastal dunes. | High | Recorded from the Bay of Islands Coastal Park by Biosis (2009). Suitable habitat throughout study area. |
| *Diomedea antipodensis* | Antipodean Albatross | VU | | L | - | PMST | - | PMST | - | - | An endemic to, and breeds on island off New Zealand. Forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea. | Negligible | No suitable habitat present. |
| *Diomedea epomophora* | Royal Albatross | VU | vu | L | - | PMST | - | PMST | - | - | This albatross breeds on islands south of New Zealand, however, occurs in offshore waters of southern Australia, mostly off south-eastern NSW, Victoria and Tasmania. | Negligible | No suitable habitat present. |
| *Diomedea exulans* | Wandering Albatross | VU | en | L | 1999 | PMST | 1999 | PMST | - | - | Occurs from Antarctic to subtropical areas in the southern hemisphere. In Australia, observed over continental shelves often in areas of continental upwellings. Regularly recorded feeding in sheltered harbours, often gathering at sewerage outfalls. | Negligible | No suitable habitat present. |
| *Diomedea exulans exulans* | Tristan Albatross | EN | | | - | PMST | - | PMST | - | - | Tristan Albatrosses breed in sub Antarctic islands within the Atlantic Ocean. There is only one known record from Australian waters. | Negligible | No suitable habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Diomedea sanfordi* | Northern Royal Albatross | EN | | | - | PMST | - | PMST | - | - | Ranges widely over the Southern Ocean and regularly feeds in Tasmanian and South Australian waters. Breeds on islands south of New Zealand. | Negligible | No suitable habitat present. |
| *Egretta garzetta* | Little Egret | | en | L | 1994 | - | 1994 | - | 1978 | - | Occupies a wide range of wetlands and typically prefers the shallows of wetlands for foraging activities. Occasionally they will forage in small waterways or wet grassland areas. | Medium | Suitable but limited wetlands present throughout study area. |
| *Gallinago hardwickii* | Latham's Snipe | | nt | | 2002 | PMST | 2002 | PMST | 2002 | PMST | A migrant to Australia from July to April occurring in a wide variety of permanent and ephemeral wetlands. Prefers open freshwater wetlands with nearby cover, but also recorded on the edges of creeks and rivers, river-pools and floodplains. | Medium | Suitable but limited wetlands present throughout study area. |
| *Gelochelidon nilotica* | Gull-billed Tern | | en | L | 1998 | - | 1998 | - | - | - | Usually occurs on shallow terrestrial wetlands, less often using sheltered embayments, estuaries, tidal mudflats and beaches. In Australia mainly breeds in inland areas following major flooding events. | Low | Limited suitable wetland habitat present. |
| *Grus rubicunda* | Brolga | | vu | L | - | - | 2000 | - | 1978 | - | Prefers shallow marshland areas, usually less than 50 cm deep with emergent vegetation. Most commonly found in south-west Victoria, the Northern Plains and associated parts of the Murray River. Feeds predominantly on wetland plants, but also forages in crops and pasture. | Low | No breeding or flocking habitat present. May forage within study area on occasions. |
| *Haematopus fuliginosus* | Sooty Oystercatcher | | nt | | 2010 | - | 2010 | - | - | - | A marine species typically inhabiting rocky shorelines, including cliff and reef areas, and sandy beaches between rocky headlands. | Negligible | No suitable habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle | | vu | L | 2004 | PMST | 2005 | PMST | 1981 | PMST | Occurs in marine habitats and terrestrial wetlands along or near coastal areas in eastern Victoria, particularly around large open wetlands such as deep freshwater swamps, lakes, reservoirs and billabongs. Uses tall trees in or near water for breeding. | Medium | May regularly fly over the study area, however, limited foraging habitat present. |
| *Halobaena caerulea* | Blue Petrel | VU | | | - | PMST | - | - | - | - | A marine species, usually pelagic but sometimes observed over shallow waters. A regular visitor to southern Australian waters. | Negligible | No suitable habitat present. |
| *Hydroprogne caspia* | Caspian Tern | | nt | L | - | - | 1979 | - | 1979 | - | Occurs on exposed ocean beaches or in sheltered coastal embayments including harbours, lagoons, inlets, estuaries and river deltas usually with sandy or muddy margins and breeds in a variety of coastal habitats including banks, ridges and beaches of sand and shell, often in open or among low or sparse vegetation. | Negligible | No suitable habitat present. |
| *Ixobrychus minutus dubius* | Little Bittern | | en | L | - | - | 1994 | - | - | - | Inhabits terrestrial wetlands, preferably with dense emergent vegetation. | Low | Limited suitable wetland habitat present. |
| *Lathamus discolor* | Swift Parrot | EN | en | L | - | PMST | - | PMST | - | PMST | Migrates to south-east mainland Australia during the winter months where it prefers dry, open eucalypt forests and woodlands, especially Box Ironbark Forest in north-central Victoria. Has also been recorded in urban parks, gardens, street trees and golf courses with flowering ornamental trees and shrubs. | Negligible | Lack of preferred foraging resources, no records from local area. |
| *Lewinia pectoralis* | Lewin's Rail | | vu | L | - | - | 1975 | - | - | - | Inhabits densely vegetated wetlands, including swamps, farm dams, saltmarshes, lakes and small pools that can range from fresh to saline water. May also use riverine forest. | Low | Limited suitable wetland habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Macronectes giganteus* | Southern Giant-Petrel | EN | vu | L | - | PMST | - | PMST | - | - | An opportunistic scavenger and predator, adults of this species are present all year round at Antarctic breeding colonies, from where immature birds disperse, some as far north as subtropical areas. | Negligible | No suitable habitat present. |
| *Macronectes halli* | Northern Giant-Petrel | VU | nt | L | - | PMST | - | PMST | - | - | Breeds in coastal habitats on subantarctic islands. Dispersal movements of juveniles are poorly known but have been observed along temperate coastal areas of Australia, Africa, South America and New Zealand. Often seen around sewer outfalls or seal and penguin colonies. | Negligible | No suitable habitat present. |
| *Neophema chrysogaster* | Orange-bellied Parrot | CR | cr | L | 2002 | PMST | 2002 | PMST | 1999 | PMST | Annual migrant to coastal Victoria from breeding grounds in south-west Tasmania, appearing from approximately March to October. Forages on coastal or near-coastal areas such as saltmarshes, coastal dunes, pastures, shrublands, estuaries, islands, beaches and moorlands. | Low | Recorded by Birds Australia (2002) in the Bay of Islands Coastal Park and surrounding farmland. Limited habitat within study area. |
| *Ninox strenua* | Powerful Owl | | vu | L | - | - | 2001 | - | - | - | Prefers tall open sclerophyll forest and woodlands and requires large, hollow-bearing eucalypts for breeding. While the species has been recorded from a wide range of woodland habitats, preferred habitat typically contains a dense understorey and suitable roost trees with a dense canopy cover. | Low | Lack of preferred woodland habitat. |
| *Nycticorax caledonicus hillii* | Nankeen Night Heron | | nt | | 1994 | - | 2003 | - | 2003 | - | Occurs in a variety of estuarine and terrestrial wetlands where it forages on the margins in shallow still or slow-moving water or exposed banks, mudflats and swamp vegetation of these environments. | Medium | Several suitable wetlands within or adjacent to study area, but limited in extent. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Oxyura australis* | Blue-billed Duck | | en | L | - | - | - | - | 1978 | - | A largely aquatic species preferring deep, large permanent wetlands with stable conditions and abundant aquatic vegetation, including Melaleuca swamps. Occurs less commonly on river frontages, billabongs and flooded depressions. | Low | Limited large wetlands within study area. |
| *Pachycephala rufogularis* | Red-lored Whistler | VU | en | L | - | - | 1983 | - | - | - | Confined to mallee communities, this species prefer area with a low and dense cover of mixed plant communities including Cypress Pine and Broombush. Often the canopy layer is opened and the undergrowth consists of a dense shrubs. | Negligible | Outside species' range and lack of suitable habitat features. |
| *Pachyptila turtur* | Fairy Prion | | vu | | 2002 | - | - | - | - | - | This marine waterbird can be found from sub-Antarctic to subtropical waters in the southern hemisphere, mostly occurring over continental shelves and slopes, and rarely coming close to shore except at breeding islands and during rough weather. | Negligible | No suitable habitat present. |
| *Pelecanoides urinatrix* | Common Diving-Petrel | | nt | | - | - | 1979 | - | 1979 | - | The Common Diving-Petrel occurs in inshore and pelagic waters off the Victorian coast and breeds on coastal islands. | Negligible | No suitable habitat present. |
| *Phalacrocorax fuscescens* | Black-faced Cormorant | | nt | | 2010 | - | 2010 | - | 1980 | PMST | Occurs in marine and estuarine habitats and forages over inshore waters and reefs, rarely entering small inlets or bays. Roost on islands, offshore rocks, sandbanks and jetties. | Medium | Curdies River provides potential habitat. |
| *Phalacrocorax varius* | Pied Cormorant | | nt | | - | - | 2001 | - | 1977 | - | Mainly inhabits marine environments and coastal waters including beaches, coastal lagoons, estuaries and rock platforms. Also found in terrestrial wetlands with open expanses of permanent water including rivers, inland lakes and billabongs. Breeds and roosts in trees or bushes along the edges of water body, as well as on artificial structures such as pylons. | Recorded | Observed foraging within Curdies River during current assessment. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Platalea regia* | Royal Spoonbill | | vu | | 2002 | - | 2002 | - | 2002 | - | Often seen around permanent and ephemeral waters in the arid interior of east Australia foraging in shallow waters. Prefers terrestrial wetlands and wet grassland areas, particularly large expanses of water such as lakes, swamps or lagoons. | Medium | Suitable but limited wetlands present, including Curdies River and large wetland south of Squibbs Rd. |
| *Plegadis falcinellus* | Glossy Ibis | | nt | | - | - | 1972 | - | - | - | Glossy Ibis are usually found foraging in wet pasture environments and low lying wetland areas. This species is only rarely recorded in Victoria. Prefers freshwater wetlands especially permanent or ephemeral water bodies on floodplains but also found in sheltered coastal environments. | Low | May forage in pasture on rare occasions. |
| *Porzana pusilla* | Baillon's Crake | | vu | L | 2009 | - | 2009 | - | - | - | Occurs in a variety of densely vegetated terrestrial and coastal wetlands including billabongs, swamps, creeks and rivers, including freshwater, brackish and saline environments. Occasionally recorded in grassed or vegetated areas (parks, gardens, golf courses) and marine environments (saltmarshes, coastal dunes and mudflats). | Recorded | Recorded by Biosis (2009) on margins of wetland adjacent to Baileys Road. Limited suitable habitat present throughout remainder of study area. |
| *Pterodroma leucoptera leucoptera* | Gould's Petrel | EN | | | - | PMST | - | PMST | - | - | A small petrel that rarely recorded away from its breeding islands off NSW. Suggested that mostly occurs within the Tasman Sea outside of the breeding season. | Negligible | No suitable habitat present. |
| *Pterodroma mollis* | Soft-plumaged Petrel | VU | | | - | PMST | - | - | - | - | Generally found over temperate and sub-Antartic waters in the South Atlantic, southern Indian and western South Pacific oceans. Also a regular and common visitor to southern Australian seas. | Negligible | No suitable habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Rostratula australis* | Australian Painted Snipe | EN | cr | L | - | PMST | - | PMST | - | PMST | Generally found in shallow, terrestrial freshwater wetlands with rank, emergent tussocks of grass, sedges and rushes. Australian Painted Snipe can occur in well vegetated lakes, swamps, inundated pasture, saltmarsh and dams. | Low | Limited suitable wetland habitat present. |
| *Stagonopleura guttata* | Diamond Firetail | | vu | L | 2009 | - | 2009 | - | - | - | Occurs mostly in the lowlands and foothills in the north of Victoria. It has specific habitat requirements, which include grassy woodlands with tree cover for refuge and an undisturbed ground layer with grasses. | High | Recorded from the Douglas Fenwick Reserve by Biosis (2009). Wooded road reserves provide suitable habitat. |
| *Sternula albifrons* | Little Tern | | vu | L | PMST | - | PMST | - | - | - | This bird is mostly recorded in sheltered coastal environments, including bays, lagoons and estuaries. Nests on sandy substrates containing much shell-grit, which provides good camouflage for their eggs. | Negligible | No suitable habitat present. |
| *Sternula nereis* | Fairy Tern | VU | en | L | - | PMST | - | PMST | - | PMST | Fairy Terns inhabit coastal environments including intertidal mudflats, sand flats and beaches. Nests above high-water mark on sandy shell-grit beaches. | Low | No suitable habitat present. |
| *Stictonetta naevosa* | Freckled Duck | | en | L | - | - | 2004 | - | - | - | Freckled Ducks are usually found on densely vegetated freshwater wetlands. During dry conditions the birds move from ephemeral wetlands to large areas of permanent open water, particularly lakes and reservoirs. | Low | Large wetland south of Squibbs Road provides marginal habitat. |
| *Thalassarche bulleri* | Pacific Albatross | VU | | | - | PMST | - | PMST | - | - | Buller's Albatross breeds in New Zealand and is a seasonal visitor to Victorian coastal waters where it occurs in pelagic and inshore waters. | Negligible | No suitable habitat present. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Thalassarche cauta* | Shy Albatross | EN | vu | L | - | PMST | 1979 | PMST | 1979 | - | The Shy Albatross is a marine pelagic species inhabiting sub-Antarctic and subtropical waters, spending the majority of their time at sea. Occasionally it is observed in continental shelf waters in bays and harbours. | Negligible | No suitable habitat present. |
| *Thalassarche chrysostoma* | Grey-headed Albatross | EN | vu | L | - | PMST | - | PMST | - | - | Occurs in warmer areas over winter, its breeding grounds are found in the Antarctic and subantarctic islands. Generally forages over the open oceans, there have been a small number of records over inshore and offshore areas along the Victorian coast. | Negligible | No suitable habitat present. |
| *Thalassarche melanophris* | Black-browed Albatross | VU | vu | I | 2002 | PMST | 2002 | PMST | - | - | Breeds in antarctic and sub-antarctic islands, but commonly occurs in pelagic waters off the coast of Victoria. | Negligible | No suitable habitat present. |
| *Thalassarche melanophris impavida* | Campbell Albatross | VU | | | - | PMST | - | PMST | - | - | Occurs in open marine waters of southern and south eastern Australia. Breeding occurs on Campbell Island, New Zealand. | Negligible | No suitable habitat present. |
| *Thalassarche salvini* | Salvin's Albatross | VU | | | - | PMST | - | PMST | - | - | Breeds on islands south of New Zealand and is a non-breeding visitor to Australian waters. | Negligible | No suitable habitat present. |
| *Thalassarche steadi* | White-capped Albatross | VU | | | - | PMST | - | PMST | - | - | Breeding colonies occur on islands south of New Zealand. The species is thought to be common off the coast of south-east Australia throughout the year. | Negligible | No suitable habitat present. |
| *Thinornis rubricollis* | Hooded Plover | | vu | L | 2010 | PMST | 2010 | PMST | 1979 | - | In south-east Australia, prefers sandy ocean beaches, especially those that are broad and flat, with a wide beach zone for feeding. Prefer beachcast seaweed for feeding activities and sparsely vegetated back dunes for shelter and nesting. | Negligible | No suitable habitat present. |
| **Reptiles** | | | | | | | | | | | | | |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Caretta caretta* | Loggerhead Turtle | EN | | | - | PMST | - | PMST | - | - | Loggerhead Turtles forage widely in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia. Nesting occurs in coastal environments of northern WA, NT and QLD. | Negligible | No habitat present. |
| *Chelonia mydas* | Green Turtle | VU | | | - | PMST | - | PMST | - | - | Marine species with a pan-tropical distribution throughout the world. More abundant along the tropical coasts of Australia and the Great Barrier Reef. Green Turtles spend their first five to ten years drifting on ocean currents. | Negligible | No habitat present. |
| *Dermochelys coriacea* | Leathery Turtle | EN | cr | L | 1989 | PMST | 1989 | PMST | - | - | Marine species usually sighted along the eastern seaboard often in bays, estuaries and rivers. No major nesting events have been recorded in Australia. | Negligible | No habitat present. |
| *Lissolepis coventryi* | Swamp Skink | | | L | - | - | - | # | - | - | Occupies swamp scrub habitat in cool, temperate, low-lying wetlands and swamp margins with a dense shrub layer. Commonly occurs in near-coastal areas ranging from the Mt Gambier region in the west, across southern Victoria to just beyond the NSW border to the east. | Medium | Suitable habitat occurs along the unnamed tributary of Curdies River. |
| **Frogs** | | | | | | | | | | | | | |
| *Litoria raniformis* | Growling Grass Frog | VU | en | L | - | - | 1982 | PMST | - | PMST | Occupies a variety of permanent and semi-permanent water bodies generally containing abundant submerged and emergent vegetation, within lowland grasslands, woodlands and open forests. | Medium | Large wetland south of Squibbs Road provides potential breeding habitat. Drainage line north of Callaghans Rd provides potential habitat. Targeted survey for east and west study area did not detect the species in 2009. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| *Pseudophryne semimarmorata* | Southern Toadlet | | vu | | 1979 | - | 1993 | - | 1977 | - | Occupies a variety of habitats in south-eastern Australia, such as open forests, lowland woodlands and heathlands where adults shelter beneath leaf litter and other debris in moist soaks and depressions. | High | Suitable habitat occurs throughout the study area, including Port Campbell Ck and many of the drainage lines and smaller waterways. |
| **Fishes** | | | | | | | | | | | | | |
| *Carcharodon carcharias* | Great White Shark | VU | vu | L | - | PMST | - | PMST | - | - | Widely distributed, and located throughout temperate and sub-tropical regions in the northern and southern hemispheres. It is primarily found in the coastal and offshore areas of the continental and insular shelves and offshore continent. | Negligible | No suitable habitat present. |
| *Galaxiella pusilla* | Dwarf Galaxias | VU | vu | L | - | PMST | - | PMST | - | PMST | Occurs in relatively shallow still or slow flowing water bodies including streams, wetlands, drains, that in many instances are ephemeral and partially dry up over summer. Typically requires abundant marginal and aquatic vegetation. | Negligible | No suitable habitat within alignment. |
| *Macquaria ambigua* | Golden Perch | | vu | I | - | - | 1997 | - | - | - | Occurs primarily in warm, turbid, sluggish, inland rivers and their associated backwaters and billabongs. Naturally occurs north of the Great Dividing Range, in the Murray-Darling River system. | Negligible | Previous record indicative of failed translocations. Only populations within natural distribution are listed. |
| *Nannoperca obscura* | Yarra Pygmy Perch | VU | nt | L | - | - | - | PMST | - | - | A freshwater, non-migratory fish preferring heavily vegetated, slow flowing or still aquatic habitats but also known to occur in tiny semi-permanent habitats. | Low | Limited suitable habitat within alignment. |
| *Prototroctes maraena* | Australian Grayling | VU | vu | L | - | PMST | - | PMST | - | PMST | A diadromous species which spends most of its life in freshwater within rivers and large creeks. Juveniles inhabit estuaries and coastal seas. Adults occur in freshwater habitats, typically rivers and streams with cool, clear waters and gravel substrates, but occasionally also in turbid waters. | Low | Limited suitable transient habitat at the Curdies River. |

| Scientific name | Common name | Conservation status | | | West | | Central | | East | | Habitat description | Likely occurrence in study area (100 m corridor) | Rationale for likelihood ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EPBC | DEPI | FFG | Most recent database record | Other records | Most recent database record | Other records | Most recent database record | Other records | | | |
| **Invertebrates** | | | | | | | | | | | | | |
| *Acrodipsas brisbanensis* | Large Ant-blue Butterfly | - | en | L | 1907 | - | 1907 | - | - | - | This relatively small butterfly species is restricted to small, isolated remnants of open forest and woodland. The peaks of specific summits are important for 'hill-topping' during the main breeding season (Dec to Feb) when territories are established around the tops of trees. | Negligible | No suitable habitat present. |
| *Engaeus sericatus* | Hairy Burrowing Crayfish | - | vu | - | - | - | 1982 | - | 1982 | - | This species occupies burrows connected to the water-table, typically adjacent to creeks or on floodplains. Although it is widespread in Victoria, most records are found in an area extending from the Otways, west to Port Fairy and north to Ballarat. | High | Abundant suitable habitat throughout study area. |
| *Geocharax gracilis* | Otway Bush Yabby | - | en | - | - | - | 2007 | - | - | - | Poorly known species with limited distribution within and in the vicinity of the Otway Coast Basin. | High | Recorded within study area during assessment. |

## A3.4 Migratory species (EPBC Act listed)

**Table A3.4. Migratory fauna species recorded or predicted to occur within 5 km of the study area.**

| Scientific Name | Common Name | East | Most recent record | Central | Most recent record | West | Most recent record |
|---|---|---|---|---|---|---|---|
| *Acrocephalus stentoreus* | Clamorous Reed Warbler | - | - | ✓ | 2001 | ✓ | 1981 |
| *Actitis hypoleucos* | Common Sandpiper | - | - | ✓ | 1979 | ✓ | 1979 |
| *Apus pacificus* | Fork-tailed Swift | ✓ | - | ✓ | 2001 | ✓ | 2001 |
| *Ardea modesta* | Eastern Great Egret | ✓ | 2002 | ✓ | 2002 | ✓ | 2000 |
| *Ardenna tenuirostris* | Bryde's Whale | ✓ | 1978 | ✓ | 1979 | ✓ | 1980 |
| *Balaenoptera edeni* | Blue Whale | ✓ | - | ✓ | - | - | - |
| *Balaenoptera musculus* | Cattle Egret | ✓ | - | ✓ | - | - | - |
| *Bubulcus ibis* | Sharp-tailed Sandpiper | ✓ | 1994 | ✓ | 2004 | ✓ | 2004 |
| *Calidris acuminata* | Red-necked Stint | ✓ | 2002 | ✓ | 2002 | - | - |
| *Calidris ruficollis* | Pygmy Right Whale | ✓ | 1999 | ✓ | 1999 | ✓ | 1979 |
| *Caperea marginata* | Great White Shark | ✓ | - | ✓ | - | - | - |
| *Carcharodon carcharias* | Loggerhead Turtle | ✓ | - | ✓ | - | - | - |
| *Caretta caretta* | Double-banded Plover | ✓ | - | ✓ | - | - | - |
| *Charadrius bicinctus* | Green Turtle | - | - | ✓ | 1978 | ✓ | 1978 |
| *Chelonia mydas* | Leathery Turtle | ✓ | - | ✓ | - | - | - |
| *Dermochelys coriacea* | Antipodean Albatross | ✓ | 1989 | ✓ | 1989 | - | - |
| *Diomedea antipodensis* | Wandering Albatross | ✓ | - | ✓ | - | - | - |
| *Diomedea exulans* | Tristan Albatross | ✓ | 1999 | ✓ | 1999 | - | - |
| *Diomedea exulans exulans* | Northern Royal Albatross | ✓ | - | ✓ | - | - | - |
| *Diomedea sanfordi* | Southern Right Whale | ✓ | - | ✓ | - | - | - |
| *Eubalaena australis* | Latham's Snipe | ✓ | 2008 | ✓ | 1985 | - | - |
| *Gallinago hardwickii* | White-bellied Sea-Eagle | ✓ | 2002 | ✓ | 2002 | ✓ | 2002 |
| *Haliaeetus leucogaster* | White-throated Needletail | ✓ | 2004 | ✓ | 2005 | ✓ | 1981 |
| *Hirundapus caudacutus* | Caspian Tern | ✓ | 2001 | ✓ | 2004 | ✓ | 2004 |
| *Hydroprogne caspia* | Dusky Dolphin | - | - | ✓ | 1979 | ✓ | 1979 |
| *Lagenorhynchus obscurus* | Porbeagle | ✓ | - | ✓ | - | - | - |

| Scientific Name | Common Name | East | Most recent record | Central | Most recent record | West | Most recent record |
|---|---|---|---|---|---|---|---|
| *Lamna nasus* | Lewin's Rail | ✓ | - | ✓ | - | - | - |
| *Lewinia pectoralis* | Southern Giant-Petrel | ✓ | | ✓ | 1975 | - | - |
| *Macronectes giganteus* | Northern Giant-Petrel | ✓ | - | ✓ | - | - | - |
| *Macronectes halli* | Humpback Whale | ✓ | - | ✓ | - | - | - |
| *Megaptera novaeangliae* | Rainbow Bee-eater | ✓ | 2009 | ✓ | - | - | - |
| *Merops ornatus* | Satin Flycatcher | ✓ | - | ✓ | - | ✓ | |
| *Myiagra cyanoleuca* | Killer Whale | ✓ | - | ✓ | 2004 | ✓ | 2004 |
| *Orcinus orca* | Eastern Osprey | ✓ | 1988 | ✓ | 1988 | - | - |
| *Pandion cristatus* | Sperm Whale | ✓ | - | ✓ | - | ✓ | - |
| *Physeter macrocephalus* | Glossy Ibis | ✓ | 1998 | ✓ | 1998 | - | - |
| *Plegadis falcinellus* | Flesh-footed Shearwater | ✓ | | ✓ | 1972 | - | - |
| *Puffinus carneipes* | Short-tailed Shearwater | ✓ | - | ✓ | - | - | - |
| *Rhipidura rufifrons* | Rufous Fantail | ✓ | 2001 | ✓ | 2001 | ✓ | - |
| *Rostratula australis* | Australian Painted Snipe | ✓ | - | ✓ | - | ✓ | - |
| *Stercorarius parasiticus* | Arctic Jaeger | - | - | - | - | ✓ | 1979 |
| *Sternula albifrons* | Little Tern | ✓ | - | ✓ | - | - | - |
| *Thalassarche bulleri* | Pacific Albatross | ✓ | - | ✓ | - | - | - |
| *Thalassarche cauta* | Shy Albatross | ✓ | - | ✓ | 1979 | ✓ | 1979 |
| *Thalassarche chrysostoma* | Grey-headed Albatross | ✓ | - | ✓ | - | - | - |
| *Thalassarche melanophris* | Black-browed Albatross | ✓ | 2002 | ✓ | 2002 | - | - |
| *Thalassarche melanophris impavida* | Campbell Albatross | ✓ | - | ✓ | - | - | - |
| *Thalassarche salvini* | Salvin's Albatross | ✓ | - | ✓ | - | - | - |
| *Thalassarche steadi* | White-capped Albatross | ✓ | - | ✓ | - | - | - |

# Appendix 4: Photos of the study area

**Photo Point 1: Damp Heathy Woodland; looking approximately west (Figure 2.5).**

**Photo Point 2: Damp Heathy Woodland; looking approximately west (Figure 2.9).**

**Photo Point 3: Lowland Forest; looking approximately south (Figure 2.14).**

**Photo Point 4: Lowland Forest (Whiskey-Creek Rd); looking approximately south-west (Figure 2.16).**

**Photo Point 5: Scattered eucalypts; looking approximately east (Figure 2.18).**

**Photo Point 6: Damp Heath Scrub – Habitat Zone 17; looking approximately west (Figure 2.25).**

**Photo Point 7: Plains Grassy Wetland – Habitat Zone 16; looking approximately south-west (Figure 2.28).**

**Photo Point 8: Swampy Riparian Woodland– Habitat Zone 18; looking approximately west (Figure 2.31).**

**Photo Point 9: Damp Heathy Woodland – Habitat Zone 1. Looking approximately north-west (Figure 2.32).**

# Appendix 5: Biodiversity Impacts and Offsets requirements report

## A5.1 Biodiversity Impacts and Offsets requirements report (as provided by DEPI)

# Biodiversity impact and offset requirements report

This report provides additional biodiversity information for moderate and high risk-based pathway applications for permits to remove native vegetation under clause 52.16 or 52.17 of the planning schemes in Victoria

**Date of issue:** **27/08/2014** **DEPI ref: BIO_0035**
**Time of issue:** **11:14 AM**

| **Project ID** | Halladale Gas Pipeline |
|---|---|

## Summary of marked native vegetation

| **Risk-based pathway** | **Moderate** |
|---|---|
| **Total extent** | 1.665 ha |
| Remnant patches | 1.031 ha |
| Scattered trees | 9 trees |
| **Location risk** | A |

| **Strategic biodiversity score of all marked native vegetation** | 0.361 |
|---|---|

## Offset requirements if a permit is granted

If a permit is granted to remove the marked native vegetation, a requirement to obtain a native vegetation offset will be included in the permit conditions. The offset must meet the following requirements:

| **Offset type** | **General offset** |
|---|---|
| **General offset amount (general biodiversity equivalence units)** | 0.244 general units |
| **General offset attributes** | |
| Vicinity | Corangamite **or** Glenelg Hopkins Catchment Management Authority (CMA) **or** the Local Municipal District where clearing takes place |
| Minimum strategic biodiversity score | 0.289[1] |

See Appendices 1 and 2 for details in how offset requirements were determined.

NB: values presented in tables throughout this document may not add to totals due to rounding

[1] Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

## Next steps

This proposal to remove native vegetation must meet the application requirements of the moderate risk-based pathway and it will be assessed under the moderate risk-based pathway.

If you wish to remove the marked native vegetation you are required to apply for a permit from your local council.
The biodiversity assessment report from NVIM and this biodiversity impact and offset report should be submitted with your application for a permit to remove native vegetation you plan to remove, lop or destroy.

The Biodiversity assessment report generated by the tool within NVIM provides the following information:

- The location of the site where native vegetation is to be removed.
- The area of the patch of native vegetation and/or the number of any scattered trees to be removed.
- Maps or plans containing information set out in the *Permitted clearing of native vegetation – Biodiversity assessment guidelines*
- The risk-based pathway of the application for a permit to remove native vegetation

This report provides the following information to meet application requirements for a permit to remove native vegetation:

- Confirmation of the risk-based pathway of the application for a permit to remove native vegetation
- The strategic biodiversity score of the native vegetation to be removed
- Information to inform the assessment of whether the proposed removal of native vegetation will have a significant impact on Victoria's biodiversity, with specific regard to the proportional impact on habitat for any rare or threatened species.
- The offset requirements should a permit be granted to remove native vegetation.

Additional application requirements must be provided with an application for a permit to remove native vegetation in the moderate or high risk-based pathways. These include:

- A habitat hectare assessment report of the native vegetation that is to be removed
- A statement outlining what steps have been taken to ensure that impacts on biodiversity from the removal of native vegetation have been minimised
- An offset strategy that details how a compliant offset will be secured to offset the biodiversity impacts of the removal of native vegetation.

Refer to the *Permitted clearing of native vegetation – Biodiversity assessment guidelines* and for a full list and details of application requirements.



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For more information contact the DEPI Customer Service Centre 136 186

# Appendix 1 – Biodiversity impact of removal of native vegetation

## Habitat hectares

Habitat hectares are calculated for each habitat zone within your proposal using the extent and condition scores in the GIS data you provided.

| Habitat zone | Site assessed condition score | Extent (ha) | Habitat hectares |
|---|---|---|---|
| 4_A | 0.240 | 0.084 | 0.020 |
| 5_A | 0.420 | 0.037 | 0.015 |
| 6_A | 0.240 | 0.114 | 0.027 |
| 23_A | 0.280 | 0.057 | 0.016 |
| 7_A | 0.250 | 0.043 | 0.011 |
| 18_A | 0.520 | 0.001 | 0.000 |
| 3_A | 0.360 | 0.002 | 0.001 |
| 13_A | 0.520 | 0.027 | 0.014 |
| 14_A | 0.520 | 0.015 | 0.008 |
| 16_A | 0.320 | 0.005 | 0.002 |
| 17_A | 0.320 | 0.026 | 0.008 |
| 15_A | 0.320 | 0.048 | 0.015 |
| 9_A | 0.690 | 0.026 | 0.018 |
| 12_A | 0.380 | 0.016 | 0.006 |
| 9_B | 0.650 | 0.012 | 0.008 |
| 11_A | 0.400 | 0.066 | 0.026 |
| 25_A | 0.520 | 0.005 | 0.003 |
| 22_A | 0.520 | 0.004 | 0.002 |
| 21_A | 0.520 | 0.021 | 0.011 |
| 24_A | 0.350 | 0.000 | 0.000 |
| 27_A | 0.390 | 0.049 | 0.019 |
| 26_A1 | 0.390 | 0.013 | 0.005 |
| 26_A2 | 0.390 | 0.039 | 0.015 |
| 2_A | 0.520 | 0.001 | 0.001 |
| 8_A | 0.250 | 0.000 | 0.000 |
| 10_A | 0.650 | 0.005 | 0.003 |
| 14_B | 0.520 | 0.005 | 0.002 |
| 20_B | 0.520 | 0.000 | 0.000 |
| 20_A | 0.520 | 0.016 | 0.008 |

| Habitat zone | Site assessed condition score | Extent (ha) | Habitat hectares |
|---|---|---|---|
| 19_A | 0.520 | 0.005 | 0.003 |
| 29_A | 0.250 | 0.253 | 0.063 |
| 1_A | 0.340 | 0.021 | 0.007 |
| 28_A | 0.520 | 0.013 | 0.007 |
| 30_A | 0.200 | 0.070 | 0.014 |
| 31_A | 0.200 | 0.070 | 0.014 |
| 32_A | 0.200 | 0.070 | 0.014 |
| 33_A | 0.200 | 0.070 | 0.014 |
| 34_A | 0.200 | 0.070 | 0.014 |
| 35_A | 0.200 | 0.070 | 0.014 |
| 36_A | 0.200 | 0.070 | 0.014 |
| 37_A | 0.200 | 0.070 | 0.014 |
| 38_A | 0.200 | 0.070 | 0.014 |
| **TOTAL** | | | **0.474** |

## Impacts on rare or threatened species habitat above specific offset threshold

The specific-general offset test was applied to your proposal. The test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the specific offset threshold. The threshold is set at 0.005 per cent of the total habitat for a species. When the proportional impact is above the specific offset threshold a specific offset for that species' habitat is required.

The specific-general offset test found your proposal does not have a proportional impact on any rare or threatened species' habitats above the specific offset threshold. No specific offsets are required. A general offset is required as set out below.

## Clearing site biodiversity equivalence score(s)

The general biodiversity equivalence score for the habitat zone(s) is calculated by multiplying the habitat hectares by the strategic biodiversity score.

| Habitat zone | Habitat hectares | Strategic biodiversity score | General biodiversity equivalence score (GBES) |
|---|---|---|---|
| 4_A | 0.020 | 0.314 | 0.006 |
| 5_A | 0.015 | 0.296 | 0.005 |
| 6_A | 0.027 | 0.296 | 0.008 |
| 23_A | 0.016 | 0.232 | 0.004 |
| 7_A | 0.011 | 0.100 | 0.001 |
| 18_A | 0.000 | 0.100 | 0.000 |
| 3_A | 0.001 | 0.195 | 0.000 |
| 13_A | 0.014 | 0.407 | 0.006 |
| 14_A | 0.008 | 0.408 | 0.003 |
| 16_A | 0.002 | 0.338 | 0.001 |
| 17_A | 0.008 | 0.100 | 0.001 |
| 15_A | 0.015 | 0.407 | 0.006 |
| 9_A | 0.018 | 0.195 | 0.004 |
| 12_A | 0.006 | 0.340 | 0.002 |
| 9_B | 0.008 | 0.195 | 0.002 |
| 11_A | 0.026 | 0.197 | 0.005 |
| 25_A | 0.003 | 0.341 | 0.001 |
| 22_A | 0.002 | 0.246 | 0.000 |
| 21_A | 0.011 | 0.307 | 0.003 |
| 24_A | 0.000 | 0.229 | 0.000 |
| 27_A | 0.019 | 0.253 | 0.005 |
| 26_A1 | 0.005 | 0.342 | 0.002 |
| 26_A2 | 0.015 | 0.390 | 0.006 |
| 2_A | 0.001 | 0.219 | 0.000 |
| 8_A | 0.000 | 0.100 | 0.000 |
| 10_A | 0.003 | 0.189 | 0.001 |
| 14_B | 0.002 | 0.362 | 0.001 |
| 20_B | 0.000 | 0.305 | 0.000 |
| 20_A | 0.008 | 0.364 | 0.003 |
| 19_A | 0.003 | 0.311 | 0.001 |
| 29_A | 0.063 | 0.482 | 0.030 |

| Habitat zone | Habitat hectares | Strategic biodiversity score | General biodiversity equivalence score (GBES) |
|---|---|---|---|
| 1_A | 0.007 | 0.218 | 0.002 |
| 28_A | 0.007 | 0.298 | 0.002 |
| 30_A | 0.014 | 0.392 | 0.006 |
| 31_A | 0.014 | 0.392 | 0.006 |
| 32_A | 0.014 | 0.407 | 0.006 |
| 33_A | 0.014 | 0.520 | 0.007 |
| 34_A | 0.014 | 0.609 | 0.009 |
| 35_A | 0.014 | 0.609 | 0.009 |
| 36_A | 0.014 | 0.609 | 0.009 |
| 37_A | 0.014 | 0.100 | 0.001 |
| 38_A | 0.014 | 0.100 | 0.001 |

## Mapped rare or threatened species' habitats on site

This table sets out the list of rare or threatened species' habitats mapped at the site beyond those species for which the impact is above the specific offset threshold. These species habitats do not require a specific offset according to the specific-general offset test.

| Species number | Species common name | Species scientific name |
|---|---|---|
| 10045 | Lewin's Rail | Lewinia pectoralis pectoralis |
| 10050 | Baillon's Crake | Porzana pusilla palustris |
| 10186 | Intermediate Egret | Ardea intermedia |
| 10187 | Eastern Great Egret | Ardea modesta |
| 10195 | Little Bittern | Ixobrychus minutus dubius |
| 10197 | Australasian Bittern | Botaurus poiciloptilus |
| 10215 | Hardhead | Aythya australis |
| 10217 | Musk Duck | Biziura lobata |
| 10220 | Grey Goshawk | Accipiter novaehollandiae novaehollandiae |
| 10226 | White-bellied Sea-Eagle | Haliaeetus leucogaster |
| 10230 | Square-tailed Kite | Lophoictinia isura |
| 10238 | Black Falcon | Falco subniger |
| 10246 | Barking Owl | Ninox connivens connivens |
| 10248 | Powerful Owl | Ninox strenua |
| 10498 | Chestnut-rumped Heathwren | Calamanthus pyrrhopygius |
| 12283 | Lace Monitor | Varanus varius |

| Species number | Species common name | Species scientific name |
|---|---|---|
| 12407 | Swamp Skink | Lissolepis coventryi |
| 12683 | Glossy Grass Skink | Pseudemoia rawlinsoni |
| 13117 | Brown Toadlet | Pseudophryne bibronii |
| 13125 | Southern Toadlet | Pseudophryne semimarmorata |
| 4686 | Australian Grayling | Prototroctes maraena |
| 4701 | Dwarf Galaxias | Galaxiella pusilla |
| 4882 | Yarra Pygmy Perch | Nannoperca obscura |
| 500044 | Sticky Wattle | Acacia howittii |
| 500159 | Rough Blown-grass | Lachnagrostis scabra |
| 500786 | Leafy Twig-sedge | Cladium procerum |
| 501082 | Swamp Diuris | Diuris palustris |
| 501290 | Bog Gum | Eucalyptus kitsoniana |
| 501456 | Clover Glycine | Glycine latrobeana |
| 502145 | Giant Honey-myrtle | Melaleuca armillaris subsp. armillaris |
| 502868 | Otway Bush-pea | Pultenaea prolifera |
| 503043 | Wiry Bog-sedge | Schoenus carsei |
| 503859 | Currant-wood | Monotoca glauca |
| 504491 | Southern Blue-gum | Eucalyptus globulus subsp. globulus |
| 505337 | Austral Crane's-bill | Geranium solanderi var. solanderi s.s. |
| 505358 | Western Peppermint | Eucalyptus falciformis |

## Appendix 2 – Offset requirements detail

If a permit is granted to remove the marked native vegetation the permit condition will include the requirement to obtain a native vegetation offset.

To calculate the required offset amount required the biodiversity equivalence scores are aggregated to the proposal level and multiplied by the relevant risk multiplier.

Offsets also have required attributes:

- General offsets must be located in the same Catchment Management Authority (CMA) boundary or Local Municipal District (local council) as the clearing and must have a minimum strategic biodiversity score of 80 per cent of the clearing.[2]

The offset requirements for your proposal are as follows:

| Offset type | Clearing site biodiversity equivalence score | Risk multiplier | Offset requirements | |
|---|---|---|---|---|
| | | | Offset amount (biodiversity equivalence units) | Offset attributes |
| General | 0.163 GBES | 1.5 | 0.244 general units | Offset must be within Corangamite CMA **or** Glenelg Hopkins CMA **or** the same Municipal District as the vegetation removal<br>Offset must have a minimum strategic biodiversity score of 0.289 |

[2] Strategic biodiversity score is a weighted average across habitat zones where a general offset is required

## Appendix 3 – Images of marked native vegetation

**Image 1. Native vegetation location risk map**

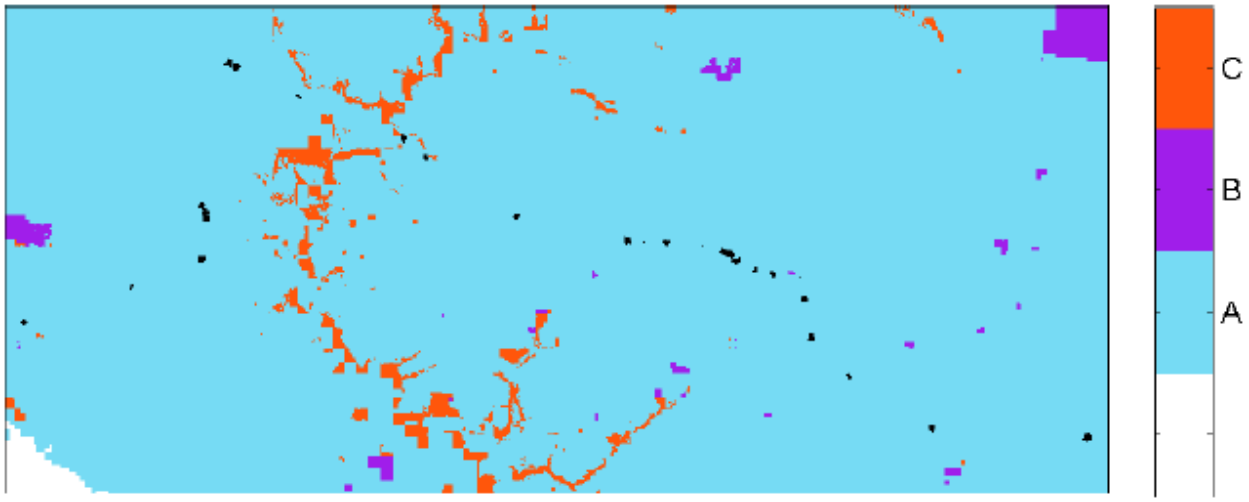



**Image 2. Strategic biodiversity score map**

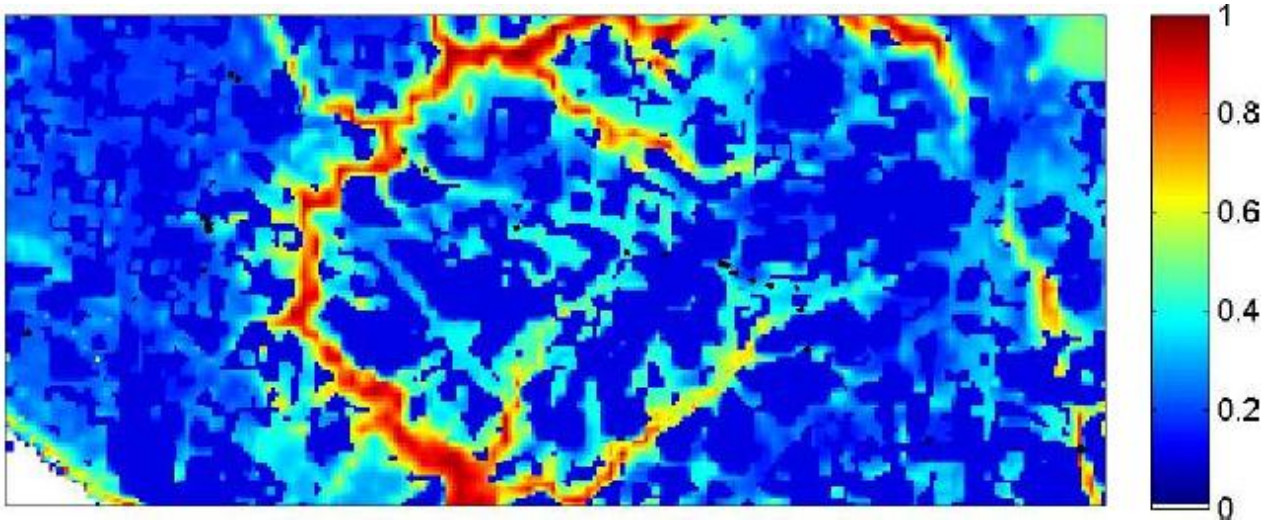
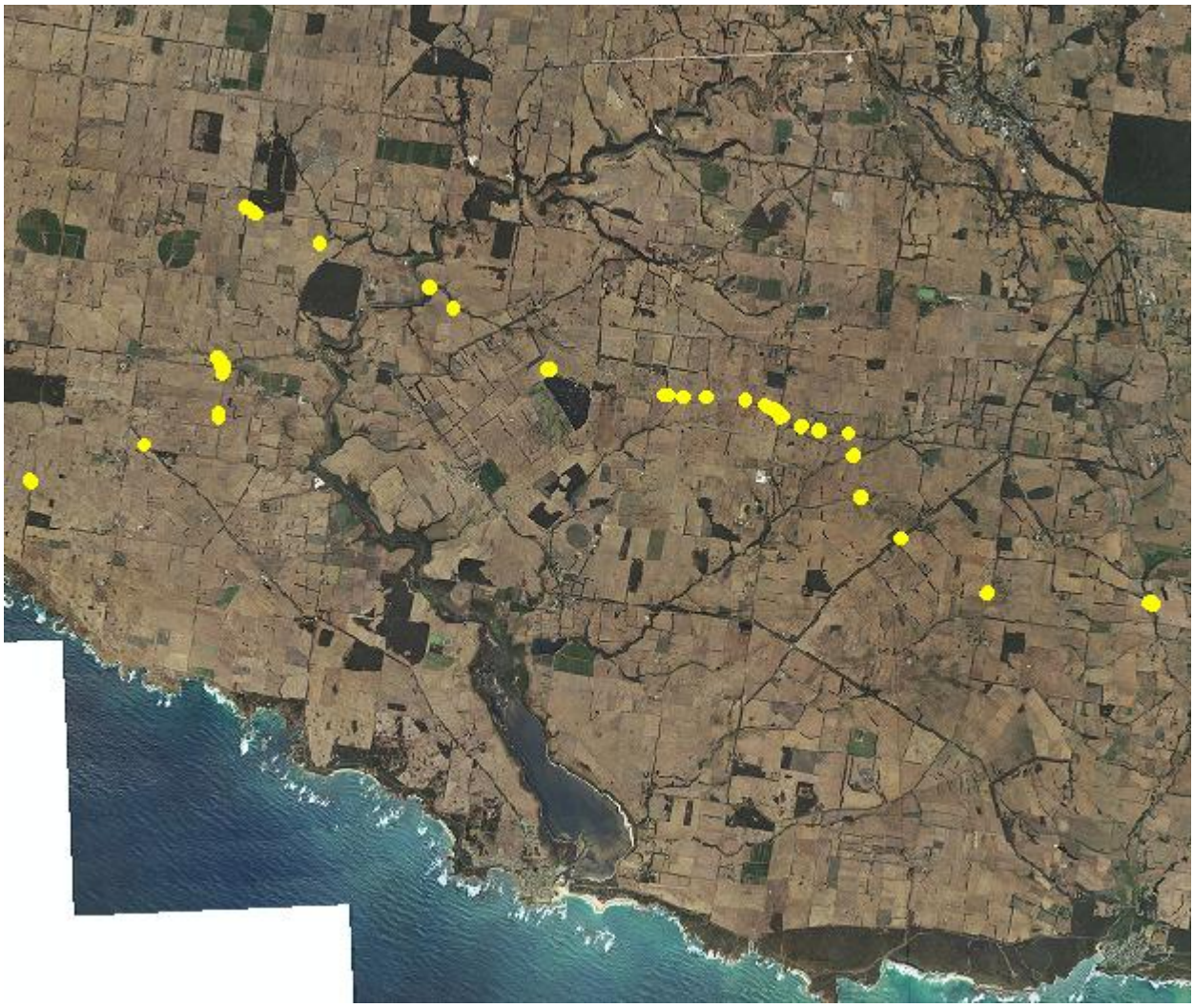


**Image 3. Aerial photograph showing marked native vegetation**



## Glossary

**Condition score**

This is the site-assessed condition score for the native vegetation. Each habitat zone in the clearing proposal is assigned a condition score according to the habitat hectare assessment method. This information has been provided by or on behalf of the applicant in the GIS file.

**Dispersed habitat**

A dispersed species habitat is a habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area greater than 2,000 hectares.

**General biodiversity equivalence score**

The general biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to Victoria's biodiversity. The general biodiversity equivalence score is calculated as follows:

$$\textbf{\textit{General biodiversity equivalence score}} = \textbf{\textit{habitat hectares}} \times \textbf{\textit{strategic biodiversity score}}$$

**General offset amount**

This is calculated by multiplying the general biodiversity equivalence score of the native vegetation to be removed by the risk factor for general offsets. This number is expressed in general biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\textbf{\textit{Risk adjusted general biodiversity equivalence score}} = \textbf{\textit{general biodiversity equivalence score clearing}} \times \mathbf{1.5}$$

**General offset attributes**

General offset must be located in the same Catchment Management Authority boundary or Municipal District (local council) as the clearing site. They must also have a strategic biodiversity score that is at least 80 per cent of the score of the clearing site.

**Habitat hectares**

Habitat hectares is a site-based measure that combines extent and condition of native vegetation. The habitat hectares of native vegetation is equal to the current condition of the vegetation (condition score) multiplied by the extent of native vegetation. Habitat hectares can be calculated for a remnant patch or for scattered trees or a combination of these two vegetation types. This value is calculated for each habitat zone using the following formula:

$$\textbf{\textit{Habitat hectares}} = \textbf{\textit{total extent}}\ (\textbf{\textit{hectares}}) \times \textbf{\textit{condition score}}$$

**Habitat importance score**

The habitat importance score is a measure of the importance of the habitat located on a site for a particular rare or threatened species. The habitat importance score for a species is a weighted average value calculated from the habitat importance map for that species. The habitat importance score is calculated for each habitat zone where the habitat importace map indicates that species habitat occurs.

**Habitat zone**

Habitat zone is a discrete contiguous area of native vegetation that:

- is of a single Ecological Vegetation Class
- has the same measured condition.

**Highly localised habitat**

A highly localised habitat is habitat for a rare or threatened species that is spread across a very restricted area (less than 2,000 hectares). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species. Highly localised habitats have the highest habitat importance score (1) for all locations where they are present.

**Minimum strategic biodiversity score**

The minimum strategic biodiversity score is an attribute for a general offset.

The strategic biodiversity score of the offset site must be at least 80 per cent of the strategic biodiversity score of the native vegetation to be removed. This is to ensure offsets are located in areas with a strategic value that is comparable to, or better than, the native vegetation to be removed. Where a specific and general offset is required, the minimum strategic biodiversity score relates only to the habitat zones that require the general offset.

**Offset risk factor**

There is a risk that the gain from undertaking the offset will not adequately compensate for the loss from the removal of native vegetation. If this were to occur, despite obtaining an offset, the overall impact from removing native vegetation would result in a loss in the contribution that native vegetation makes to Victoria's biodiversity.

To address the risk of offsets failing, an offset risk factor is applied to the calculated loss to biodiversity value from removing native vegetation.

$$\boldsymbol{Risk\ factor\ for\ general\ offsets = 1.5}$$

$$\boldsymbol{Risk\ factor\ for\ specific\ offset = 2}$$

**Offset type**

The specific-general offset test determines the offset type required.

When the specific-general offset test determines that the native vegetation removal will have an impact on one or more rare or threatened species habitat above the set threshold of 0.005 per cent, a specific offset is required. This test is done at the permit application level.

A general offset is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have an impact on any habitat for any rare or threatened species above the set threshold of 0.005 per cent. All habitat zones that do not require a specific offset will require a general offset.

**Proportional impact on species**

This is the outcome of the specific-general offset test. The specific-general offset test is calculated across the entire proposal for each species on the native vegetation permitted clearing species list. If the proportional impact on a species is above the set threshold of 0.005 per cent then a specific offset is required for that species.

**Specific offset amount**

The specific offset amount is calculated by multiplying the specific biodiversity equivalence score of the native vegetation to be removed by the risk factor for specific offsets. This number is expressed in specific biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\boldsymbol{Risk\ adjusted\ specific\ biodiversity\ equivalence\ score = specific\ biodiversity\ equivalence\ score\ clearing \times 2}$$

**Specific offset attributes**

Specific offsets must be located in the modelled habitat for the species that has triggered the specific offset requirement.

**Specific biodiversity equivalence score**

The specific biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to the habitat of the relevant rare or threatened species. It is calculated for each habitat zone where one or more species habitats require a specific offset as a result of the specific-general offset test as follows:

$$\boldsymbol{Specific\ biodiversity\ equivalence\ score} = \boldsymbol{habitat\ hectares} \times \boldsymbol{habitat\ importance\ score}$$

**Strategic biodiversity score**

This is the weighted average strategic biodiversity score of the marked native vegetation. The strategic biodiversity score has been calculated from the *Strategic biodiversity map* for each habitat zone.

The strategic biodiversity score of native vegetation is a measure of the native vegetation's importance for Victoria's biodiversity, relative to other locations across the landscape. The *Strategic biodiversity map* is a modelled layer that prioritises locations on the basis of rarity and level of depletion of the types of vegetation, species habitats, and condition and connectivity of native vegetation.

**Total extent (hectares) for calculating habitat hectares**

This is the total area of the marked native vegetation in hectares.

The total extent of native vegetation is an input to calculating the habitat hectares of a site and in calculating the general biodiversity equivalence score. Where the marked native vegetation includes scattered trees, each tree is converted to hectares using a standard area calculation of 0.071 hectares per tree. This information has been provided by or on behalf of the applicant in the GIS file.

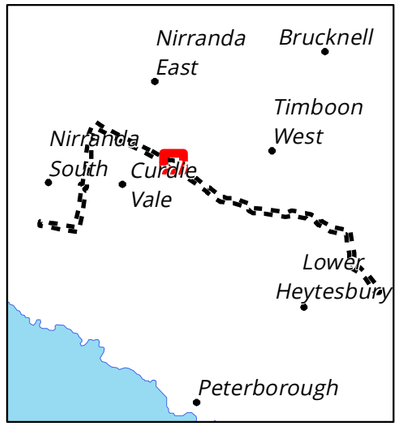
**Vicinity**

The vicinity is an attribute for a general offset.

The offset site must be located within the same Catchment Management Authority boundary or Local Municipal District as the native vegetation to be removed.

# Appendix 6: Physical assessments

Photo downstream through cross section 1

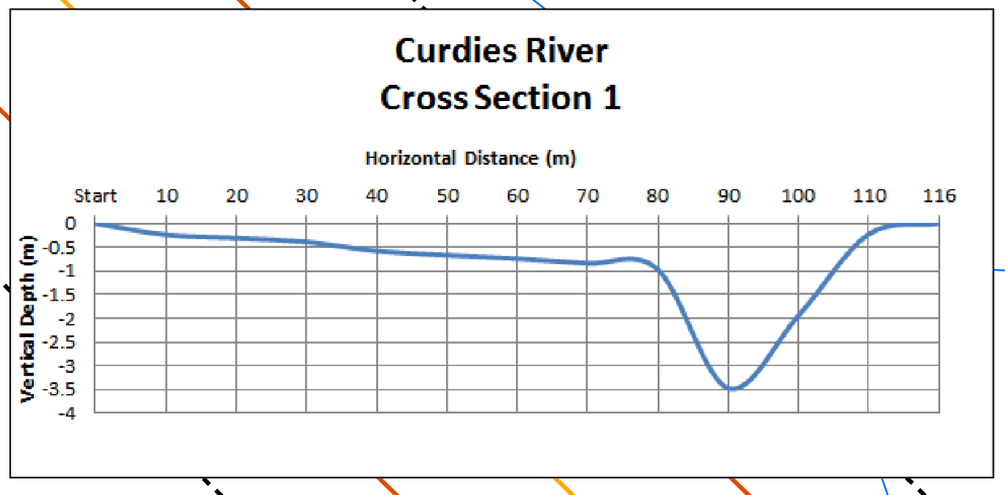



Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

HS-AQ5

Curdies River




## Site HS-AQ5 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

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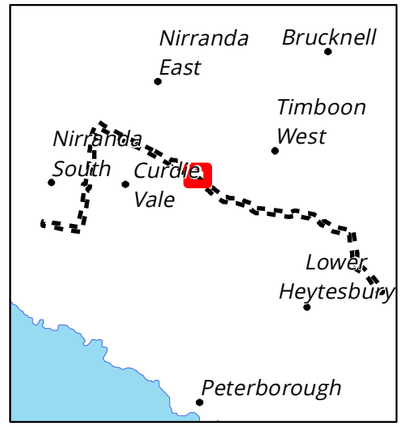
*Matter: 17973,*
*Date: 12 June 2014,*
*Checked by: ADS, Drawn by: JMS, Last edited by: jshepherd*
*Location:P:\17900s\17973\Mapping*
*17973_Appendix_AquaticCrossSections*

Photo downstream through cross section 1




Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

HS-AQ6

Le Couteurs Rd

Timboon - Curdievale Rd

# Site HS-AQ6 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N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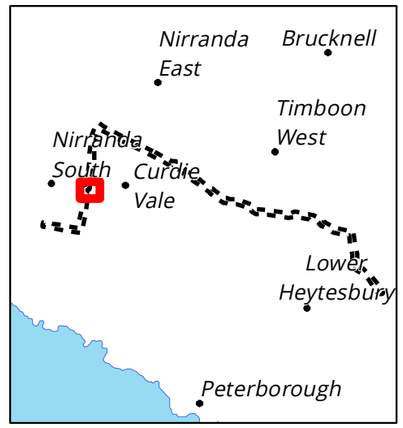
*Location:P:\17900s\17973\Mapping\17973_Appendix_AquaticCrossSections*

**Photo upstream through cross section 1.**



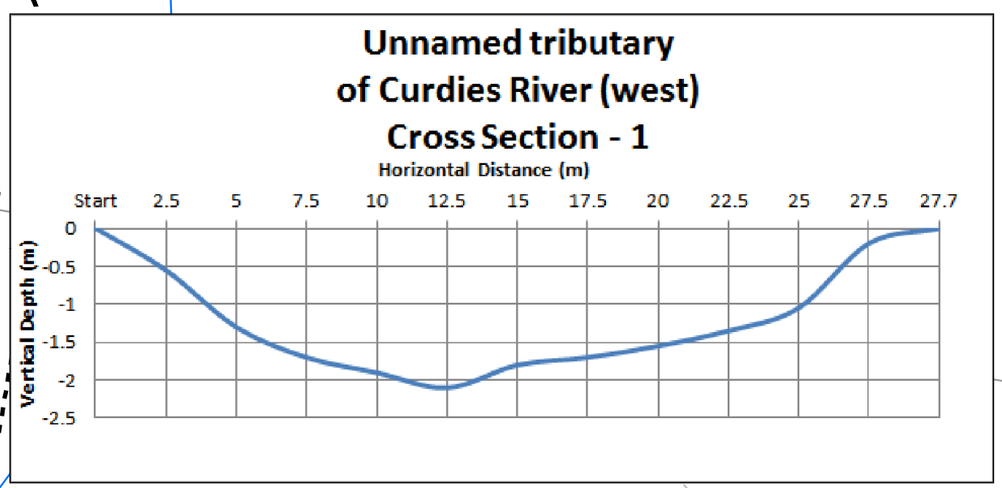

Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

HS-AQ9

Callaghans Rd

Sodas Lane




## Site HS-AQ9 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N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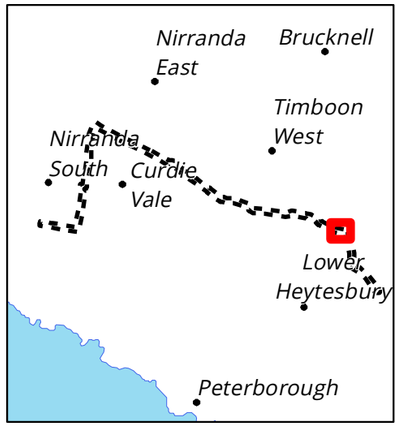
*Location:P:\17900s\17973\Mapping\17973_Appendix_AquaticCrossSections*

Photo downstream through cross section 1



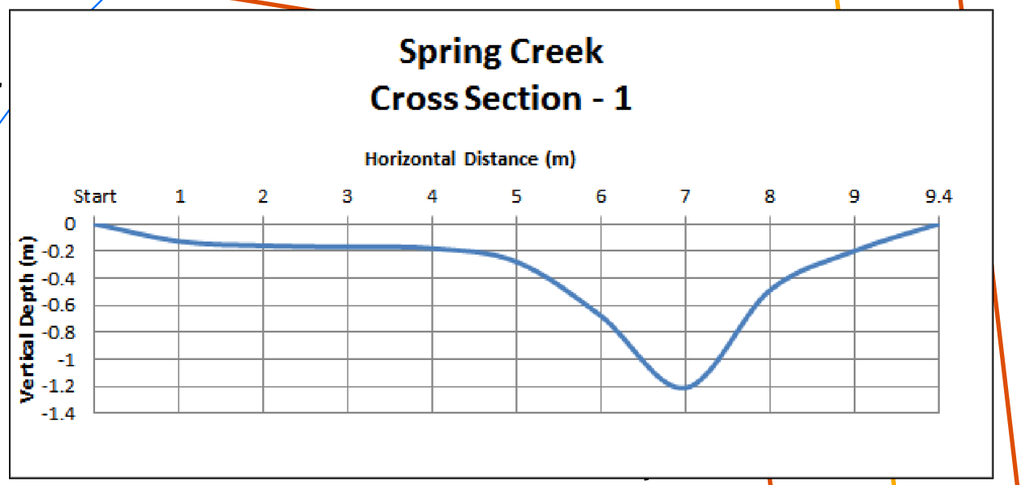

Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

HS-AQ2

Squibbs Rd

HS-AQ1




## Site HS-AQ2 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

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*17973_Appendix_AquaticCrossSections*

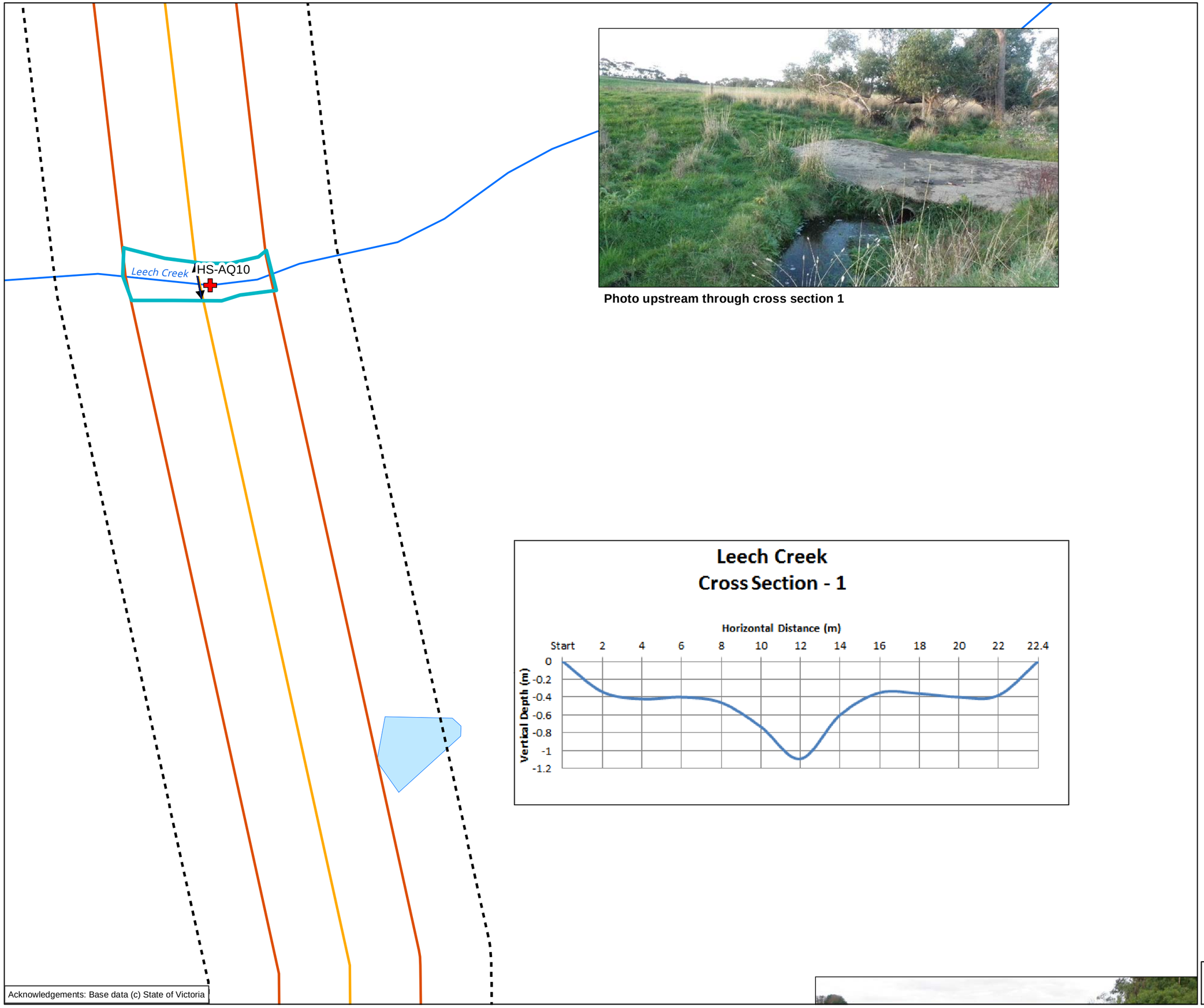
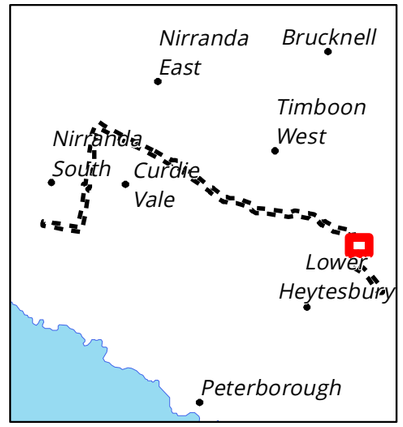





**Photo upstream through cross section 1**




Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

## Site HS-AQ10 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N

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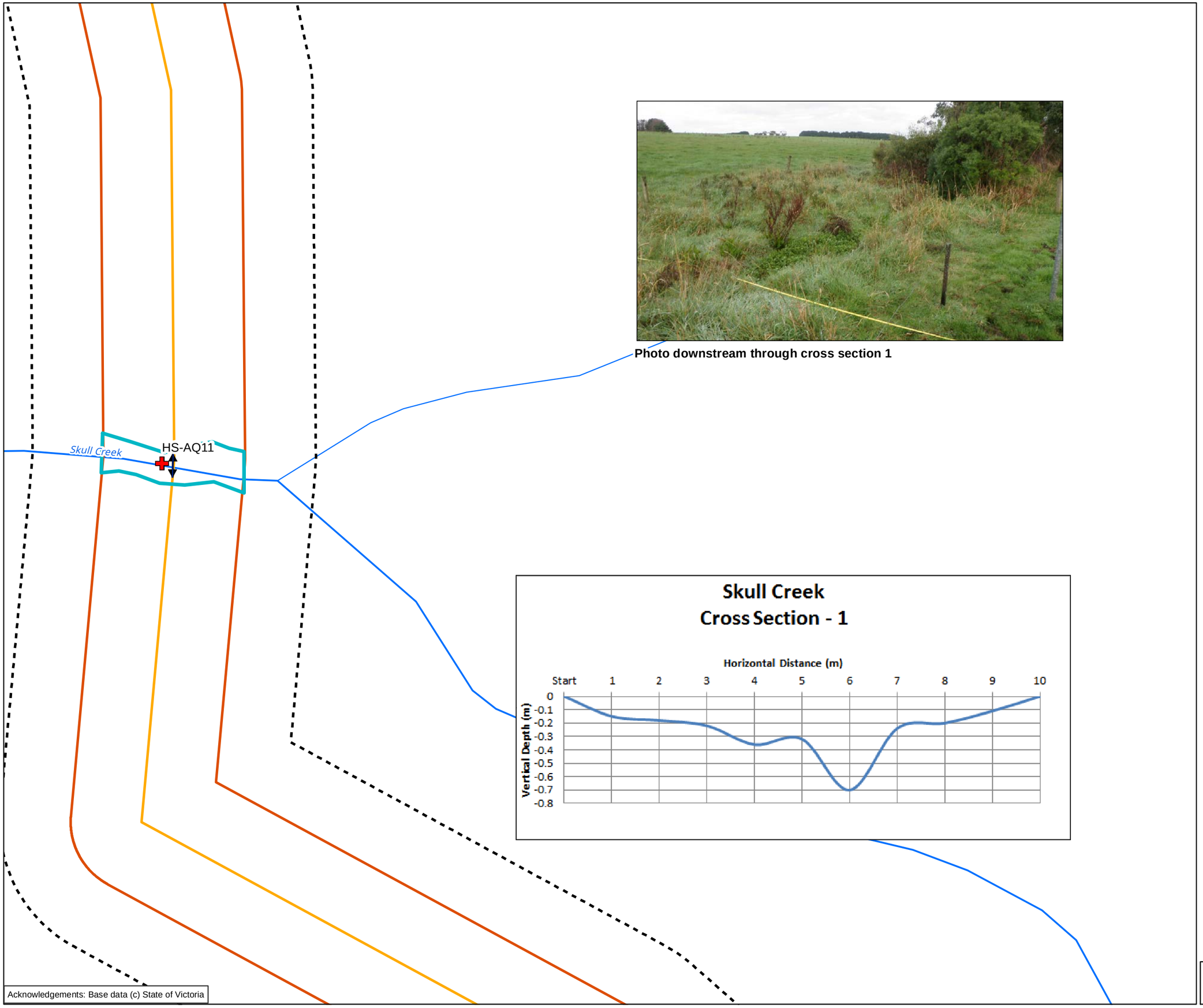
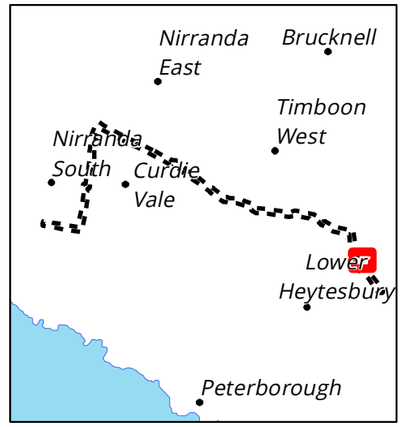
*Location:P:\17900s\17973\Mapping*
*17973_Appendix_AquaticCrossSections*

Photo downstream through cross section 1




Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

## Site HS-AQ11 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N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*Location:P:\17900s\17973\Mapping*
*17973_Appendix_AquaticCrossSections*



Acknowledgements: Base data (c) State of Victoria

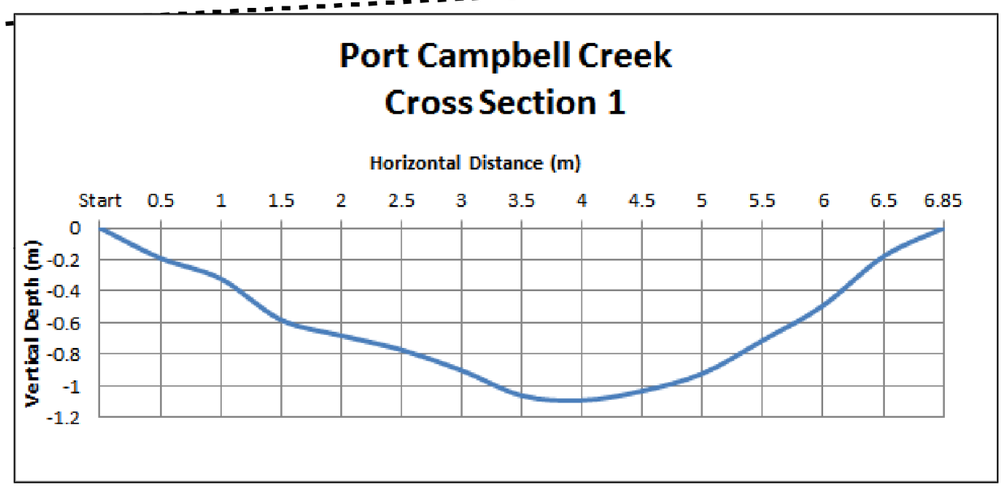
Port Campbell Creek

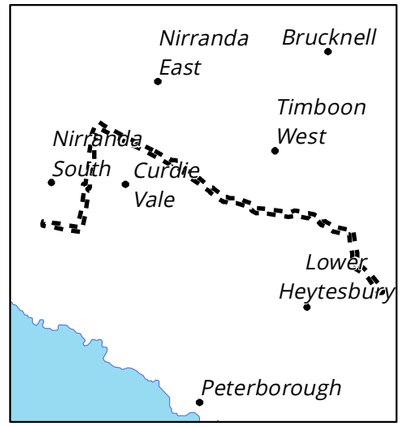
Newfield

Photo downstream through cross section 1

Cobden - Port Campbell Rd

HS-AQ7




Legend

- Alignment
- Alignment 50m buffer
- Alignment 100m buffer
- Aquatic Assessment
- Proposed Burrowing Crayfish buffer

## Site HS-AQ7 Cross Section

0 25 50 75 100 125

Metres

Scale: 1:2,500 @ A3

*Coordinate System: GDA 1994 MGA Zone 54*

N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*Matter: 17973,*
*Date: 12 June 2014,*
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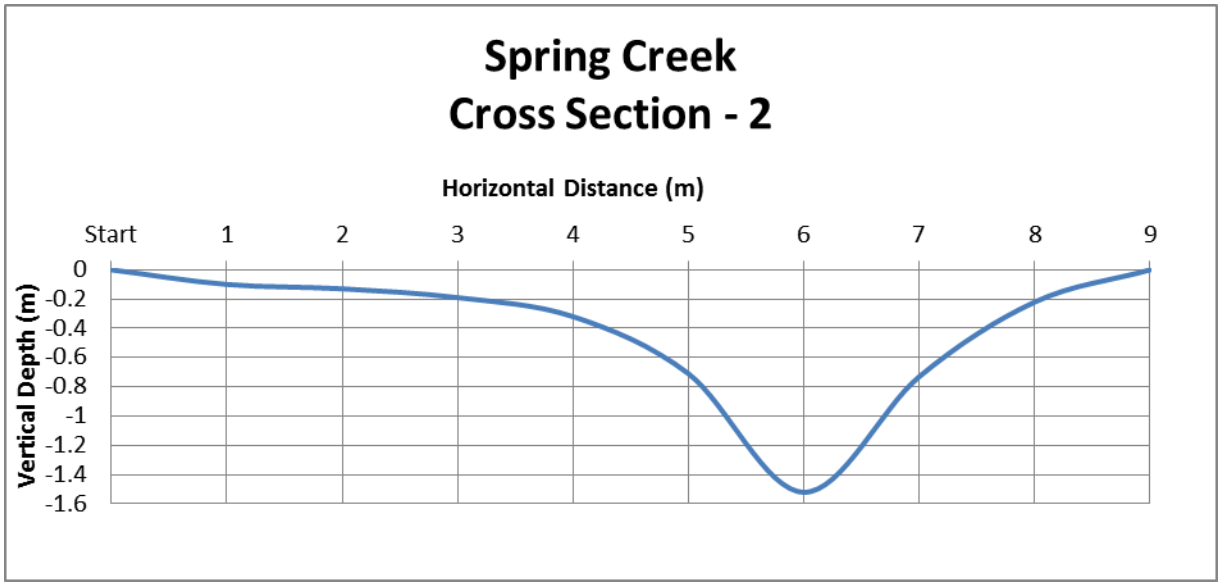
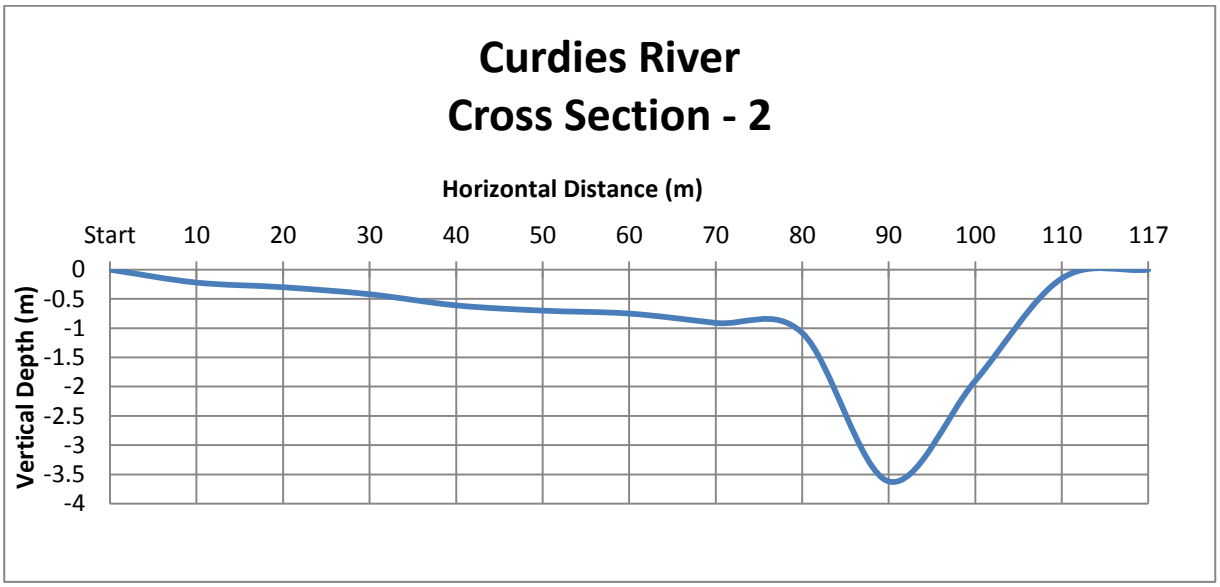
*Location:P:\17900s\17973\Mapping*
*17973_Appendix_AquaticCrossSections*

Second cross sections at each of the sites assessed using the AUSRIVAS physical assessment methodology and site photos through cross sections.

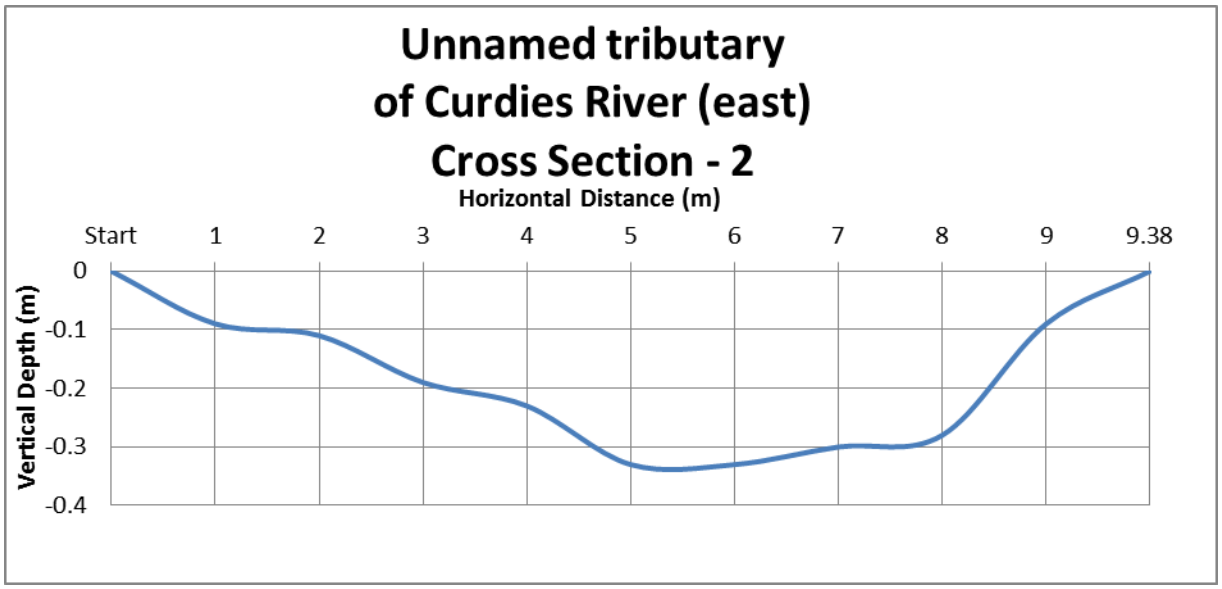
**HS-AQ2**



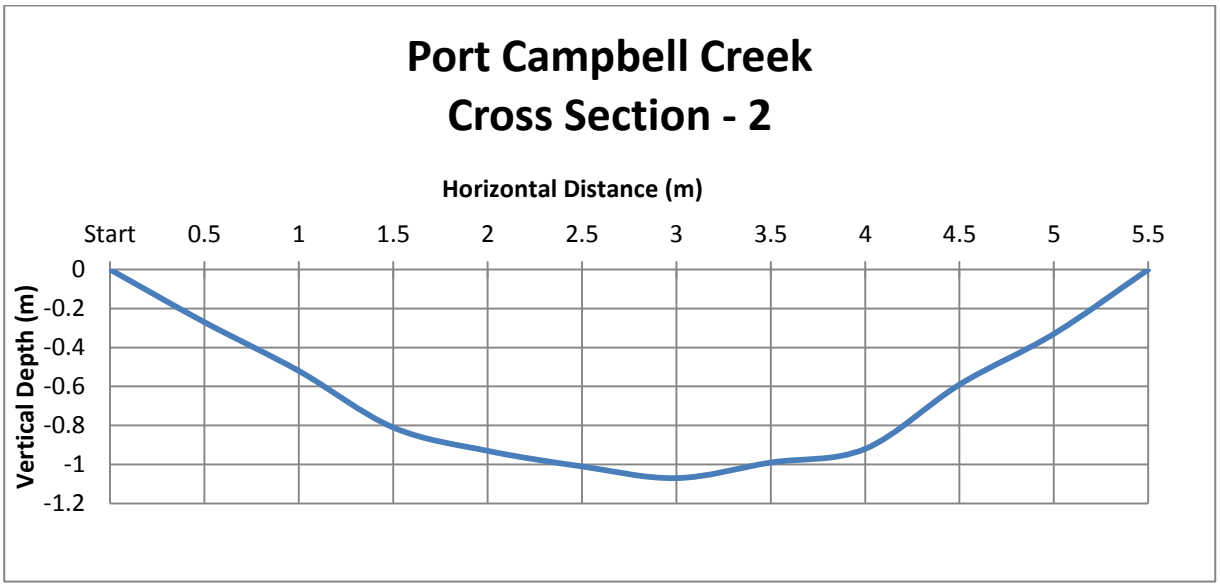

**HS-AQ5**



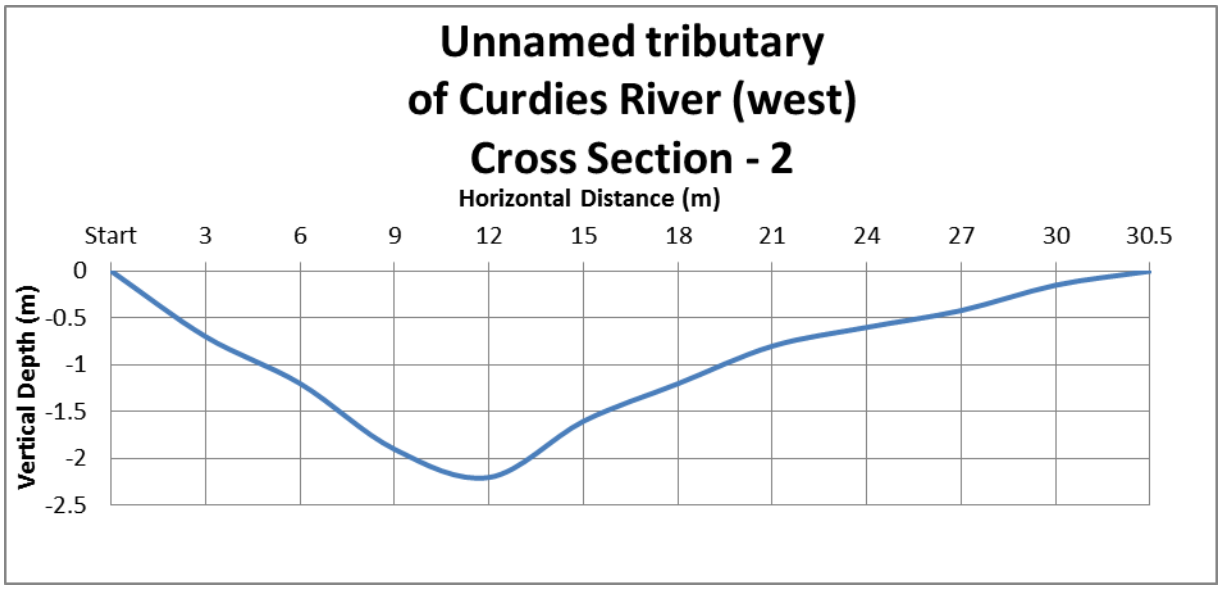

**HS-AQ6**



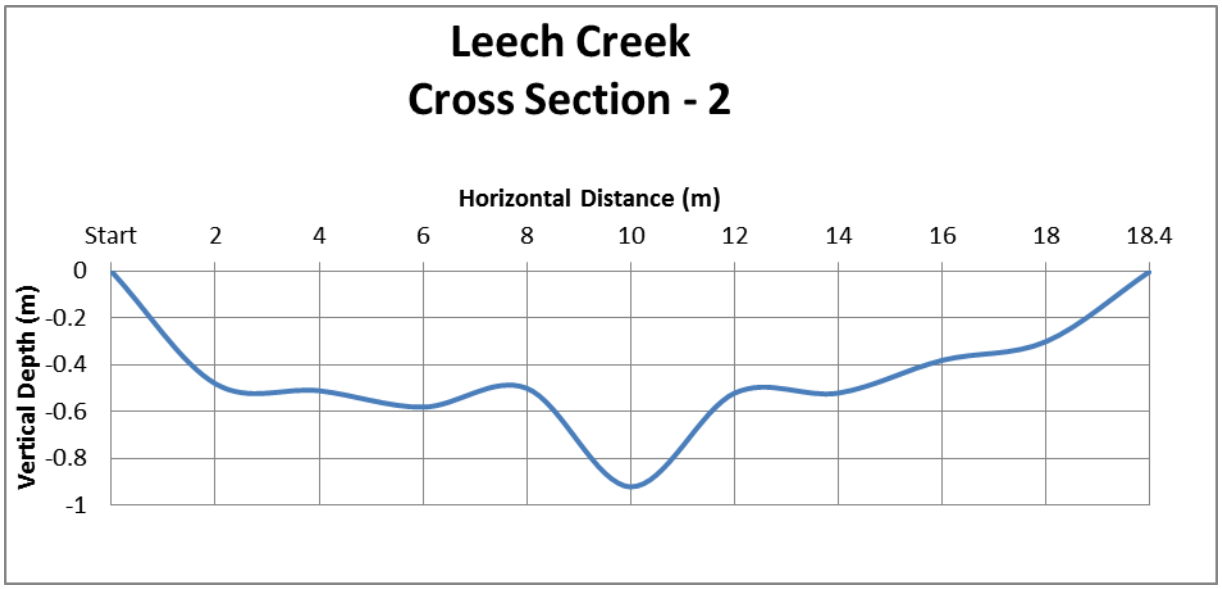

**HS-AQ7**



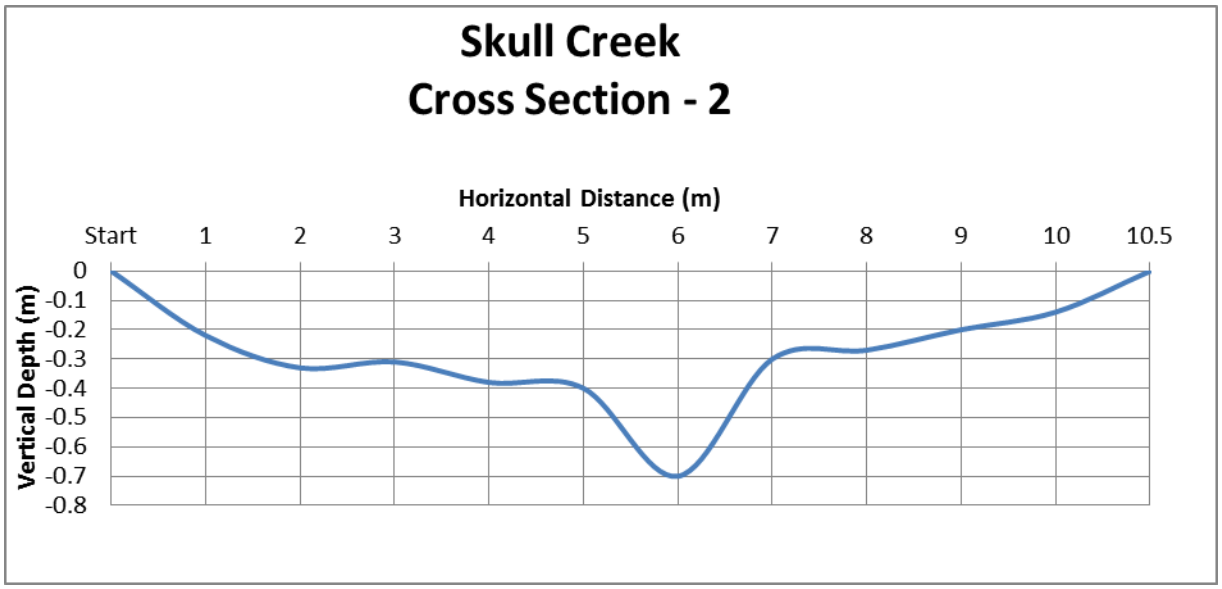

**HS-AQ9**

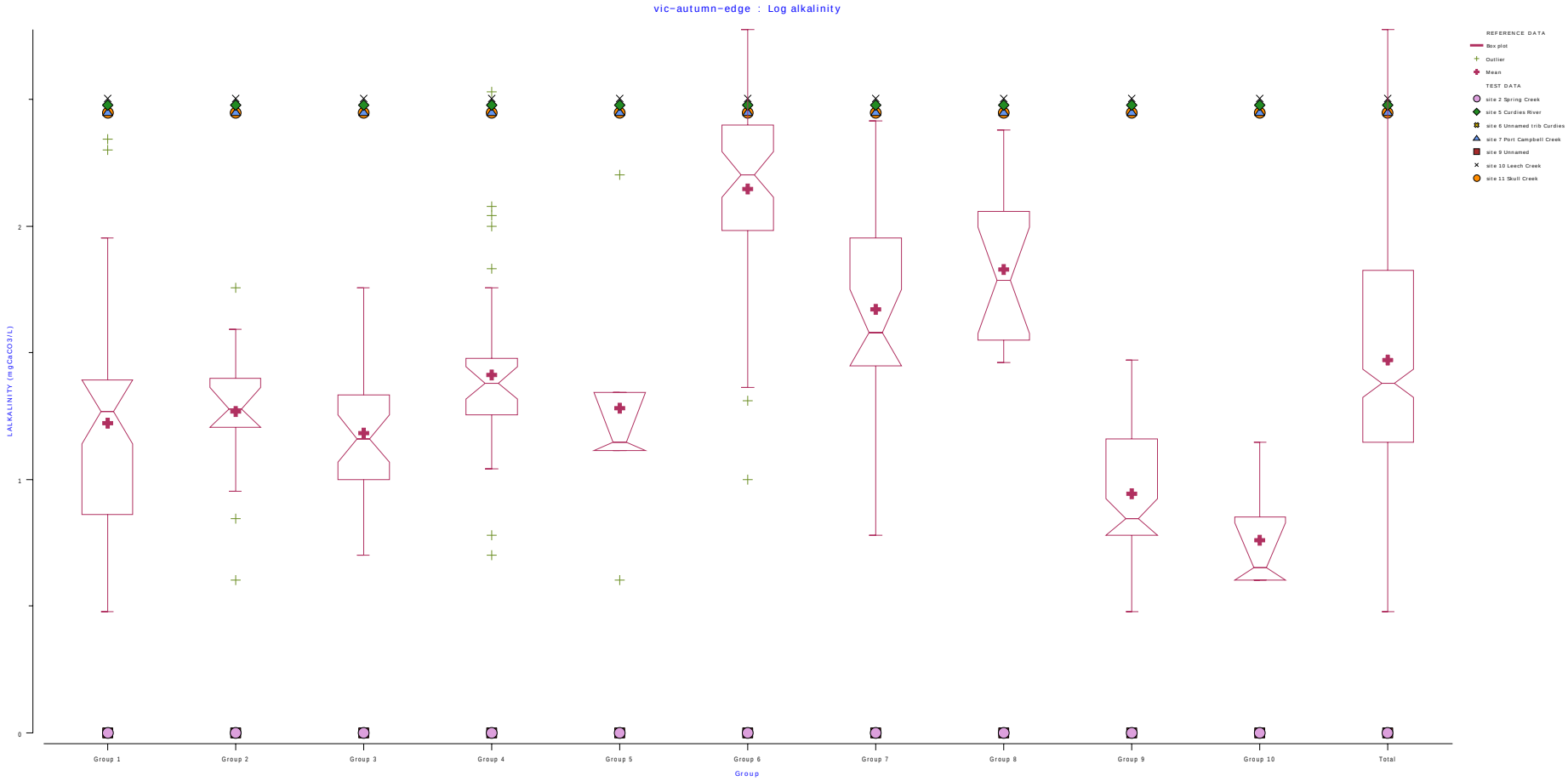


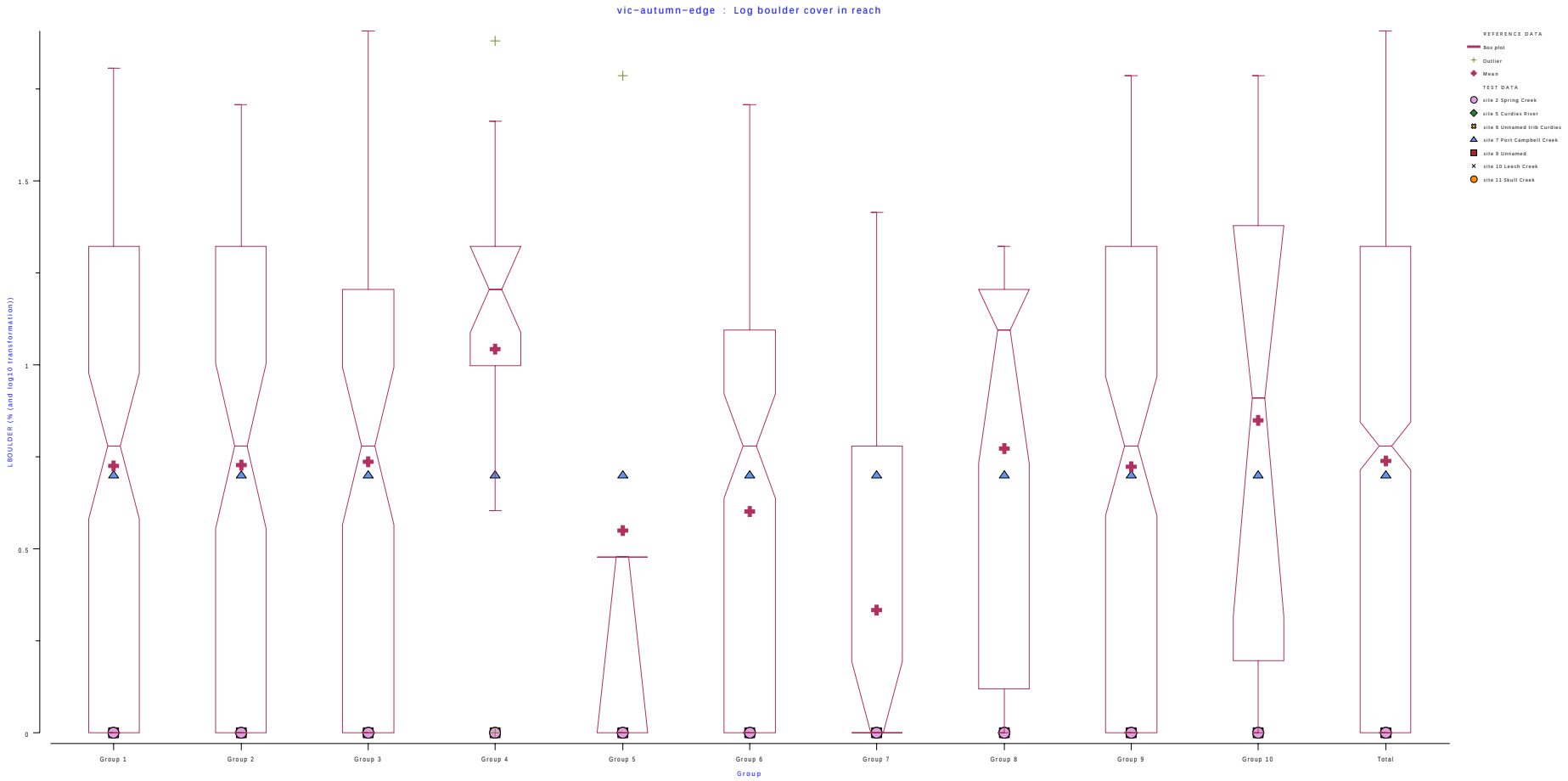

**HS-AQ10**

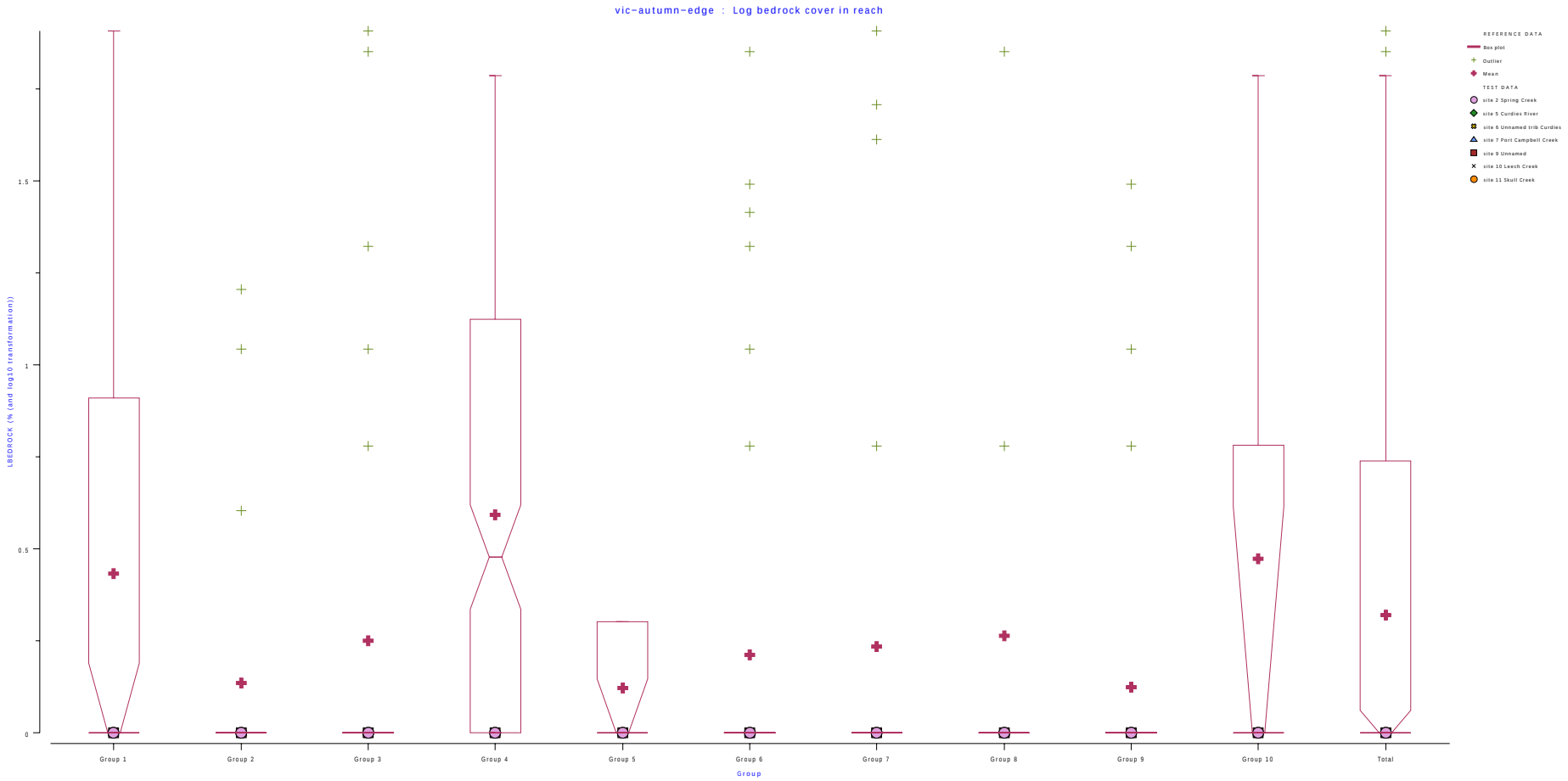


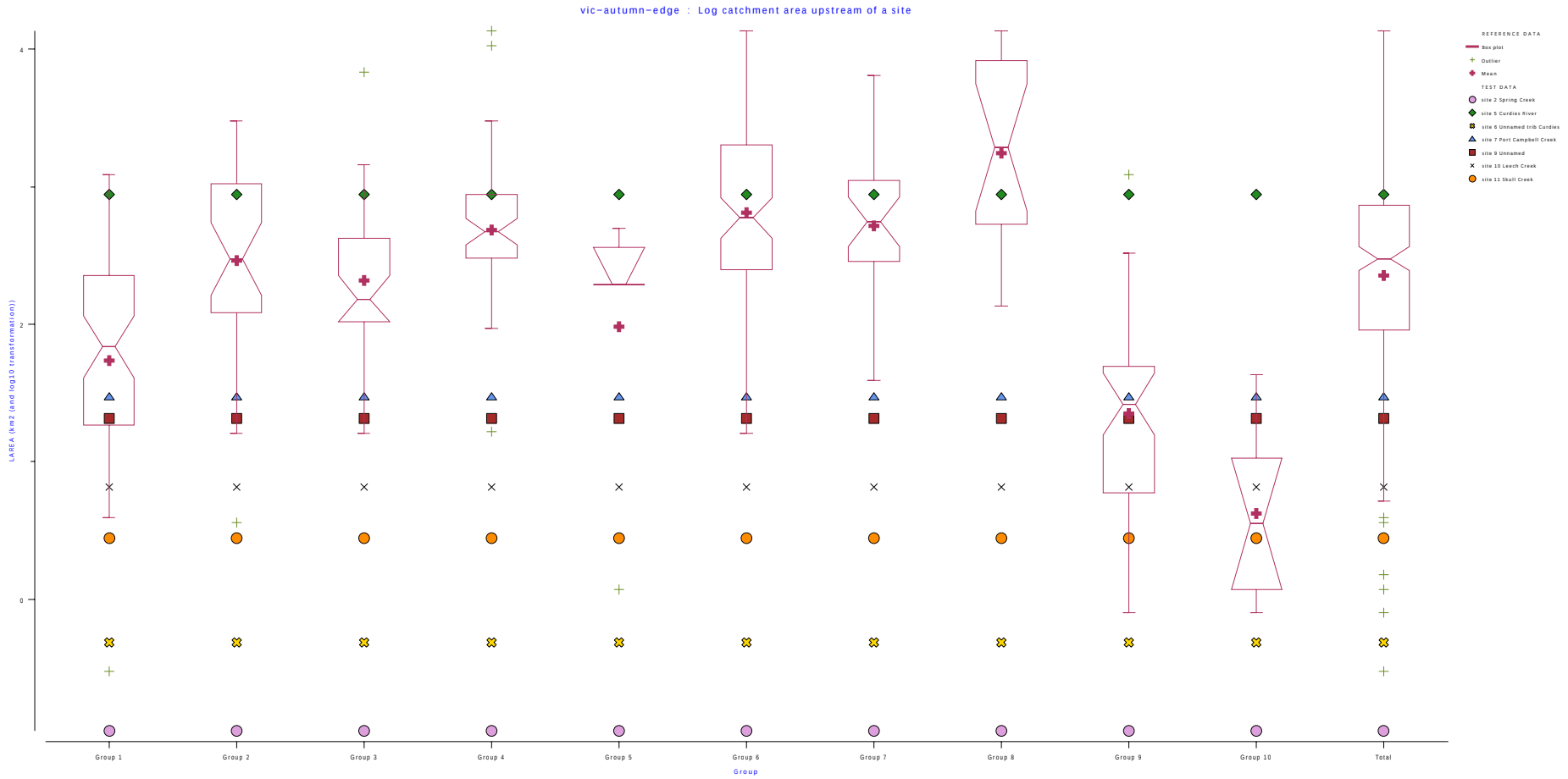

**HS-AQ11**

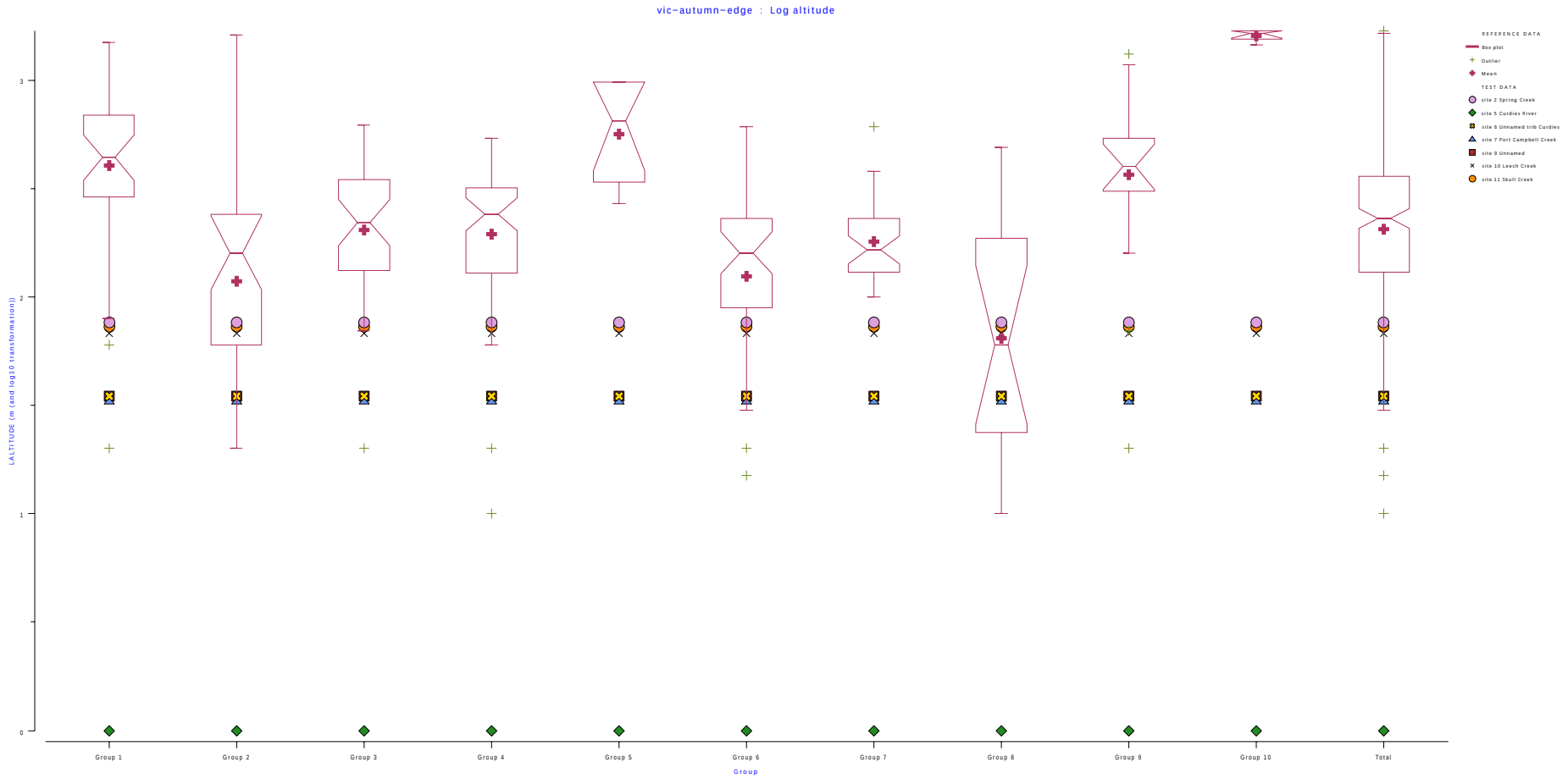




vic-autumn-edge : Log alkalinity
LALKALINITY (mgCaCO3/L)
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log boulder cover in reach
LBOULDER (% (and log10 transformation))
1.5
1
0.5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log bedrock cover in reach
LBEDROCK (% (and log10 transformation))
1.5
1
0.5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic−autumn−edge : Log catchment area upstream of a site
LAREA (km2 (and log10 (transformation)))
4
2
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log altitude
LALTITUDE (m (and log10 transformation))
3
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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site 9 Unnamed
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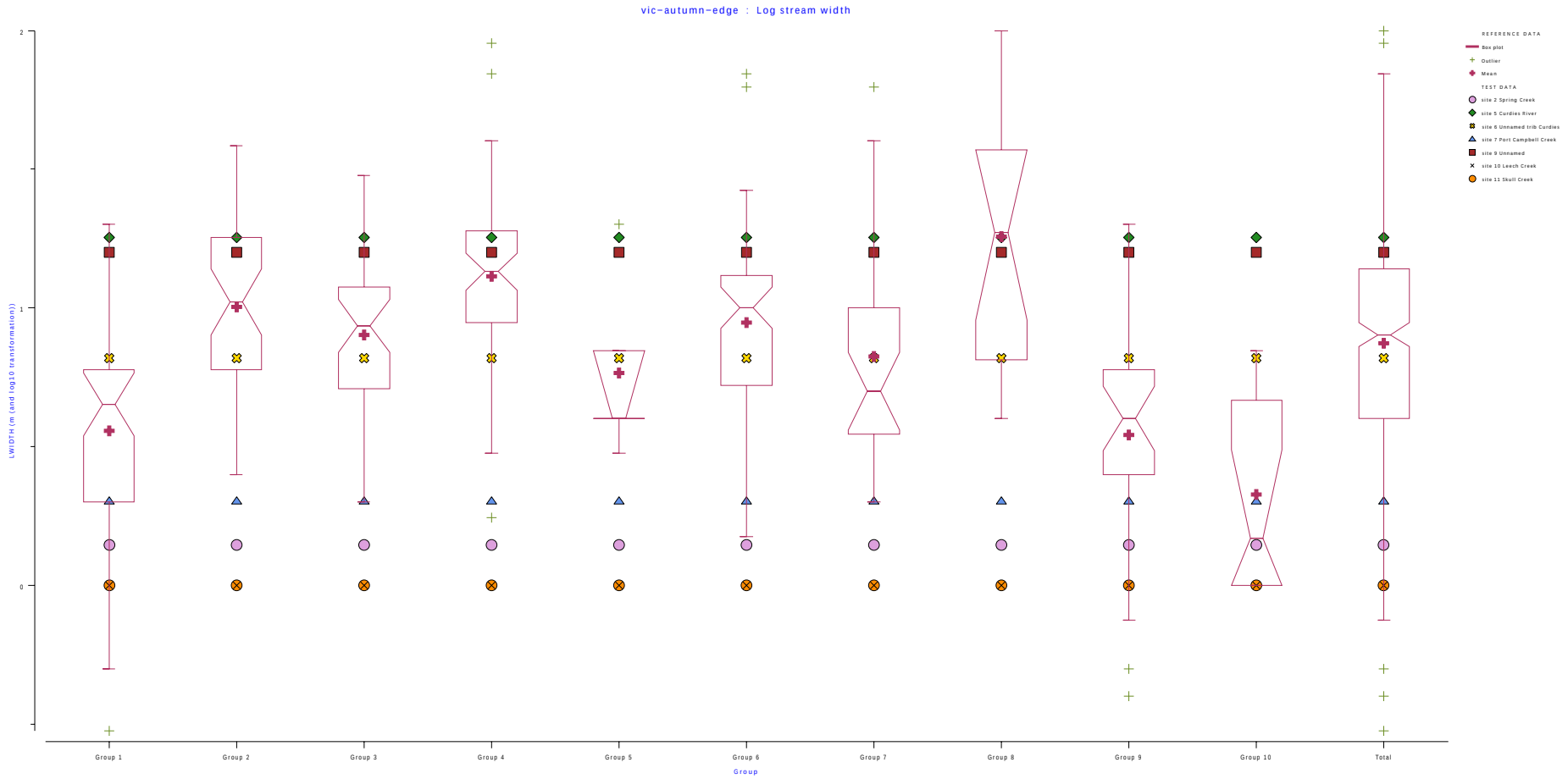
vic−autumn−edge : Log stream width
LWIDTH (m (and log10 transformation))
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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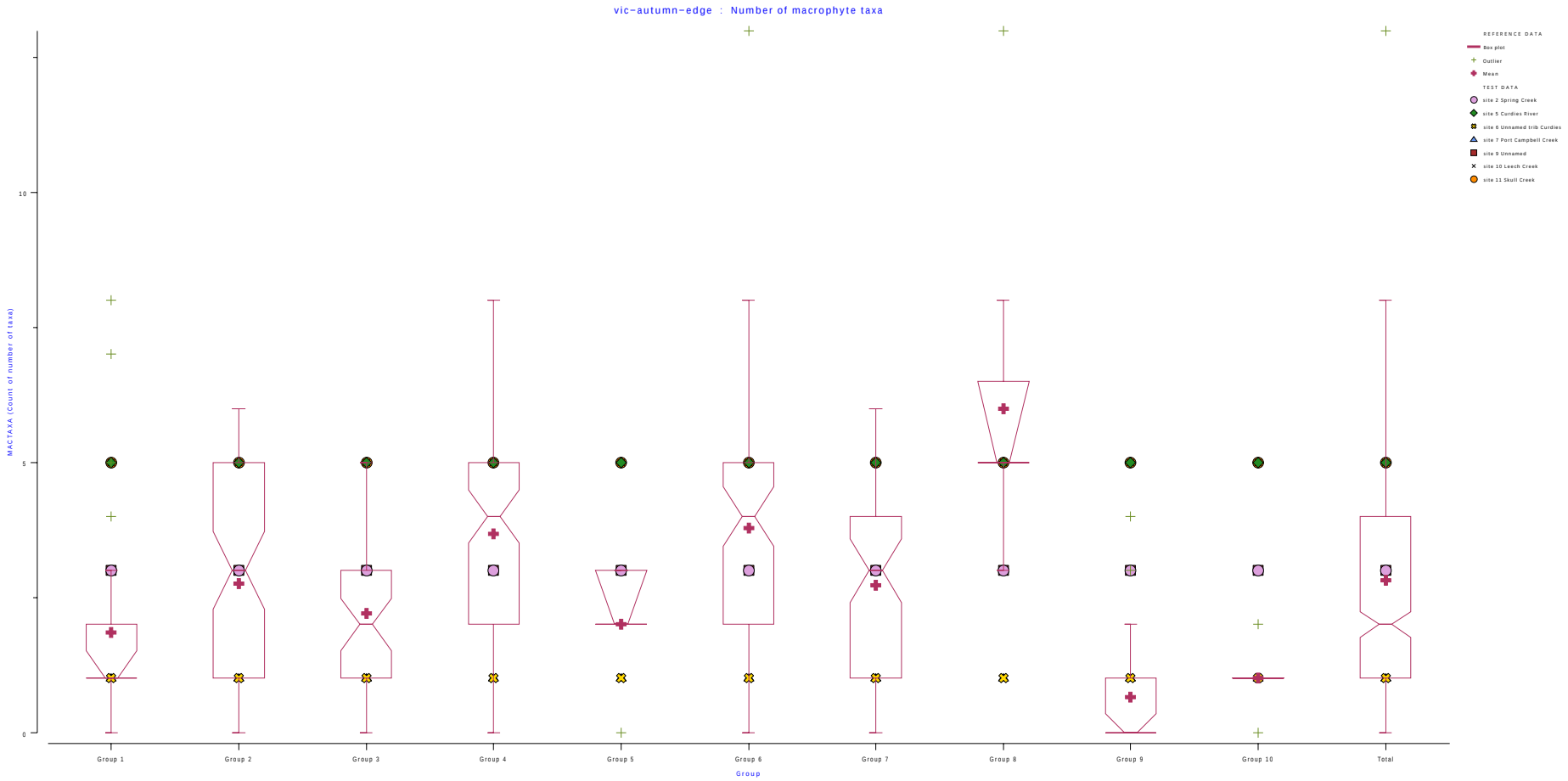
vic–autumn–edge : Number of macrophyte taxa
MACTAXA (Count of number of taxa)
10
5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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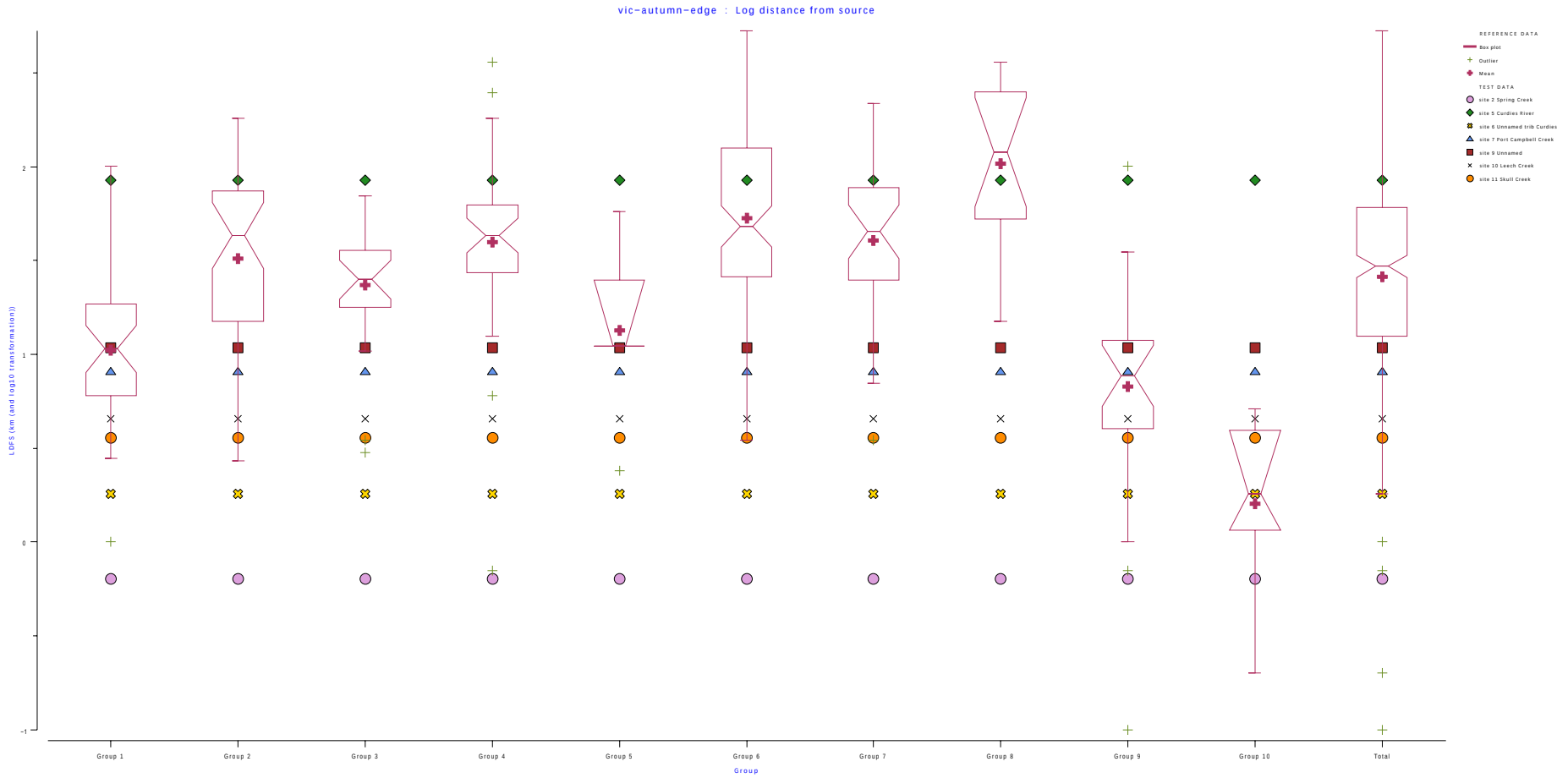
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log distance from source
LDFS (km (and log10 transformation))
2
1
0
-1
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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site 9 Unnamed
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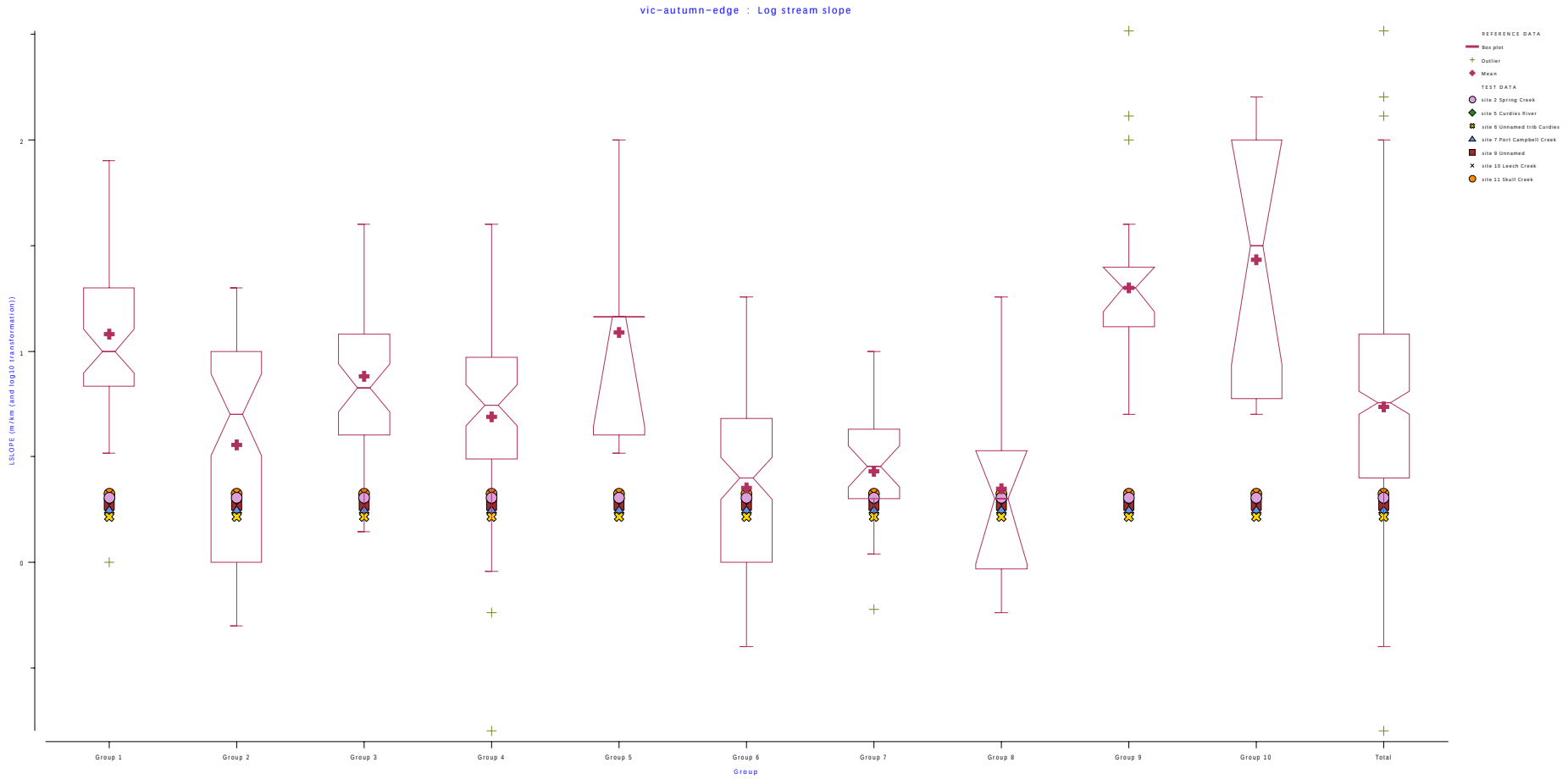
site 11 Skull Creek


vic–autumn–edge : Log stream slope
LSLOPE (m/km (and log10 transformation))
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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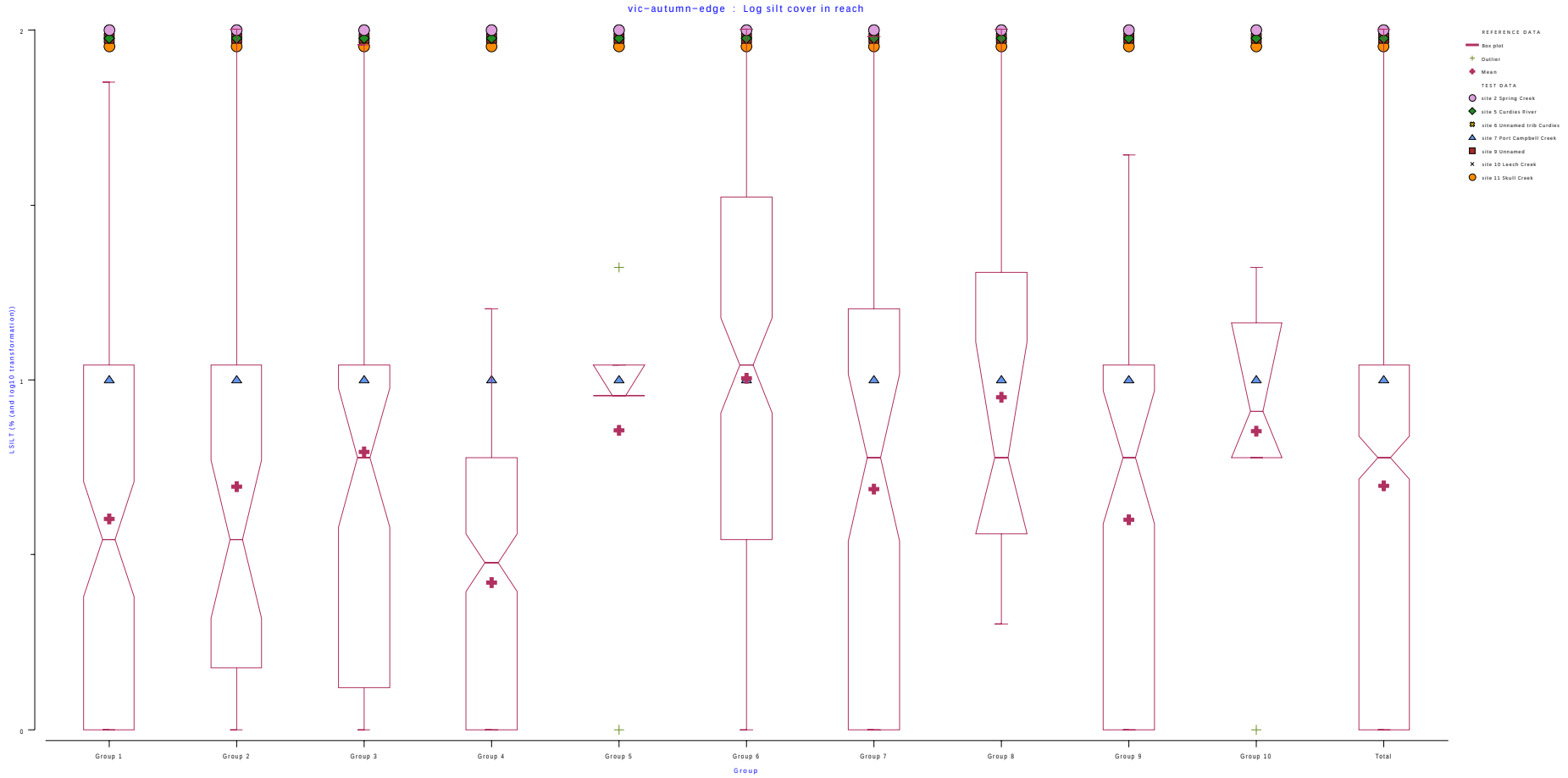
vic-autumn-edge : Log silt cover in reach
LSILT (% (and log10 transformation))
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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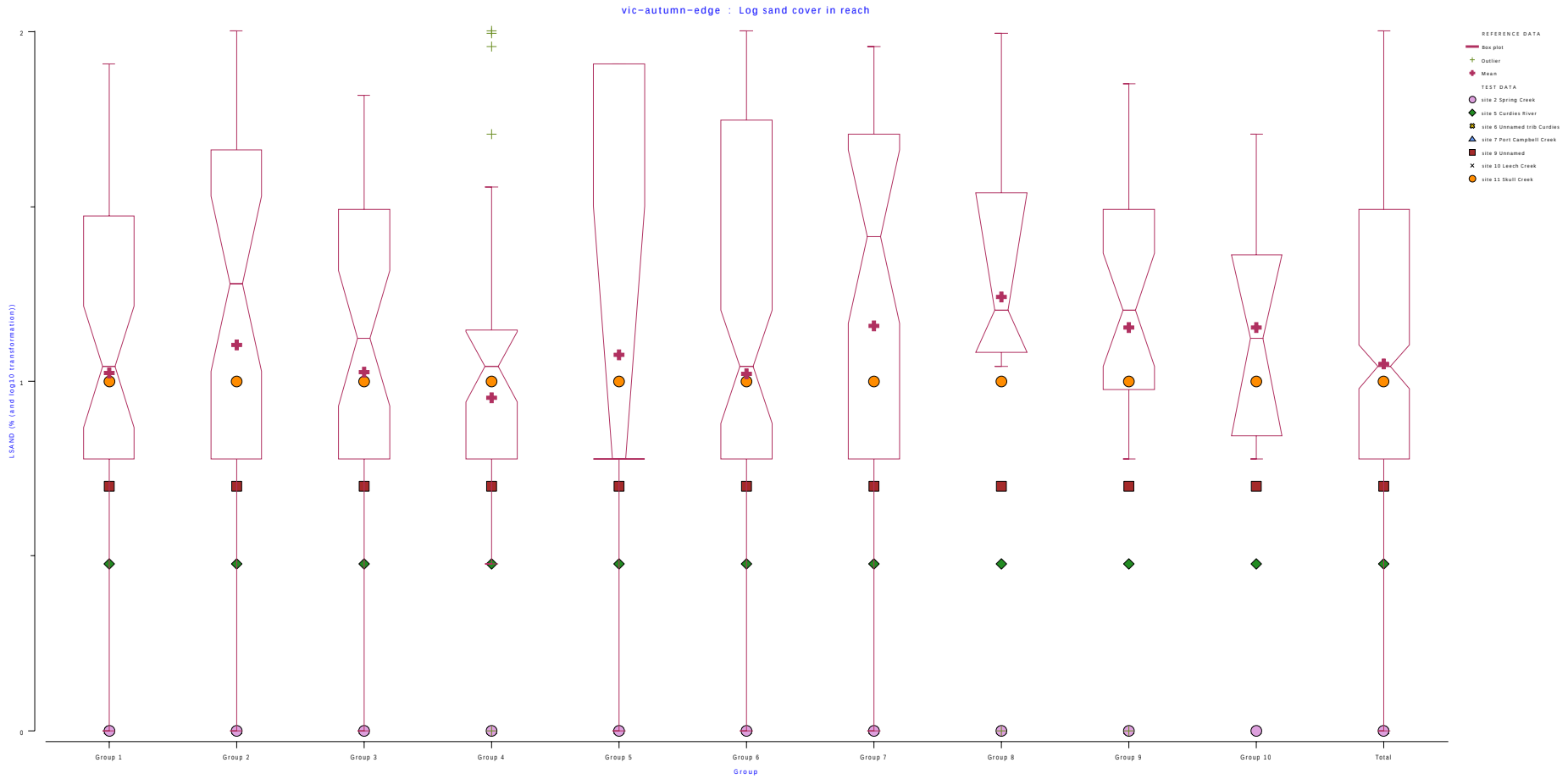
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log sand cover in reach
LSAND (% (and log10 transformation))
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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site 9 Unnamed
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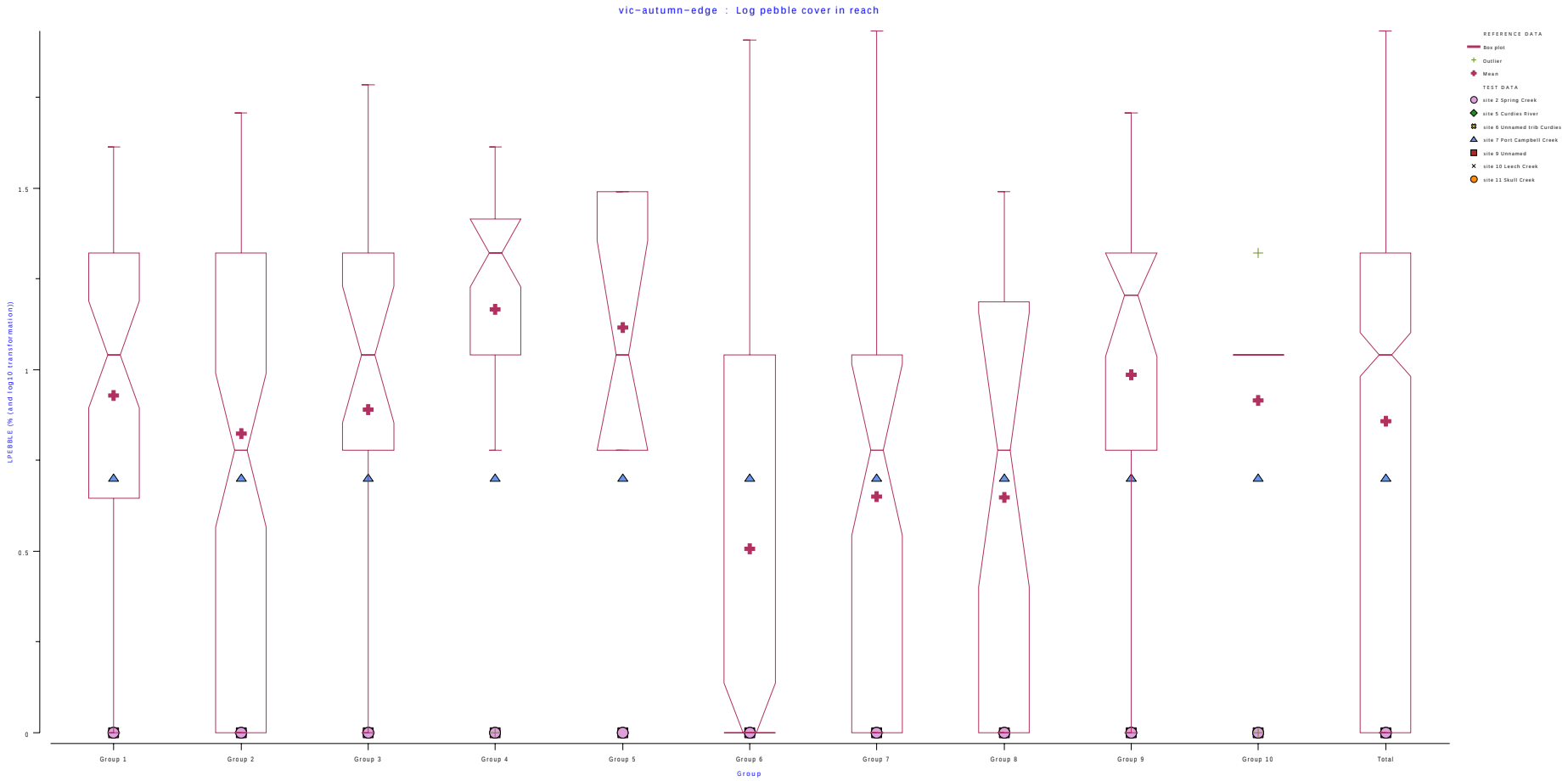
site 11 Skull Creek


vic-autumn-edge : Log pebble cover in reach
LPEBBLE (% (and log10 transformation))
1.5
1
0.5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
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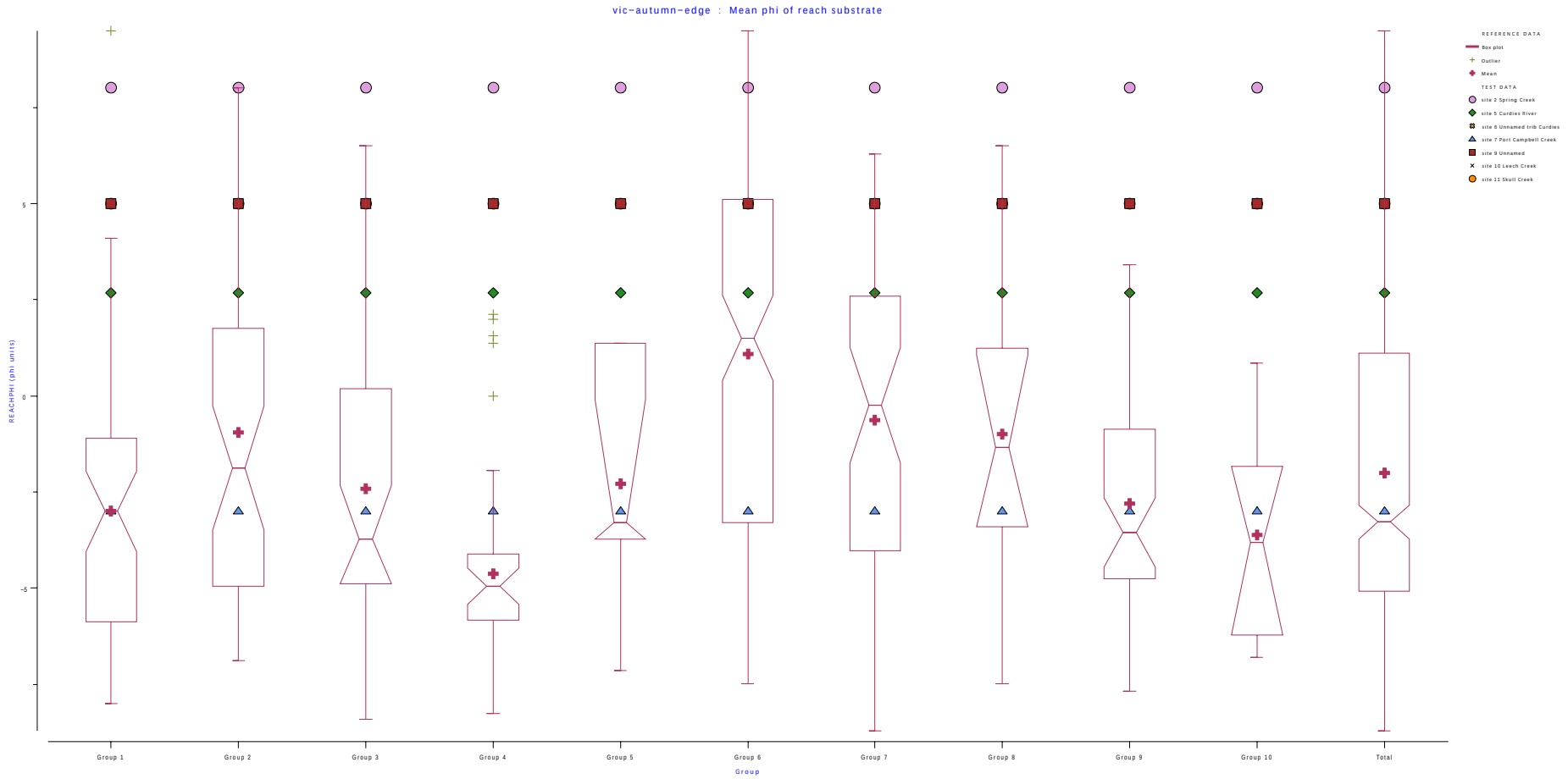
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Mean phi of reach substrate
REACHPHI (phi units)
5
0
-5
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
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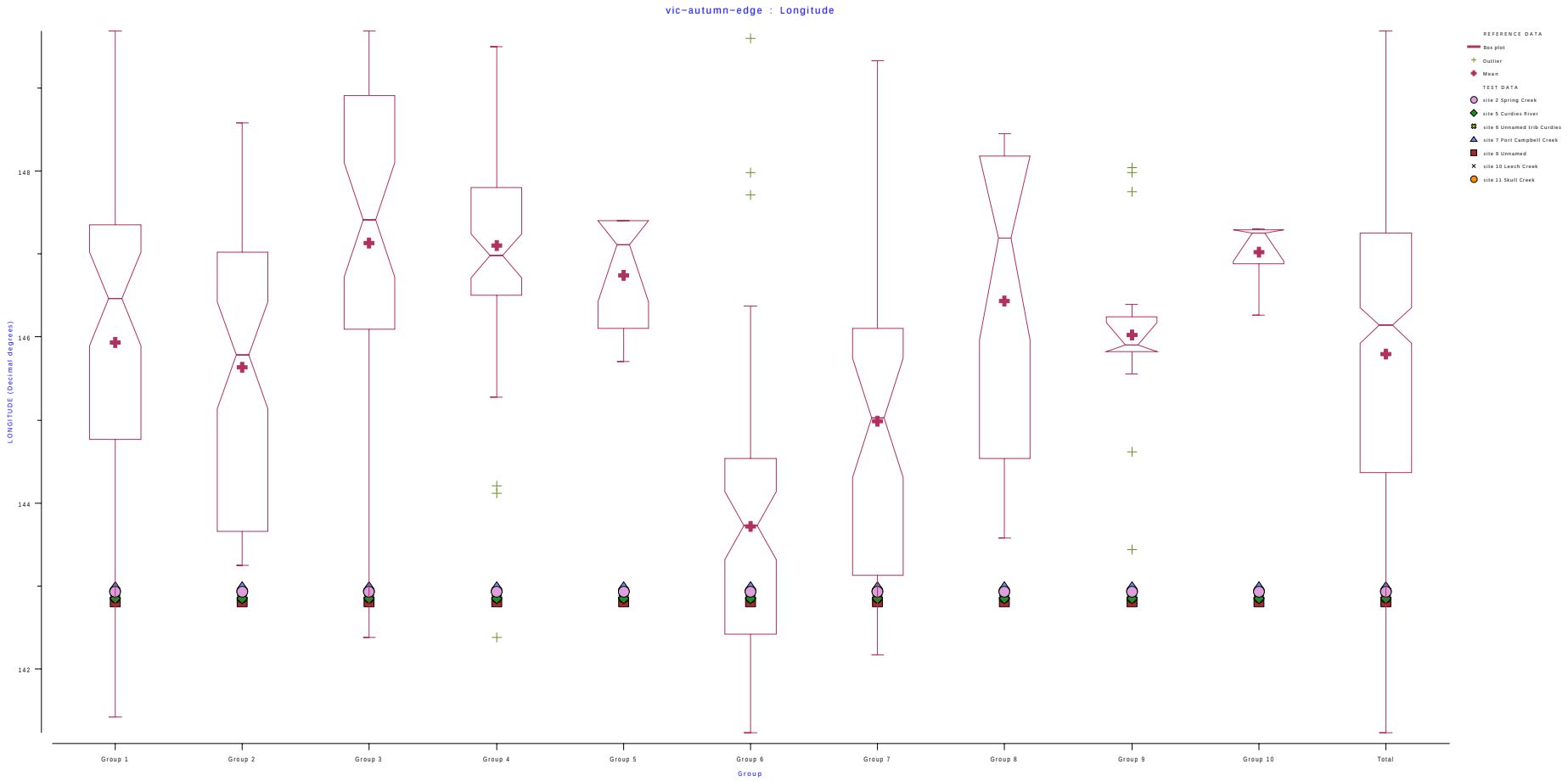
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Longitude
LONGITUDE (Decimal degrees)
148
146
144
142
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
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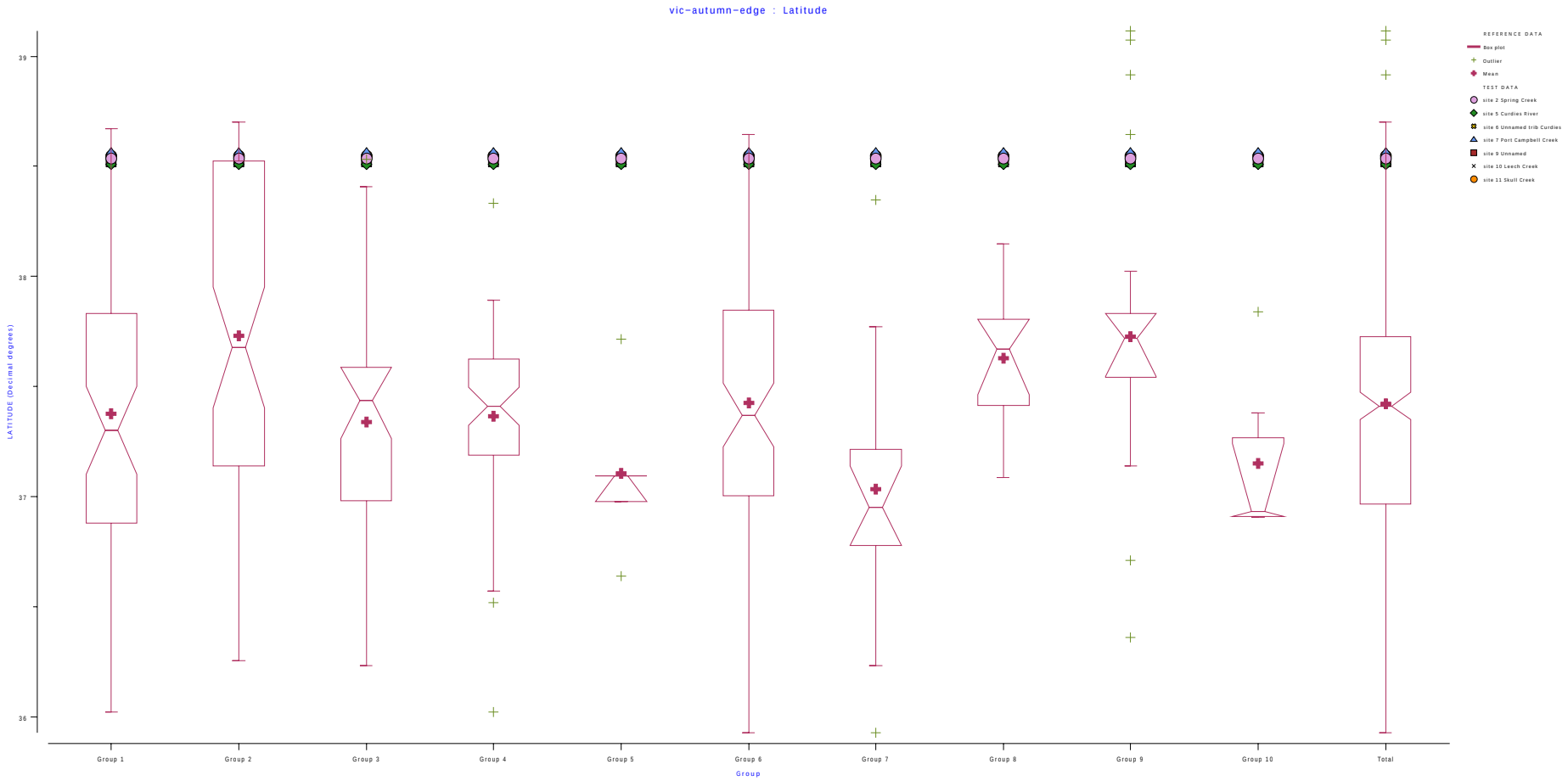
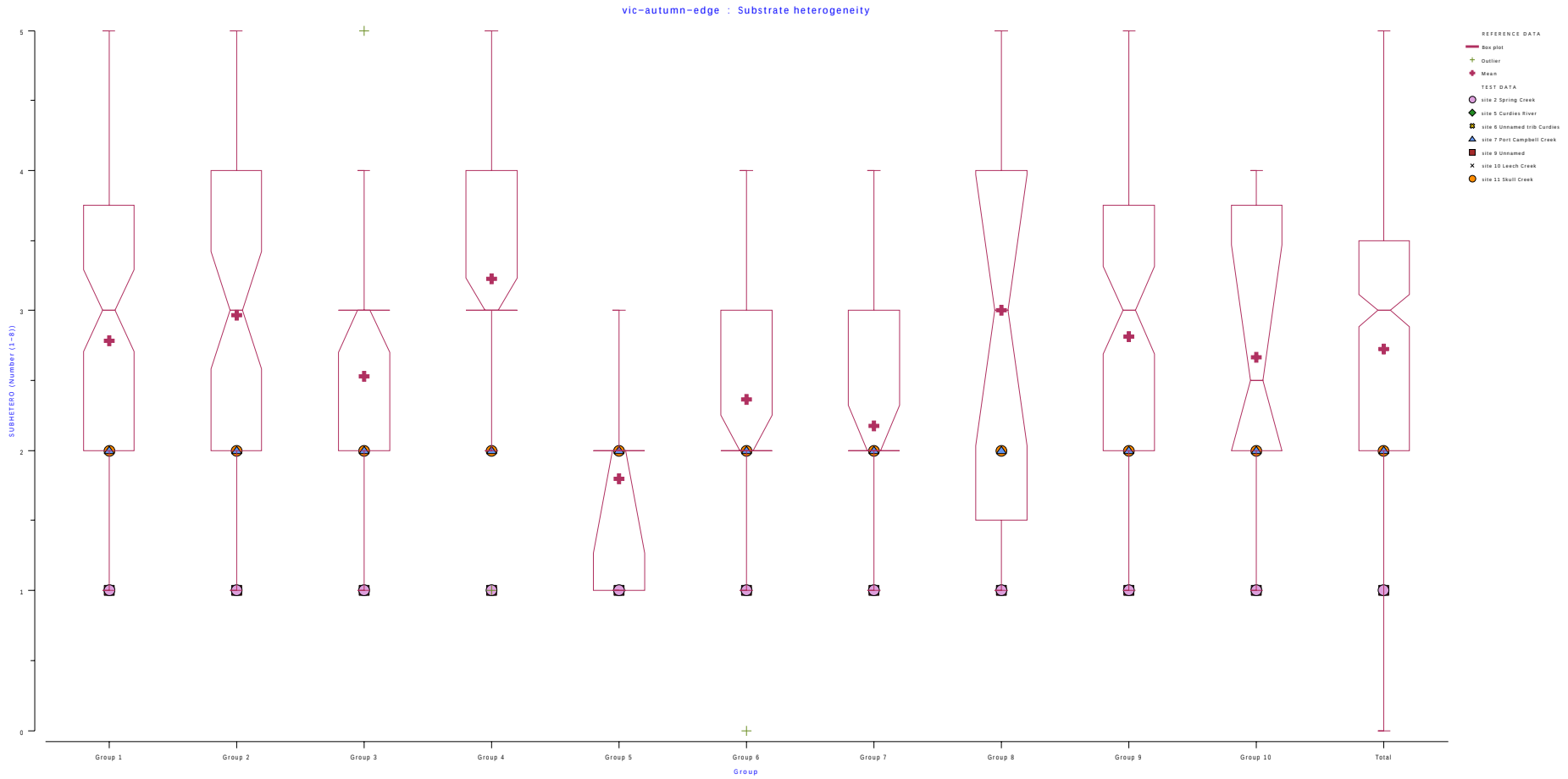

vic-autumn-edge : Latitude
LATITUDE (Decimal degrees)
39
38
37
36
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Substrate heterogeneity
SUBHETERO (Number(1-8))
5
4
3
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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site 7 Port Campbell Creek
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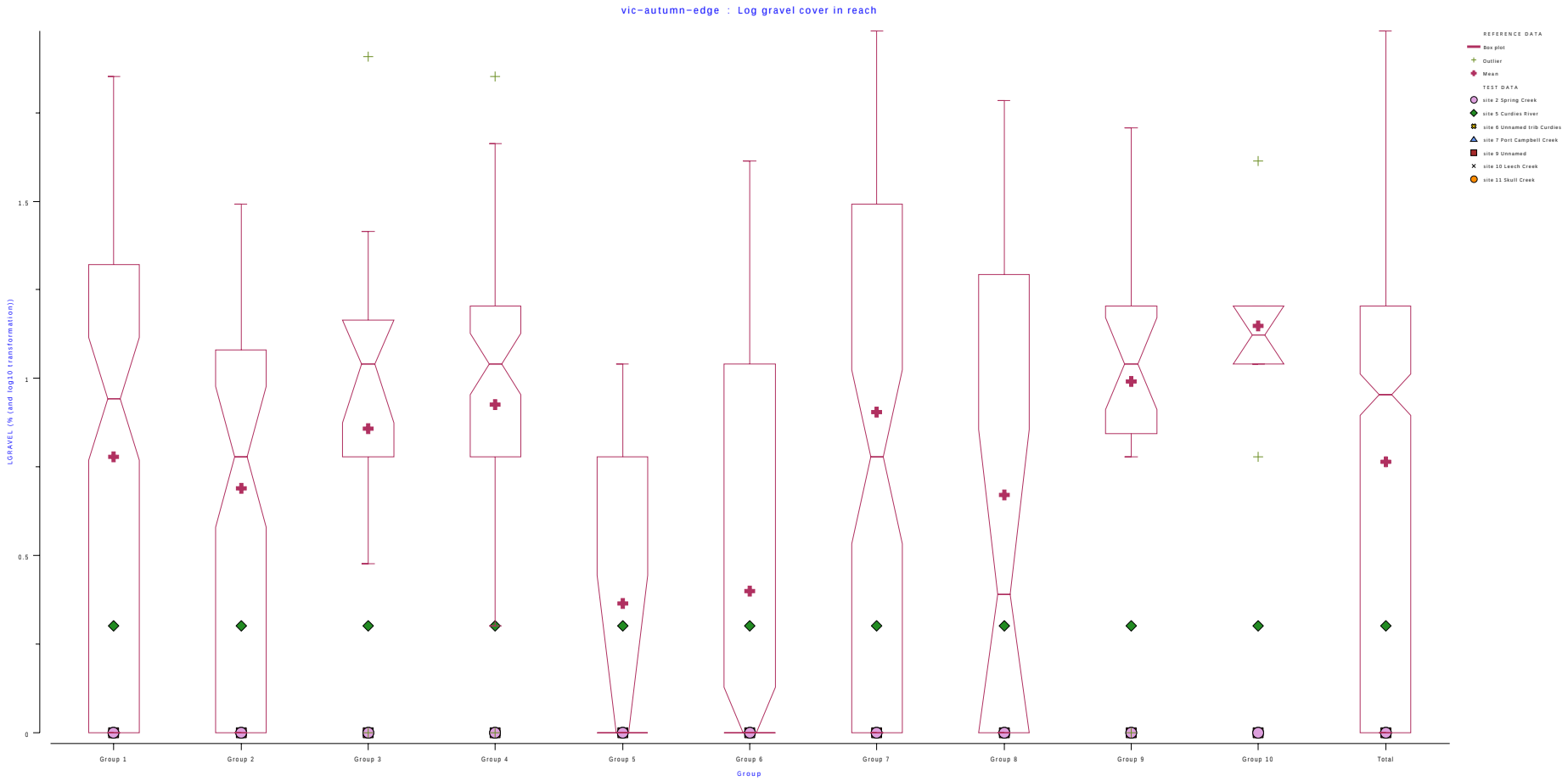
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log gravel cover in reach
LGRAVEL (% (and log10 transformation))
1.5
1
0.5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
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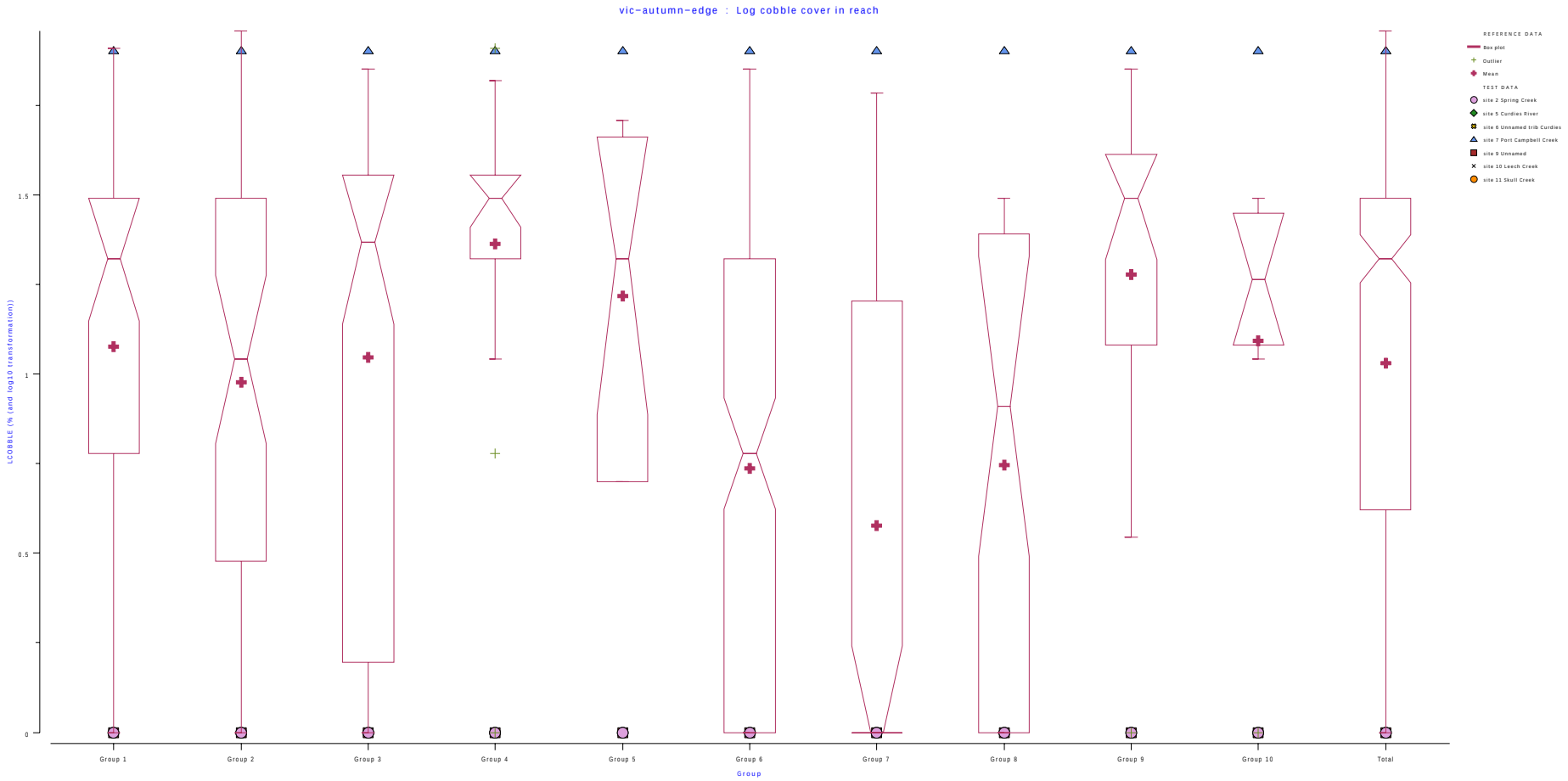
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log cobble cover in reach
LCOBBLE (% (and log10 transformation))
1.5
1
0.5
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
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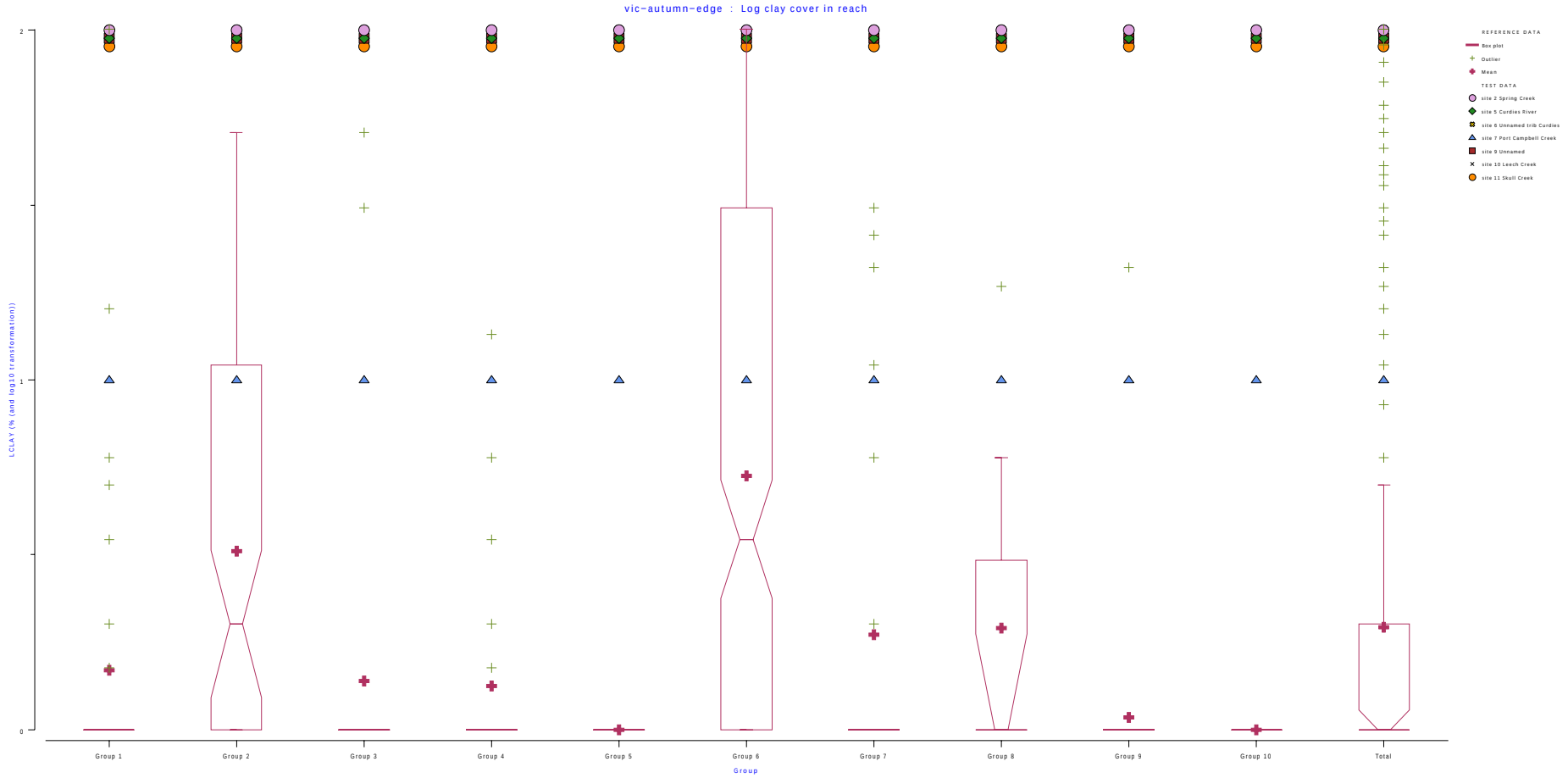
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek


vic-autumn-edge : Log clay cover in reach
LCLAY (% (and log10 transformation))
2
1
0
Group 1
Group 2
Group 3
Group 4
Group 5
Group 6
Group 7
Group 8
Group 9
Group 10
Total
Group
REFERENCE DATA
Box plot
Outlier
Mean
TEST DATA
site 2 Spring Creek
site 5 Curdies River
site 6 Unnamed trib Curdies
site 7 Port Campbell Creek
site 9 Unnamed
site 10 Leech Creek
site 11 Skull Creek

# Appendix 7: Glossary

Items marked with an asterisk (*) are cited from (DEPI 2013a) and items marked with a caret (^) are cited from DSE (2007b).

**Avoid***

Avoiding removing any native vegetation when undertaking a use or development. This can be either by not permitting or not going ahead with the use or development, or locating it elsewhere so that removing native vegetation is not required.

**Benchmark^**

A standard vegetation –quality reference point, dependent on vegetation type, which is applied in habitat hectare assessments. Represents the average characteristics of a mature and apparently long undisturbed state of the same vegetation type.

**Biodiversity***

The variety of all life forms, the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part.

**Biodiversity Interactive Map (BIM)**

Web based interactive map available on the DSE website that provides information on the biodiversity of Victoria and displays flora and fauna data from the Victorian Biodiversity Atlas.

**Bioregion^**

Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values. A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.

**BushBroker***

A program coordinated by DEPI to match parties that require native vegetation offsets with third party suppliers of native vegetation offsets.

**Canopy Tree^**

A tree, greater than three meters in height, that is normally found in the upper layer of a vegetation type. Canopy trees are specified within each Ecological Vegetation Class in Victoria.

**Condition score**

The score assigned to a habitat zone that indicates the quality of the vegetation relative to the ecological vegetation class benchmark, usually expressed as a percentage or on a scale of 0 to 1.

**Degraded treeless vegetation^**

Vegetation that is neither a wetland, a remnant patch nor scattered tree(s).

**Dispersed habitat***

Habitat for a rare or threatened species whose habitat is spread over a relatively broad geographic area.

**DBH (Diameter at Breast Height)^**

The diameter of the main trunk of a tree measured 1.3 m above ground level.

**Ecological vegetation class (EVC)***

A native vegetation type classified on the basis of a combination of its floristic, life form, environmental and ecological characteristics.

**EVC (see Ecological vegetation class)^**

**Extent risk***

The level of risk to biodiversity from the removal of native vegetation based on the area and/or number of scattered trees to be removed.

**Forb**

A herbaceous flowering plant that is not a graminoid (grass, sedge or rush).

**Gain***

Predicted improvement in the contribution to Victoria's biodiversity achieved from an offset, calculated by combining site gain with the strategic biodiversity score or habitat importance score of the site. Gain is measured with biodiversity equivalence scores or units.

**Gain Target^**

The amount of gain that needs to be achieved to offset a loss measured in habitat hectares.

**General biodiversity equivalence score/units***

Score or units used to quantify the relative overall contribution of a site to Victoria's biodiversity.

**General offset***

An offset that is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have a significant impact on habitat for any rare or threatened species.

**General provisions***

Operational requirements in planning schemes which are consistent across the state, relating to matters such as administrative provisions, ancillary activities and referral of applications.

**Habitat hectares site assessment***

A site-based measure of the condition of native vegetation with reference to the benchmark for the same type of native vegetation. The assessment generates a condition score of between 0 and 1.

**Habitat hectares benchmark***

A reference point for each vegetation type that represents the average condition of mature stands that are likely to reflect pre-settlement circumstances.

**Habitat hectares***

Combined measure of condition and extent of native vegetation. This measure is obtained by multiplying the site's condition score (measured between 0 and 1) with the area of the site (in hectares).

**Habitat importance map***

A map that indicates the importance of locations as habitat for a particular rare or threatened species. This map is based on modelled data.

**Habitat importance score***

Measure of the importance of the habitat located on a site for a particular rare or threatened species.

**Habitat zone^**

A discrete area of native vegetation consisting of a single vegetation type (EVC) within an assumed similar quality. This is the base spatial unit for conducting a habitat hectare assessment. Separate *Vegetation Quality Assessments* (or habitat hectare assessments) are conducted for each habitat zone within the designated assessment area.

**Highly localised habitat***

Habitat for rare or threatened species whose habitat is spread over a very restricted area (i.e. less than 2,000 ha). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species.

**Improvement gain^**

This is gain resulting from management commitments beyond existing obligations under legislation to improve the current vegetation quality. Achieving improvement gain is predicated on maintenance commitments being already in place. For example, control of any threats such as grazing that could otherwise damage the native vegetation must already be agreed. Typical actions leading to an improvement gain include reducing or eliminating environmental weeds, enhancement planting or revegetation over a 10-year management period. If the vegetation is to be used as an offset, a commitment to maintain the improvement gain (i.e. no subsequent decline in quality) will be required in perpetuity.

**Incorporated document***

A document that is included in the list of incorporated documents in a planning scheme. These documents affect the operation of the planning scheme.

**Indigenous vegetation^**

The type of native vegetation that would have normally been expected to occur on the site prior to European settlement.

**Landholder***

An owner, occupier, proprietor or holder of land.

**Landowner***

Owner of land.

**Large Old Tree (LOT) ^**

A tree with a DBH equal to or greater than the large tree diameter as specified in the relevant EVC benchmark.

**Landscape scale information***

Mapped or modelled information based on data collected across the landscape rather than just on a particular site.

**Listed species**

A flora or fauna species listed under the Commonwealth *Environment Protection and Biodiversity Act 1999* or listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.

**Local Planning Policy Framework***

Framework outlining a Municipal Strategic Statement and the Local Planning Policies that apply to the local government area.

**Location risk***

The risk that removing native vegetation in a particular location will have an impact on the persistence of a rare or threatened species.

**Loss***

Loss in the contribution to Victoria's biodiversity when native vegetation is fully or partially removed, as measured in biodiversity equivalence scores or units.

**Maintenance Gain^**

This is gain from commitments that contribute to the maintenance of the current vegetation quality over time (i.e. avoiding any decline). Includes foregoing certain entitled activities that could otherwise damage or remove native vegetation, such as grazing or firewood collection. Also typically requires a commitment to ensure no further spread of environmental weeds that may otherwise result in the loss of vegetation quality over time. If the vegetation is to be used as an offset, a commitment to maintain the vegetation quality will be required in perpetuity.

**Minimise***

Locating, designing or managing a use or development to reduce the impacts on biodiversity from the removal of native vegetation.

**Native (indigenous) vegetation^**

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

**Native vegetation credit***

Gains in the contribution that native vegetation makes to Victoria's biodiversity that are registered on the native vegetation credit register. Native vegetation credits are offered for sale to parties who are required to offset the removal of native vegetation.

**Native vegetation credit register***

A statewide register of native vegetation credits that meet minimum standards for security and management of sites. The register is administered by the Department of Environment and Primary Industries, and records the creation, trade and allocation of credits to meet specific offset requirements.

**Native vegetation extent***

Area of land covered by native vegetation or the number of scattered trees.

**Native Vegetation Information Management (NVIM) system ***

An on-line management tool to assess the potential risk assessment pathway to use for the proposed clearing of native vegetation. Where a project is assessed under the low risk pathway the NVIM provides an offset prescription for the defined loss of native vegetation.

**Native vegetation particular provision***

Clause 52.17 in the Victoria Planning Provisions that relates to the removing, destroying or lopping of native vegetation.

**No net loss***

An outcome where a particular gain in the contribution to Victoria's biodiversity is equivalent to an associated loss in the contribution to Victoria's biodiversity from permitted clearing.

**Offset***

Protection and management (including revegetation) of native vegetation at a site to generate a gain in the contribution that native vegetation makes to Victoria's biodiversity. An offset is used to compensate for the loss to Victoria's biodiversity from the removal of native vegetation.

**Offset market***

A system which facilitates trade of native vegetation credits between parties requiring offsets and third party suppliers of offsets.

**Offset Management Plan (OMP)**

A document which sets out the requirements for establishment, protection and management of an offset site.

**Old tree^**

A tree with a DBH equal to or greater than 0.75 of the large tree diameter as specified in the relevant EVC benchmark. Includes medium old trees and large old trees (see separate definitions). Some Regional Native Vegetation Plans additionally define very large old trees (1.5 times large tree diameter).

**On-site offset^**

An offset located on the same property as the clearing.

**Particular Provisions***

Provisions in the Victoria Planning Provisions that relate to specific activities (for example, native vegetation is a Particular Provision).

**Permit***

A legal document that gives permission for a use or development on a particular piece of land.

**Permitted clearing***

Removal of native vegetation for which a planning permit has been granted to remove native vegetation.

**Permitted clearing regulations***

The rules in the planning system that regulate permits for the removal of native vegetation.

Planning provisions – See Victoria Planning Provisions.

**Planning scheme***

Policies and provisions for the use, development and protection of land in a local government area.

**Planning system***

Victoria's land-use planning system that includes the Victoria Planning Provisions and each local government's planning scheme.

**Perennial***

A plant that lives for more than two years. Perennials include species that are always visible e.g. shrubs and trees, but also include species that are not always visible above ground.

**Prior management gain**

This gain acknowledges actions to manage vegetation since State-wide planning permit controls for native vegetation removal were introduced in 1989.

**Property Vegetation Plan^**

A plan which relates to the management of native vegetation within a property, and which is contained within an agreement made pursuant to section 69 of the Conservation, Forests and Lands Act 1987.

**Protected species**

A flora species protected under the *Victorian Flora and Fauna Guarantee Act 1988.*

**Protection (of a tree) ^**

An area with twice the canopy diameter of the tree(s) fenced and protected from adverse impacts: grazing, burning and soil disturbance not permitted, fallen timber retained, weeds controlled, and other intervention and/or management if necessary to ensure adequate natural regeneration or planting can occur.

**Rare or threatened species***

A species that is listed in:

- DEPI's Advisory List of Rare or Threatened Plants in Victoria as 'endangered', 'vulnerable', or 'rare', but does not include the 'poorly known' category
- DEPI's Advisory List of Threatened Vertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories
- DEPI's Advisory List of Threatened Invertebrate Fauna in Victoria as 'critically endangered', 'endangered' or 'vulnerable', but does not include 'near threatened' or 'data deficient' categories.

**Recruitment^**

The production of new generations of plants, either by allowing natural ecological processes to occur (regeneration etc), by facilitating such processes such as regeneration to occur, or by actively revegetating (replanting, reseeding). See Revegetation.

**Referral authority***

An authority that a permit application is referred to for decision under Section 55 of the Planning and Environment Act 1987. All referral requirements are specified in Clause 66 of planning schemes.

**Remnant patch of native vegetation***

Either:

- an area of native vegetation , with or without trees, where at least 25 per cent of the total perennial understorey plant cover is native plants
- an area with three or more indigenous canopy trees where the tree canopy cover is at least 20 per cent.

**Remnant vegetation^**

Native vegetation that is established or has regenerated on a largely natural landform. The species present are those normally expected in that vegetation community. Largely natural landforms may have been subject to some past surface disturbance such as some clearing or cultivation (or even the activities of the nineteenth century gold rushes) but do not include man-made structures such as dam walls and quarry floors.

**Responsible authority***

The authority charged with the responsibility for administering and enforcing particular aspects of a planning scheme.

**Revegetation^**

Establishment of native vegetation to a minimum standard in formerly cleared areas, outside of a remnant patch.

**Scattered tree***

An indigenous canopy tree that does not form part of a remnant patch of native vegetation (see definition of remnant patch of native vegetation).

**Section 173 agreements^**

A management agreement primarily between a landowner and the responsible authority according to section 173 of the Planning and Environment Act 1987.

**Security Gain**

This is gain from actions to enhance security of the on-going management and protection of native vegetation at the offset site, either by entering into an on-title agreement (for example under Section 173 of the *Planning and Environment Act 1987*), or by locating the offset on land that has greater security than the clearing site, or by transferring private land to a secure public conservation reserve.

**Site***

An area of land that contains contiguous patches of native vegetation or scattered trees, within the same ownership.

**Site-based information***

Information that is collected at a site.

**Site gain***

Predicted improvement in the condition, or the condition and extent, of native vegetation at a site (measured in habitat hectares) generated by the landowner committing to active management and increased security.

**Site loss***

Loss in the condition, or condition and extent, of native vegetation when native vegetation is fully or partially removed, measured in habitat hectares.

**sp.**

Species (one species).

**spp.**

Species (more than one species).

**Species persistence***

The continued existence of a species into the future.

**Specific biodiversity equivalence score/units***

With reference to a specific species, a score or units used to quantify the relative contribution of a site to Victoria's biodiversity.

**Specific-general offset test***

A test used to determine whether a general or specific offset is required based on the impact of native vegetation removal on the habitat for rare or threatened species.

**Specific offset***

An offset that is targeted to a particular species (or multiple species) impacted by the removal of native vegetation.

**State Planning Policy Framework***

A collection of clauses in the Victoria Planning Provisions that inform planning authorities and responsible authorities of those aspects of state planning policy which they are to take into account and give effect to in planning and administering their respective areas.

**Strategic biodiversity map***

A map that shows the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species. The map is based on modelled data.

**Strategic biodiversity score***

A score that quantifies the relative value of a location in the landscape with regard to its condition, extent, connectivity and the support function it plays for species.

**Strategic planning***

A coordinated approach to planning where areas for conservation and areas which can be cleared are strategically identified.

**Supplementary planting**

Establishment of overstorey and/or understorey plants within a remnant patch. Typically includes the planting or direct-seeding of understorey life forms.

**Taxon (plural taxa)**

A term used to describe any taxonomic unit. This term is typically used when referring broadly to any scientifically recognised species, subspecies or variety.

**Third-party offset^**

An offset located on a property owned by a person other than the landowner who incurs the native vegetation loss being offset.

**Patch** (see Remnant Patch)

**Understorey**

Understorey is all vegetation other than mature canopy trees – includes immature trees, shrubs, grasses, herbs, mosses, lichens and soil crust. It does not include dead plant material that is not attached to a living plant. More information on understorey life forms is set out in the Vegetation Quality Assessment Manual (DSE 2004).

**Victoria Planning Provisions***

A list of planning provisions that provides a standard template for individual planning schemes.

**Zone***

A zone in the Victoria Planning Provisions is a set of permitted uses of land which are defined spatially.

**Vegetation Quality Assessment**

The standard DEPI method for assessing remnant patches of vegetation. Details of the method are outlined in the Vegetation Quality Assessment Method (DSE 2004). The results of the assessment are expressed in habitat hectares. Also referred to as a 'habitat hectare assessment'.