Hamilton Environmental Services
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WINTON WETLANDS

INDEX OF WETLAND CONDITION ASSESSMENTS 2012/2013

Winton Wetlands

Winton Wetlands –Index of Wetland Condition Assessments 2012/2013

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Cover Photo: A view across Bill Friday Swamp in December 2012.

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1. INTRODUCTION

The Winton Wetlands Committee of Management (WWCoM) engaged Hamilton Environmental Services (HES) in December 2012 to undertake Index of Wetland Condition (IWC) assessments on thirteen wetlands within the Winton Wetlands:

- Sergeants Swamp;
- Winton Swamp;
- Green Swamp;
- Boggy Bridge Swamp;
- Blacks Swamp;
- Lindsays Swamp;
- Sadlers Swamp;
- Humphries Swamp;
- 11 Mile Wetland;
- Ashmeads Swamp;
- Bill Friday Swamp;
- 7 Mile Wetland;
- Duck Pond.

HES made the decision during the assessment process to undertake assessments on five unnamed wetlands, and a further wetland identified as an extension to Boggy Bridge Swamp. After the submission of the initial reporting, the WWCoM authorised the assessment of eleven new wetlands, which occurred in early 2013.

Field assessments in accordance with IWC methodology were undertaken on the initial nineteen wetlands between the 14th and 22nd December 2012, and on the new eleven wetlands on the 7th, 14th and 27th March 2013, by Dr. Steve Hamilton, in combination with either Chris Neilson or Michael Saunders, Wetlands Ranger, WWCoM.

This report provides both the necessary documentation and mapping for IWC assessment, and a general description of each wetland assessed based on the field evaluation.

2. METHOD

2.1 The Index of Wetland Condition

The Index of Wetland Condition (IWC) is a standard method developed in Victoria by the Department of Sustainability and Environment (DSE) for rapid assessment of wetland condition. It is based on the state of the biological, physical and chemical components of the wetland ecosystem and their interactions. The method aims to differentiate natural from human-induced changes in wetland condition.

The technique is suitable for use at all naturally occurring, non-flowing wetlands without a marine hydrological influence in Victoria, at any time of the year. It is designed to assess wetland condition in a single visit; it can be used as a tool for surveillance of wetland extent and condition over a 10-20 year timeframe. Images of the wetland and of vegetation type condition from geo-located photopoints facilitate the use of the method as a longer-term monitoring tool.

The IWC takes the form of a hierarchical index. It has six sub-indices based on the characteristics that define wetlands that are assessed at each wetland (from DSE 2009 and Papas *et al.* 2009a):

- catchment (definition of the wetland buffer and adjacent land use intensity);
- physical form (reduction in wetland area from previously mapped boundaries and changes in bathymetry);
- hydrology (assessment of activities that may have changed the water regime);
- soils (assessment of extent and severity of wetland soil disturbance);
- water properties (evidence of salinity influence and activities leading to nutrient enrichment); and
- biota (determination of wetland vegetation type(s) [Ecological Vegetation Class, or EVC], presence/abundance of critical lifeform groups for identified wetland types, vegetation structure and health, presence and abundance of weeds, and indicators of altered ecological processes).

The measures for each sub-index have been selected by identifying commonly accepted and well recognised threats and impacts in Victoria that affect wetland condition and relating them to key ecological components of wetlands (DSE 2005a; Papas *et al.* 2009b). The measures were then assessed against suitability for rapid assessment. A methods manual provides details of how to collect the recommended measures (Papas *et al.* 2009a and updates such as DSE 2012).

Each measure is scored in comparison to a reference condition (e.g. DSE 2011). Each sub-index is scored out of 20. Sub-index scores are added together to give a total score out of a possible 120. No weightings are used. The wetland is then assigned a condition category based on its total score (DSE 2009).

2.2 Wetland Assessment

2.2.1 Location of Wetlands

The basic details, name and identifier numbers of each of the nineteen wetlands is provided in Table 2-1.

The location of the thirty wetlands is shown in Fig. 2-1.

2.2.2 Timing of Assessments

Wetland assessments were undertaken by Dr. Steve Hamilton, Chris Neilson and Michael Saunders on the 14th, 16th, 17th, 21st and 22nd December 2012, and the 7th, 14th and 27th March 2013. All of these days were free from rain and were fine with light winds, and maximum temperatures ranging from 22 to 35°C (Bureau of Meteorology 2013).

2.2.3 Field Method

The IWC methodology for the assessment of each wetland was undertaken strictly in accordance with Version 7 of the IWC Methods Manual (Papas *et al.* 2009a) and taking into account the most recent update of the method (December 2012; DSE 2012).

Version 8 of the IWC Field Assessment Sheet (DSE 2009) was used for recording data, and the latest version of the IWC Wetland EVC Benchmarks utilised for determining EVC(s) at each wetland (DSE 2010).

As according to DSE (2009), a series of base maps have been drawn for each wetland. All of these base maps have been drawn with an appropriate grid and scale using ArcGIS 10 and a recent aerial image as a map base:

- Map 1. Features previous mapped wetland extent 2010 (Davidson and Mann 2010) and 2012 mapped extent, notable features located within the wetland, and the extent of the wetland buffer;
- Map 2. Adjacent land use intensity and location of soil disturbance within the wetland;
- Map 3. Location of EVCs within the wetland;
- Map 4. If the entire wetland was not able to be surveyed, an approximate area of survey is shown.

The wetlands assessed are listed in Table 2-1. While thirteen of the wetlands had an existing name, the remaining seventeen do not, and these were assigned temporary names for the sake of identification. Similarly, sixteen of the wetlands have been assigned wetland identifier numbers by DSE, with fourteen wetlands at this time not assigned such a number; Green, Winton and Sergeants Swamps have been assigned the one number between them, and treated as a 'complex' (Table 2-1).

The 2010 areas are based on the mapping by Davidson and Mann (2010), and the 2012 area based on the extent mapping for this project (Table 2-1). It should be noted that the grouping of Green, Winton and Sergeants Swamps in 2010 has resulted in a total area for the three wetlands, while separate areas have been delineated in 2012 (Table 2-1).

The largest swamp is Winton Swamp (1,791 ha), while the smallest is Unnamed Swamp K (2.12 ha), with twenty six of the thirty swamps being under 100 ha in area, and twenty being under 25 ha (Table 2-1).

An inventory of all vascular plants species was recorded for each wetland, with a cover-abundance value being ascribed for each species observed. This inventory and the cover-abundance values have been included with the Field Assessment Sheets in the relevant appendix for each wetland, and also recorded in a two-way table in Appendix A for each wetland.

2.2.4 Typical Ecological Vegetation Classes

There were several wetland EVCs observed across the nineteen wetlands at the time of assessment, across a range of quality and condition. A typical description of these EVCs as observed within the Winton Wetlands is included below. Common names have been used in preference throughout the text; scientific and common names can be found in Appendix A.

Aquatic Herbland EVC (EVC 653)

Semi-permanent to seasonal wetland vegetation, treeless (or nearly so) and predominantly open areas, dominated by herbaceous aquatic species (typically with at least rootstocks tolerant of dry periods)(DSE 2011). Typical species for this EVC at Winton Wetlands include Upright and Red water-milfoil, Water Primrose, Common Spike-sedge, Starfruit, Swamp Lily, Water Primrose and Water Ribbons. In the assessment of wetlands in this project, open areas of water and dried-out areas in wetlands were classified as Aquatic Herbland EVC if there was any evidence of the occupation of the site by typical EVC species as listed. This was done as it is known that over the 2010-2011wet period, most such wetlands maintained significant and diverse patches of this EVC, however, drier conditions since this time have resulted in a decline or temporary disappearance of this EVC until the next favourable environmental conditions (i.e. flooding).

Billabong Wetland Aggregate EVC (EVC 334)

This name is a collective label for the various zones of vegetation associated with lagoons/billabongs on flood-plains (DSE 2011). Applied because more distinctive wetland components within the wetland are not at a sufficient scale to allow comprehensive separation. There are no specific typical

species, and reference needs to be made to the component EVC benchmarks. However, in the one instance of this EVC at Winton Wetlands, species such as Tall and Leafy Flat-sedge, Clammy Goosefoot, Common Sneezeweed, Globular Pigweed, Spiny Mud-grass and Lesser Joyweed were common.

Table 2-1 Wetland names, ID numbers and areas.

Wetland Name	Temporary Name	Wetland ID Number	2010 area (ha)	2012/13 area (ha)
7 Mile Wetland			8.83	5.37
11 Mile Wetland		812567923	12.6	8.00
Ashmeads Swamp		812567925	64.1	91.7
Bill Friday Swamp		812567926	26.3	64.6
Blacks Swamp		812567927	23.6	24.6
Boggy Bridge Swamp		812567913	130.7	173.9
	Boggy Bridge North Swamp			51.9
Duck Pond			12.0	14.4
Humphries Swamp		812567929	8.22	8.85
Lindsay Swamp	Lindsay Swamp East	812567930	14.4	15.9
	Lindsay Swamp West	812567932	32.0	48.4
Sadlers Swamp		812567931	12.5	16.8
	Unnamed Swamp A	812567936	2.93	5.31
	Unnamed Swamp B	812567935	1.70	3.29
	Unnamed Swamp C	812567934	2.96	4.47
	Unnamed Swamp D			6.46
	Unnamed Swamp E	812567933	35.2	39.4
	Unnamed Swamp F			4.03
	Unnamed Swamp G			8.50
	Unnamed Swamp H			4.29
	Unnamed Swamp I			14.9
	Unnamed Swamp J			3.12
	Unnamed Swamp K			2.12
	Unnamed Swamp L			46.2
	Unnamed Swamp M			2.93
	Unnamed Swamp N			8.70
	Unnamed Swamp O			2.62
Sergeants Swamp		812567909	2,952.5	598.5
Winton Swamp				1,791.7
Green Swamp				802.0

Dwarf Floating Aquatic Herbland EVC (EVC 949)

Surface layer of dwarf free-floating plants, usually as component of more diverse aquatic systems, but sometimes comprising the only life-form present, and potentially expanding over broad areas during inundation (DSE 2011). There was no specific labelling of any area in a wetland at Winton Wetlands with this EVC, but there were small areas amidst Aquatic Herbland EVC where the character species were observed. Typical species include Common Duckweed, Ferny Azolla and Fringed Heartwort.

Floodplain Riparian Woodland EVC (EVC 56)

Eucalypt woodland of well-developed floodplains of less arid areas, often with treeless wetland areas. At maximum development, Floodplain Riparian Woodland represents the vegetation of a mosaic of terraces, active floodways and former channels and consequently a number of communities indicative of a range of hydrological conditions. Parts of the floodplain which typically lack obligate wetland species (e.g. levees which are only intermittently and briefly subject to flooding if at all) may support vegetation referable to as Riparian Woodland. It is rare that the more distinctive wetland components within Floodplain Riparian Woodland are at a sufficient scale to allow comprehensive separation (DSE 2011). In the one instance of this EVC at Winton Wetlands, species such as River Red Gum, Rush Sedge and Knob Sedge were common.

Lake Bed Herbland EVC (EVC 107)

Herbland dominated by species adapted to drying mud within lake beds; some species evade periods of prolonged inundation as seed, others as dormant tuberous rootstocks (DSE 2011). This EVC is effectively a progression of Aquatic Herbland EVC and other 'treeless' EVCs during the drier phases of a wetland (Frood 2011). There was no specific labelling of any area in a wetland at Winton Wetlands with this EVC, but there were small areas where the character species were observed. Typical species in this EVC at Winton Wetlands include Clammy Goosefoot, Matted Pratia, Hairy Carpet Weed and Globular Pigweed.

Plains Grassy Wetland (EVC 125)

These are grassy-herbaceous shallow seasonal wetlands of lowland plains, which are characteristically species-rich (at least on the verges) when relatively intact. This EVC was formerly widespread in lowland plains areas. A variety of grasses can be dominant, including Southern Cane-grass (DSE 2011), and according to Frood (2011), dense swards of Southern Cane-grass at the Winton Wetlands would be classified as Plains Swampy Woodland EVC, or possibly a lower rainfall version of Plains Grassy Wetland EVC. Stands of Southern Cane-grass have been noted both historically and following recent flooding events across a number of wetlands in the Winton system. While some small areas of this species were observed at some wetlands, dense swards were only seen at Unnamed Swamps L and to an extent, O.

Red Gum Swamp EVC (EVC 292)

Woodland of swampy depressions of lowland plains, with sedgy-herbaceous understorey including aquatic species (DSE 2011). In the one instance of this EVC at Winton Wetlands, species such as River Red Gum, Pale Knotweed, Creeping Mint, Common Spike-sedge, Rush Sedge and Knob Sedge were common.

Floodway Pond Herbland (EVC 810)

This EVC is recognised as low herbland on the drying mud of floors of ponds on floodway systems (mainly riverine floodplains). The floristics (and diversity) can be quite variable (both spatially and temporally), according to the traits of the relevant individual pond. The floristics also vary in temporal cycles with the unvegetated (open water/bare soil/mud; EVC 990) areas, and probably between seasons at some locations. This EVC is widely dispersed along major riparian floodplains, especially of Murray River and tributaries (DSE 2011). This EVC was characterised at Winton by the dominance of Pale and Creeping Knotweed and Common Sneezeweed. This EVC was not observed in any wetlands evaluated in 2012, but was noted in numerous wetlands assessed in 2013; this does not suggest that this EVC was a transitional stage of most of the Winton Wetlands, rather it suggests a unique EVC in the 'undiscovered' wetlands that were evaluated in 2013.

Tall Marsh EVC (EVC 821)

Wetland dominated by tall emergent graminoids, typically in thick species-poor swards. Rushland, sedgeland or reedbed - locally closed or in association or fine-scale mosaic with Aquatic Herbland

(e.g. along floodway lagoons)(DSE 2011). In the Winton Wetlands, this EVC seems to be dominated by dense swards of Broad-leaf Cumbungi. Species such as Ferny Azolla and Common Duckweed, and some Aquatic Herbland EVC species may often be found around these dense swards.

Plains Rushy Wetland EVC (EVC 961)

Rush-dominated wetlands with floristic affinities to Plains Grassy Wetland (DSE 2011). This EVC at Winton Wetlands is characterised by a dominant sward of Plains Rush. Pale, Yellow and/or Hollow Rush may also be present. Species such as Ferny Azolla, Lesser Joyweed, Clammy Goosefoot, Hairy Carpet Weed, Common Sneezeweed and Globular Pigweed may be found beneath the rush tussocks in many situations. Such areas are often found on the edge of wetlands, and while they can cope with inundation for significant periods of time, the areas in which they colonise are usually the areas where water recedes from first.

Unvegetated (open water/bare soil/mud)(EVC 990)

Low lying areas which are unvegetated (or nearly so), at least in relation to vascular flora, including relevant habitat on intertidal mudflats. Widespread wetland component, which may or may not alternate across time with various vegetated EVCs (DSE 2011). DSE (2011) suggested that there are no conditions when this EVC should not be assessed, and that " but awareness required that current unvegetated stage may be replaced by additional EVCs during wetter phases". There were such areas observed across Winton Wetlands during assessments; however, the presence of any character species in any abundance that indicated the presence of a vegetated EVC resulted in that designation being provided, and not EVC 990.

Impacts of stock grazing on EVCs

Stock grazing clearly results in a deterioration of any of the listed EVCs because of direct grazing, trampling and pugging. Observations made during this assessment have allowed the articulation of several generalisations that provide guidance as to the impact of stock grazing on EVC species composition and abundance. The imposition of grazing in a wetland will likely result in:

- Plains Rushy Wetland EVC tending to lose all herb species underneath tussocks;
- The loss of the majority of Aquatic Herbland EVC species such as Upright and Red water-milfoil, Water Primrose, Common Spike-sedge, Starfruit, Swamp Lily, Water Primrose and Water Ribbons in 'open' areas in the lower parts of heavily grazed areas, leaving open water areas devoid of any vegetation
- Spread of the unpalatable Plains Rush further into 'open' areas of heavily grazed wetlands as a consequence of cattle pugging, and the commensurate improved soil moisture conditions for its establishment relative to other species;
- Increased abundance of annual grassy and herbaceous introduced species on the periphery of the wetland;
- Increased abundance of introduced species such as Water Couch and Yellow Marsh-cress on the bed of the wetland as it dries out, replacing Lake Bed Herbland EVC species.

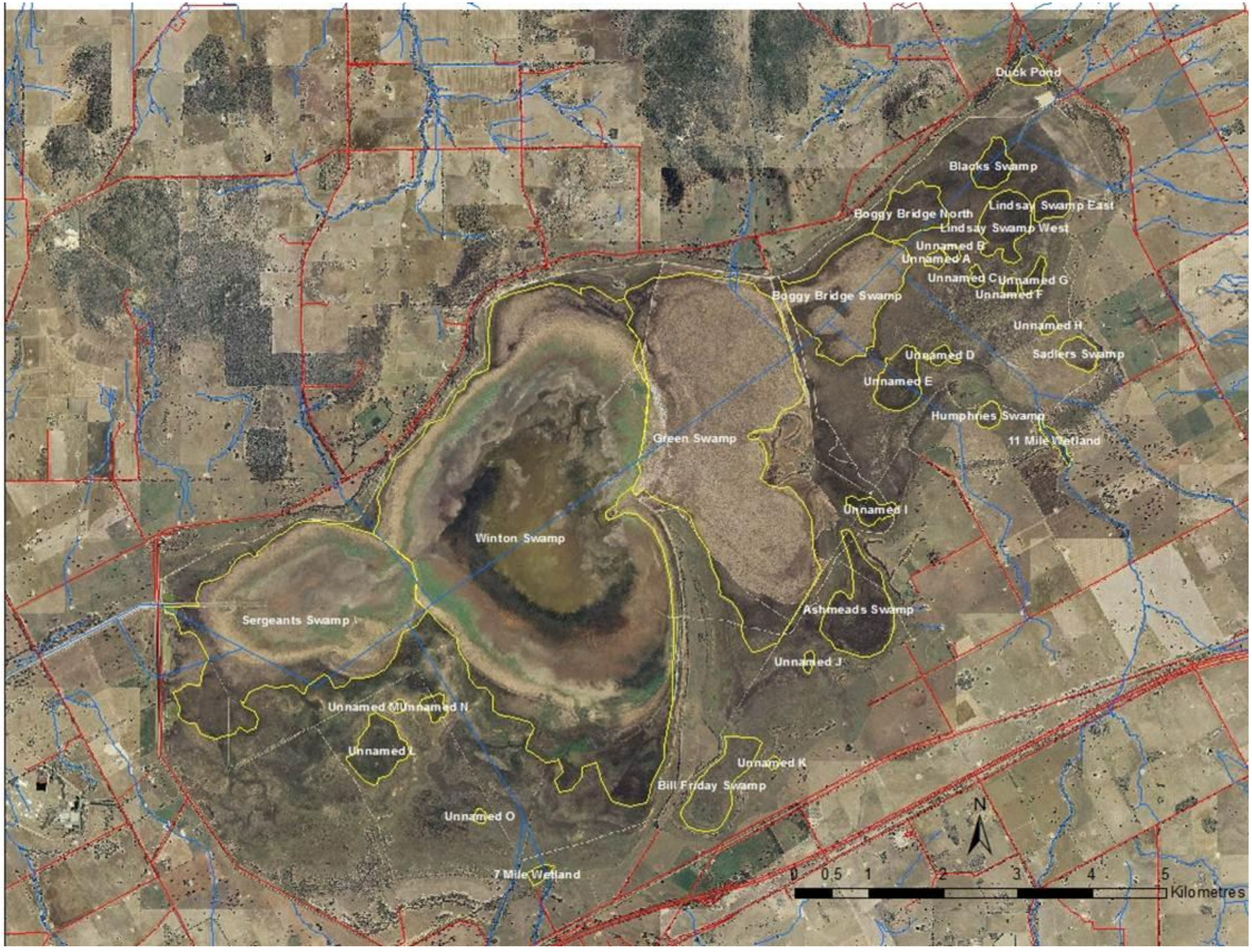

Figure 2-1 **Location of the nineteen assessed wetlands in the Winton Wetlands. Yellow lines outline defined 2012 (and 2013) wetland extents, red lines indicate the road network, and blue lines the mapped rivers, creeks, streams and drainage lines.**

2.2.5 Limitations, Assumptions and Issues in Field Assessment and Data Management

- It needs to be fully acknowledged that aspects of the assessments, especially the Biota sub-index information, is highly reliant upon the presence or recent presence of water in the wetland and indeed the water level within the wetland at the time of assessment, and is therefore a product of the recent climate, and this must be considered in interpretation of the results;
- It needs to be acknowledged that all natural wetlands assessed have many standing dead River Red Gums of multiple age classes scattered throughout, indicating a once significant tree layer across at least sections of each wetland. Their death through inundation on the commissioning of Lake Mokoan has therefore resulted in the loss of this tree layer and a change in the EVCs determined where the trees once were. Some EVCs assessed in 2012 are therefore quite different than would have been allocated prior to Lake Mokoan.
- DSE (2011) indicates that EVCs such as Aquatic Herbland EVC should not be assessed if the wetland has recently filled and aquatic growth is obscured, or the wetland is dry for a sustained period (e.g. > 6 months) and the floor of wetland is lacking evidence of aquatic plants. During these assessments, Aquatic Herbland EVC was allocated if there was any evidence of its previous occupation, as it was considered important to provide a baseline of information for the wetland, rather than recording effectively a 'nil' result (Unvegetated - open water/bare soil/mud; EVC 990).
- Each known wetland in Victoria has been assigned a unique 9 digit identifier number, and by entering this number (or known name) into the IWC Wetland Mapping Tool, you can zoom the GIS tool directly to the full extent of the wetland. However, while identifier numbers have recently been secured for 16 of the 19 wetlands within Winton Wetlands, these numbers have not yet been placed into the database, and you cannot zoom to any of the separate wetlands, with the only available name for the locale is Lake Mokoan. Interrogation of the IWC Wetland Mapping Tool with the name 'Lake Mokoan' or its unique identifier number will take you to the full extent of the former Lake Mokoan; the full extent of most of the 19 wetlands can be observed as a layer within the Lake Mokoan extent. However, these extents are not based on either the WETLAND_1788 and WETLAND_1994 spatial layers found on the IWC Wetland Mapping Tool, and it is unclear what they represent or how they were derived. The Lake Mokoan extent seems to be linked to the WETLAND_1994 spatial layer in the IWC Wetland Mapping Tool. The consequence of these issues has resulted in the following responses:
    - The lack of any IWC Wetland Mapping Tool spatial layer as an historic reference for extent for the wetlands has necessitated that extents developed by Davidson and Mann (2010) and generated by the WWCoM be utilised as the benchmark;
    - Because the any IWC Wetland Mapping Tool would not recognise any of the 19 assessed wetlands and 'zoom' in on it, no base maps for assessment or recording could be generated by the Tool (as is the usual process), and approximations needed to be prepared separately for each wetland by GIS;
- Fourteen wetlands do not have a wetland identifier number (7 Mile Wetland, Duck Pond and Boggy Bridge North Swamp and eleven unnamed wetlands) at the time of writing, and therefore this space on the Field Sheet is blank;
- Green, Sergeants and Winton Swamp are locally recognised as being discrete wetlands, but have only one wetland identifier number to service all three wetlands at the time of writing, and so while all three have been assessed separately, all three wetlands are recorded with the one number;

- Because this project has serviced beyond the scope of the Brief (i.e. in terms of surveying all known and observed wetlands and not just the thirteen listed in the Brief), there are several wetlands that have been assessed that do not have a name at the time of writing. On this basis, these wetlands have been assigned an interim name for the purposes of identification in this report (i.e. Unnamed Swamp A to Unnamed Swamp O, Lindsays Swamp West, Boggy Bridge North Swamp). Lindsays Swamp was an existing name for the wetland, but has been modified to Lindsays Swamp (East) to distinguish it from the interim named Lindsays Swamp West;
- Green, Sergeants and Winton Swamp were the only wetlands not traversed in their entirety, and as a consequence, Map 4 has been prepared for each of these wetlands indicating the approximate area actually surveyed, and included in the appropriate appendix for each of these wetlands.

2.2.6 Data Output

Scanned versions of the datasheets and all appropriate base maps for each wetland are provided in the appendices (Appendix B to AE).

Geo-located images for each wetland can be found on the CD within the back cover of this report, and the information relating to each image recorded on the data sheets for each wetland (see appropriate appendix).

Image file naming has followed the naming rules in Papas *et al.* (2009a) as much as was possible given the limitations outlined previously. It should be noted that more images were taken than filled the seven spaces provided, and for these wetlands, an extra recording sheet was created to record the details. This sheet is added to the appendix for the wetland.

2.3 Taxonomy

For plants that could not be identified in the field, specimens and images were collected for identification using the *Flora of Victoria* (Walsh and Entwisle 1994, 1996 and 1999), and PlantNet Flora On-line (Royal Botanic Gardens Sydney 2012).

3. RESULTS

Appendix A contains an inventory of the species observed within each wetland, with every species recorded attributed a cover-abundance value.

A total of 128 vascular plant species were recorded across the thirty wetlands, of which 65 were indigenous and 59 were introduced species (Appendix A). In general, the diversity of those wetlands assessed was appreciably lower in indigenous diversity than those assessed in 2012, due to the absence of indigenous herbs in autumn compared to spring.

No threatened species were observed (DSE 2005b).

The wetland with the most indigenous diversity was Bill Friday Swamp, and the least was Unnamed Swamp A, while the most introduced species diversity was found in Green Swamp, and the least in Boggy Bridge North Swamp (Table 3-1).

Table 3-1 Number of indigenous and introduced species across the thirty wetlands.

Wetland	Indigenous species	Introduced species	Total species
7 Mile Wetland	27	11	38
11 Mile Wetland	32	18	50
Ashmeads Swamp	24	19	43
Bill Friday Swamp	38	13	51
Blacks Swamp	22	7	29
Boggy Bridge Swamp	19	7	26
Boggy Bridge North Swamp	12	5	17
Duck Pond	21	7	28
Green Swamp	32	23	55
Humphries Swamp	19	14	33
Lindsay East Swamp	15	9	24
Lindsay Swamp (West)	16	11	27
Sadlers Swamp	26	21	47
Sergeants Swamp	23	23	46
Unnamed Swamp A	16	5	21
Unnamed Swamp B	10	5	15
Unnamed Swamp C	12	5	17
Unnamed Swamp D	18	15	33
Unnamed Swamp E	18	14	32
Unnamed Swamp F	15	8	23
Unnamed Swamp G	23	11	34
Unnamed Swamp H	23	12	35
Unnamed Swamp I	13	15	28
Unnamed Swamp J	19	11	30
Unnamed Swamp K	10	16	26
Unnamed Swamp L	17	13	30
Unnamed Swamp M	18	5	23
Unnamed Swamp N	14	11	25
Unnamed Swamp O	20	12	32
Winton Swamp	28	23	51

3.1 Descriptions of Individual Wetlands

Reference should be made to the appropriate appendix for the wetland described to view mapping of the wetland, and, in particular:

- Map 1, which shows 2012 (2013) and 2010 wetland extents, and features, such as inlets, outlets, levees, walls, tracks, etc.;
- Map 3, which provides an approximate location of EVCs within the wetland.

Images taken for the IWC assessment can be found on the CD within the back cover of this report, and the information relating to each image recorded on the data sheets for each wetland (see appropriate appendix).

Table 2-1 provides the area of each wetland, and Appendix A the vascular plant species observed within each wetland.

The location of each wetland is shown in Fig. 2-1.

3.1.1 7 Mile Wetland

This constructed wetland 5.37 ha is found on the channelised 7 Mile Creek (Fig. 3-1), and the maximum water levels in the wetland are controlled by a levee bank that runs along the western and northern side of it, and an outlet pipe that releases water to the other side of the levee (Fig. 3-2; Appendix B).

This outlet pipe maintains water depth at a maximum of around 1.0-1.1 m within the wetland.

Fig. 3-1 The inlet channel (7 Mile Creek) at 7 Mile Wetland.

Fig. 3-2 The outlet pipe and levee at 7 Mile Wetland.

The area of the wetland is fenced from stock, but this fenced area is surrounded by stock grazing.

The vegetation of the site when the wetland is full would be composed of small areas of Tall Marsh EVC surrounded by Aquatic Herbland EVC in the deeper sections of the site in the north, while the balance of the site with less water depth is Plains Rushy Wetland EVC (Appendix B). At the time of assessment, there was only water present in the deeper pools and the northern end of the channel,

so that the Aquatic Herbland EVC had largely dried out; however, remnants of species were present to indicate its presence.

Prior to the channelisation, it is likely that most of the wetland area was a mosaic of terrestrial EVCs, with an EVC such as Floodplain Riparian Woodland EVC found along the natural alignment of the creek.

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Fig. 3-3 A patch of Tall Marsh EVC at 7 Mile Wetland.

The wetland has a reasonable indigenous diversity, with 27 species noted, along with 11 introduced species (Table 3-1), with a healthy assemblage of herbs such as Upright Milfoil, Pale and Creeping Knotweed, Swamp Lily, Water Primrose, Poison Pratia, Lesser Joyweed, Starfruit, Creeping Mint and Hairy Carpet Weed and Ferny Azolla, and graminoids such as Pale Rush, Broad-leaf Cumbungi, Spiny Mud-grass, Common Spike-sedge, Leafy Flat-sedge and Common Swamp Wallaby-grass (Appendix A).

The peripheral areas of the wetland, including the levee in particular, maintain a dense cover of introduced species, most notably Milk Thistle, Phalaris, Paspalum, Wild Oat and Water Couch, with weeds on the bed of the wetland including Water Couch, Curled Dock and Marsh Yellow-cress.

3.1.2 11 Mile Wetland

This wetland of 8.0 ha follows the 11 Mile Creek alignment, and is confined in the west by low rises.

In the northern section of the wetland, there is a road crossing (Humphries Lane) that forms a levee that artificially impounds the water south along the 11 Mile Creek (Fig. 3-4) to a maximum water level controlled by an outlet pipe that releases water to the northern side of the track (Fig. 3-5). This embankment was apparently constructed by Goulburn-Murray Water (GMW) for sedimentation control (Saunders pers. comm. 2013).

Fig. 3-4 Impounded water south from the track embankment at 11 Mile Wetland.

Fig. 3-5 The outlet pipe and track embankment at 11 Mile Wetland.

The wetland does extend to the north beyond the track embankment (Fig. 3-6), and also does naturally extend as a floodplain to the east, which initially is a grazing licence area, and beyond this, private land (Appendix C). While the western and northern areas of the wetland are within the Winton Wetlands and not currently grazed, the wetland does have private land stock grazing to the west and south.

Fig. 3-6 The area north of the track at 11 Mile Wetland.

The vegetation of the site is dominated by dense, mostly immature River Red Gum, interspersed with large areas mostly devoid of vegetation along the creek banks. There is relatively little understorey vegetation present underneath the areas of dense River Red Gum, and these areas have been classed as Billabong Wetland Aggregate EVC in the absence of any distinctive species to attribute areas to more specific EVCs. The floodplain area to the east is Floodplain Riparian Woodland EVC (Fig. 3-7), and the area north of the embankment contains a small area of Tall Marsh EVC which has not been separately defined due to its small size (Appendix C).

Fig. 3-7 Floodplain Riparian Woodland EVC at 11 Mile Wetland.

The wetland has a reasonable indigenous diversity, with 32 species noted, along with 18 introduced species (Table 3-1), with common herbs such as Common Sneezeweed, Annual Cudweed and Hairy Carpet Weed, and graminoids such as Plains, Yellow, Hollow and Pale Rush, Rush Sedge, Broad-leaf Cumbungi, Common Spike-sedge, Tall and Leafy Flat-sedge, Blown Grass, Rigid Panic, Wallaby-grasses and Common Swamp Wallaby-grass (Appendix A).

A number of weed species are found throughout the wetland, such as St. John's Wort, Cat's Ear, Flax-leaf Fleabane and Hare's-foot Clover, with the track embankment and northern area of the wetland having dense stands of Wild Lettuce, Phalaris, Wild Oat, Spear and Milk Thistle, Paspalum and Water Couch (Appendix A).

3.1.3 Ashmeads Swamp

This wetland of 91.7 ha derives its water from natural surface runoff and drainage which flows from the north, and drains towards Green Swamp to the west. It is also likely that surface runoff from the south also flows into the wetland (Appendix D).

The 2010 wetland extent suggests that the wetland is contained to the west of Ashmeads Road; however, this assessment has concluded that the wetland extends well to the east of this road (Fig. 3-9), and indeed beyond the Winton North Road, and therefore, the wetland is bisected north-south by Ashmeads Road and east-west by the Winton North Road (Appendix D). A drainage culvert allows relatively free water movement from east to west underneath Ashmeads Road (Fig. 3-8); however, there is some evidence that in higher flows there is a level of impoundment of water on the eastern side of the road embankment.

Fig. 3-8 The western side of the culvert draining under Ashmeads Road towards the western side of the wetland.

Fig. 3-9 The eastern section of Ashmeads Swamp east of Ashmeads Road.

It is also worth noting that beyond the boundaries of Ashmeads Swamp that the flow from Ashmeads Swamp to Green Swamp is significantly impeded by the Winton North Road embankment (Appendix D).

While the southern areas of the wetland are fenced adjacent to predominantly cleared land, there is clear evidence that cattle grazing is occurring in the wetland, especially in the west. Significant sections of the drying lake bed are heavily pugged as a consequence.

The vegetation of the wetland is dominated by two EVCs. While at the time of assessment the surface waters were largely devoid of any vegetation, in the slightly deeper section of the wetland (in the centre of it), there was evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). All bordering areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix D).

Fig. 3-10 The central section of Ashmeads Swamp with receding surface waters.

The wetland has a moderate indigenous diversity, with 24 species noted, along with 19 introduced species (Table 3-1), with common herbs such as Red Water-milfoil, Pale and Creeping Knotweed, Lesser Joyweed, Shiny Dock, Water Primrose, Water Ribbons, Fringed Heartwort, Jersey Cudweed, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains and Pale Rush, Blown Grass, Brown-backed Wallaby Grass and Southern Cane-grass (Appendix A).

The impact of regular grazing and adjacent agricultural activity has resulted in a wide range of weeds spread across the wetland in some abundance. Species such as Rat's-tail Fescue, Prickly and Wild Lettuce, Ox's-tongue, Great Brome, Curled Dock, Phalaris, Paspalum, Flax-leaf Fleabane, Spear Thistle and Wild Oat are common (Appendix A).

3.1.4 Bill Friday Swamp

This wetland of 64.6 ha derives its water from surface runoff from the west, and drains towards Ashmeads Swamp to the north east. Natural drainage has been impeded by the construction of a levee on the northern side of the wetland that would impound water to a higher maximum water elevation than natural (Fig. 3-11). This levee also has a constructed channel behind it (Fig. 3-12) that drains the over flow from the levee (in the north-west corner) to the east, where it intercepts a drainage line that ultimately flows to Green Swamp (Appendix E).

The wetland most likely extended significantly to the north east prior to the development of the levee and the channel, as the channel now directs water away from this former extent. This natural extension to the wetland was still evident as recently as 1971 on the basis of aerial photography (Saunders pers. comm. 2013).

Fig. 3-11 The levee on the northern boundary of Bill Friday Swamp looking west.

Fig. 3-12 The channel on the northern side of the levee of Bill Friday Swamp.

There has been a wide fire-break slashed on the northern buffer area of the wetland running almost the length of it adjacent to the Winton North Road, and while the Hume Freeway and private grazing land is within close proximity on the south eastern side, there is no sign of any recent grazing across the wetland or its environs.

The wetland is dominated by two EVCs: Aquatic Herbland EVC in the open water sections, and Plains Rushy Wetland EVC in bordering areas (Appendix E). Unlike many of the other wetlands assessed, there were a diversity of aquatic species in the open water areas (Fig. 3-13). Occasional small patches of Tall Marsh EVC were observed across the open water areas (Appendix E), mostly in the western side of the wetland.

The wetland has a high indigenous diversity, with 38 species noted, along with 13 introduced species (Table 3-1), with common herbs such as Red and Upright Water-milfoil, Pale and Creeping Knotweed, Starfruit, Lesser Joyweed, Shiny Dock, Common Duckweed, Water Primrose, Swamp Lily, Water Ribbons, Fringed Heartwort, Jersey Cudweed, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains and Pale Rush, Common and Small Spike-sedge, Spiny Mud-grass, Broad-leaf Cumbungi, Leafy Twig-sedge, Blown Grass, Southern Cane-grass and Common Swamp Wallaby-grass (Appendix A).

Fig. 3-13 A section of Aquatic Herbland EVC on Bill Friday Swamp.

The peripheral areas of the wetland, including around the levee in particular, maintain a dense cover of introduced species, most notably Milk and Spear Thistle, Prickly and Wild Lettuce, Great Brome, Phalaris, Paspalum and Wild Oat.

3.1.5 Blacks Swamp

Blacks Swamp is an area of 24.6 ha, that has several sources of water. Natural surface runoff does appear to occur from the north west, and there are two inlet channels that have been constructed: one that comes from the GMW Dam to the East (Fig. 3-14), and another that has channelised surface runoff from the north that runs underneath the graded firebreak to the north of the wetland (Fig. 3-15; Appendix F). The outlet for the wetland has also been channelised, and runs south to Lindsay West Swamp (Fig. 3-16; Appendix F).

Fig. 3-14 The channelised inlet from the GMW Dam to Blacks Swamp.

Fig. 3-15 The channelised inlet from the graded firebreak track to Blacks Swamp.

Fig. 3-16 The channelised outlet from Blacks Swamp to Lindsay West Swamp.

While the wetland buffer around Blacks Swamp is largely indigenous in composition, the wetland has been the subject of considerable recent cattle grazing, with all dried and drying areas on the wetland been heavily pugged. As a consequence, this area is almost completely devoid of any vegetation (Appendix F).

The vegetation of the wetland is dominated by two EVCs. While at the time of assessment the surface waters were largely devoid of any vegetation, in the slightly deeper section of the wetland (in the centre of it), there was evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). All bordering areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix F).

Fig. 3-17 Open water area of Blacks Swamp.

The wetland has a moderate indigenous diversity, with 22 species noted, along with 7 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Shiny Dock, Water Primrose, Water Ribbons, Fringed Heartwort, Jersey Cudweed, Globular Pigweed, Common Duckweed, Starfruit, Clammy Goosefoot, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains and Yellow Rush, Leafy Flat-sedge, Blown Grass, Common Swamp Wallaby-grass, Broad-leaf Cumbungi and Leafy Twig-sedge (Appendix A).

Despite regular grazing, species such as Hare's-foot Clover, Prickly and Wild Lettuce, Curled Dock, Phalaris are not widespread, and tend to be confined to the areas of disturbance, e.g. the constructed channel areas (Appendix A). The dominance of Plains Rush in the wetland and environs in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.6 Boggy Bridge Swamp

Boggy Bridge Swamp is an area of 173.9 ha that is bordered by Boggy Bridge Road in the west, with the North East Track in close proximity to the northern wetland boundary.

The 2010 wetland extent suggested that the wetland was relatively narrow with an east-west alignment, however, this assessment has concluded that the wetland extends more broadly north-south (Appendix G), and the mapped extent of the wetland has increased considerably from the 2010 extent (Table 3-1).

Water in this wetland is derived from two natural inlets: one from Unnamed Swamp E to the east and from Boggy Bridge North Swamp to the north east (Fig. 3-18; Appendix G). It should be noted that Boggy Bridge Swamp and Boggy Bridge North Swamp are effectively contiguous (Appendix G); however, there is a discernible drainage grassy area in the zone delineated between the two wetlands. There is also likely to be some surface runoff from the slopes to the north in a high rainfall event.

The wetland outlet was naturally directly contiguous with the eastern edge of Green Swamp, however, the embankment created for Boggy Bridge Road has created an artificial boundary between the two wetlands (Fig. 3-19), that would appear to provide a level of impoundment both sides of the embankment (Fig. 3-20), resulting in an artificially elevated water level in the lower reaches of the wetland, and on the eastern edge of Green Swamp (Fig. 3-19).

Fig. 3-18 Northern inlet entrance to Boggy Bridge Swamp.

Fig. 3-19 The road embankment on Boggy Bridge Road, taken from Green Swamp looking north east.

The wetland and its environs are predominantly indigenous in composition, providing a significant wetland buffer, despite the bared area created by the Boggy Bridge Road alignment (Appendix G).

There was no evidence of stock grazing across the wetland at the time of assessment.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC, with a smaller open area of Aquatic Herbland EVC in the west of the wetland, adjacent to the outlet at Boggy Bridge Road (Appendix G).

While at the time of assessment there was little surface water remaining, and these areas were largely devoid of any vegetation, there was evidence of indicator species for Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have small patches of herbs that are more correctly labelled Lake Bed Herbland EVC (Fig. 3-21), however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC. All other areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix G).

Fig. 3-20 The road embankment on Boggy Bridge Road, showing artificial water level on the Boggy Bridge Swamp side.

Fig. 3-21 Open and dry areas at Boggy Bridge Swamp with patches of lake bed herbs.

The wetland has a low indigenous diversity of relatively low abundance, with 19 species noted, along with 7 introduced species (Table 3-1), with common herbs such as Pale Knotweed, Lesser Joyweed, Common Sneezeweed, Water Primrose, Water Ribbons, False Loosestrife, Globular Pigweed, Clammy Goosefoot, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains and Hollow Rush, Leafy Flat-sedge, Blown Grass, Common Swamp Wallaby-grass and Rigid Panic (Appendix A).

Despite likely regular past grazing, weed species such as Prickly and Wild Lettuce, Spear and Milk Thistle, Curled Dock, and Phalaris are not widespread, and tend to be confined to the bordering areas around the open water high water mark, and areas of disturbance, such as along the Boggy Bridge Road alignment (Appendix A). The dominance of Plains Rush in the wetland and environs in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.7 Boggy Bridge North Swamp

The Boggy Bridge North Swamp is an area of 51.9 ha that is contiguous with the Boggy Bridge Swamp to the east. The wetland is largely surrounded by indigenous vegetation (mostly Plains Rushy Wetland EVC) on all sides providing an excellent wetland buffer, except for areas on the northern boundary, adjacent to the fire break track recently created (Appendix H). There is a slashed track

created in 2012 for fox baiting that is cut through the centre of the wetland from north-to-south (Appendix H).

Water for the wetland is derived from the natural drainage line to the north east, and drains directly into Boggy Bridge Swamp to the west (Appendix H). Prior to the construction of the firebreak track with raised edges, it was likely that surface runoff from the slopes to north would have occurred in a higher rainfall event; this is now unlikely to be the case.

The entire wetland is dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix H; Fig. 3-22).

Fig. 3-22 A typical area of Plains Rushy Wetland EVC in the Boggy Bridge North Swamp.

The wetland has a low indigenous diversity of relatively low abundance, with 12 species noted, along with 5 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Starfruit and Shiny Dock, and graminoids such as Plains, Pale and Yellow Rush, Blown Grass, Common Spike-sedge and Leafy Flat-sedge (Appendix A).

Fig. 3-23 A typical view of the Boggy Bridge North Swamp.

Despite likely regular past grazing, weed species such as Shepherd's Purse, Wild Lettuce, Curled Dock, Marsh Yellow-cress and Phalaris are not widespread, and tend to be confined to occasional more open area (Appendix A). The dominance of Plains Rush in the wetland and environs in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.8 Duck Pond

This constructed wetland of 14.4 ha is found on a natural drainage line that flows from the adjacent slopes to the north east, and the maximum water levels in the wetland are controlled by a levee bank that runs along the eastern and southern side (Fig. 3-24; Appendix I). It is possible that Duck Pond is connected to the adjacent GMW Dam to the east, and that the wetland is used as a storage; however, this needs to be established (Saunders pers. comm. 2013). The water level in the wetland does appear to change rapidly, and especially if the Pond is linked to the Dam, the wetland will not necessarily conform to the prevailing environmental conditions and what would be the natural water regime in terms of duration and seasonality of water levels. The water level of the wetland tends to be higher, and it is rarely allowed to dry out (Saunders pers. comm. 2012).

Fig. 3-24 The levee wall on the eastern side of Duck Pond.

There are some areas of indigenous vegetation around the wetland forming a significant buffer (Appendix I), however these areas area revegetation established in the 1960s and 1970s.

The wetland is fenced out from stock, however, it needs to be noted that the higher water mark of the wetland is at last 20 m beyond the established fence line on the northern wetland boundary, and that this area beyond the fence line is grazed, and while not disturbed at the time of assessment, soil disturbance will be experienced when this soil is moist and grazing occurs.

The wetland is dominated by open water which does support Aquatic Herbland EVC (Fig. 3-25); there is Plains Rushy Wetland EVC in the north near the drainage line and on the western fringe of the wetland, and Red Gum Swamp EVC on the eastern boundary (Fig. 3-26; Appendix I).

The wetland has a moderate indigenous diversity, with 21 species noted, along with 7 introduced species (Table 3-1), with common herbs such as Red Water-milfoil, Pale Knotweed, Starfruit, Lesser Joyweed, Common Duckweed, Water Primrose, Poison Pratia, Water Ribbons, Creeping Mint, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Rush Sedge, Plains and Pale Rush, Common Spike-sedge, Blown Grass, Couch, Broad-leaf Cumbungi, Southern Cane-grass and Common Swamp Wallaby-grass (Appendix A).

Weed species such as Wild Lettuce, Great Brome, Yorkshire Fog, Curled Dock, Drain Sedge and Phalaris are not widespread, and tend to be confined to the bordering areas around the open water high water mark on the eastern side, and areas of disturbance, such as along the levee bank (Appendix A).

Fig. 3-25 Aquatic Herbland EVC at Duck Pond.

Fig. 3-26 Red Gum Swamp EVC at Duck Pond.

3.1.9 Green Swamp

Green Swamp is an area of 802 ha that forms part of a contiguous wetland complex with Winton and Sergeants Swamp that all maintain the same surface water elevation. The outlet for this wetland complex is the channel outlet on the western side of Sergeants Swamp (Appendix J). Despite this outlet having been lowered significantly with the decommissioning of Lake Mokoan, the maintained water level before water flows out of the system is potentially higher than would be the case with natural outflow conditions; this assertion requires further investigation (Saunders pers. comm. 2013). Waters for this wetland are derived from Boggy Bridge Swamp through the culvert under Boggy Bridge Road (Fig. 3-19), and from surface runoff from the adjacent northern slopes during high rainfall events (Appendix J). There is also an inlet on the southern edge of the wetland, which is derived from water draining from Ashmeads Swamp and flowing northward through a culvert under Winton North Road.

The high turbidity of waters in Green, Winton and Sergeants Swamp is a significant impediment to the improvement in biological diversity in this area of the wetlands. It is unclear whether this turbidity is a result of dispersive clay minerals already within the complex, or from new inflows from Winton Creek and other sources.

Areas to the east of the wetland are composed predominantly of indigenous vegetation, and form an excellent wetland buffer. However, the northern boundary (adjacent to Lake Mokoan Road and the North East Track) and on the western boundary (The Spit) are dominated by introduced species, are heavily grazed, and provide little buffer to the wetland (Appendix J; Fig. 3-27). Much of the wetland is still experiencing cattle grazing; there was significant heavy disturbance by pugging in the southern areas of this wetland, in moist areas where surface waters had receded (Appendix J).

Fig. 3-27 A view of the western area of Green Swamp from the northern tip of The Spit.

The wetland is dominated by two EVCs: Aquatic Herbland EVC in the open water sections, and Plains Rushy Wetland EVC in bordering areas (Fig. 3-29; Appendix J). While at the time of assessment the surface waters were largely devoid of any vegetation, in the open areas, there was some evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have some patches of herbs that are more correctly labelled Lake Bed Herbland EVC (Fig. 3-28), however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC. Occasional small patches of Tall Marsh EVC were observed across the open water areas (Appendix J), mostly in the central western side of the wetland.

The wetland has a high indigenous diversity, with 32 species noted, along with 23 introduced species (Table 3-1), with common herbs such as Upright Water-milfoil, Pale and Creeping Knotweed, Lesser Joyweed, Shiny Dock, Common Duckweed, Clammy Goosefoot, Globular Pigweed, Fringed Heartwort, Jersey Cudweed and Hairy Carpet Weed, and graminoids such as Plains and Pale Rush, Broad-leaf Cumbungi, Leafy Flat-sedge, Blown Grass, Southern Cane-grass and Wallaby-grasses (Appendix A).

Weed species such as Stinkwort, Wild and Prickly Lettuce, Rat's-tail Fescue, Flax-leaf Fleabane, Barrel Medic, Water Couch, Hare's-foot Clover, Spear and Milk Thistle, Great Brome, Yorkshire Fog, Curled Dock, Drain Sedge, Plantain, Blackberry Nightshade, Paspalum and Phalaris are very widespread, and in all areas adjacent to the open water high water mark (Appendix A).

Fig. 3-28 A view of the southern area of Green Swamp where surface waters had recently receded.

Fig. 3-29 Plains Rushy Wetland EVC in the northern area of Green Swamp.

3.1.10 Humphries Swamp

This wetland has an area of 8.85 ha, and is adjacent to 11 Mile Track on the northern wetland boundary. Water for the wetland is derived from flow through a natural drainage line on the southern boundary (Fig. 3-30). This boundary has been bisected by a fence line where stock grazing was occurring at the time of the assessment. This implies that some of the wetland has been excised and is part of the paddock, and furthermore, the majority of the catchment of the wetland is grazed (Appendix K).

Fig. 3-30 The inlet into Humphries Swamp with the fence line in the foreground.

The outlet for the wetland is along a drainage line running from the north west corner towards 11 Mile Creek; this drainage line runs under 11 Mile Track through a culvert (Appendix K; Fig. 3-31).

Fig. 3-31 The outlet culvert under 11 Mile Track looking towards Humphries Swamp.

The wetland environs to the west and east are predominantly indigenous in composition, providing a significant wetland buffer, however, all other areas, including the 11 Mile Track alignment, and are dominated by introduced species and grazed, and do not provide an effective buffer (Appendix K).

There was no evidence of stock grazing across the wetland at the time of assessment.

The entire wetland is dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix K; Fig. 3-32).

The wetland has a low indigenous diversity of relatively low abundance, with 19 species noted, along with 14 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Ferny Azolla, Fringed Heartwort, and Shiny Dock, and graminoids such as Plains, Pale and Yellow Rush, Grey Spike-sedge, Blown Grass, Common Spike-sedge, Common Swamp Wallaby-grass and Leafy Flat-sedge (Appendix A).

Fig. 3-32 Plains Rushy Wetland EVC in the southern area of Humphries Swamp.

Despite likely regular past grazing, weed species such as Wild and Prickly Lettuce, Curled Dock, Barley Grass, Spear Thistle, Yorkshire Fog, Marsh Yellow-cress and Phalaris are not widespread, and tend to be confined to the border of the wetland (Appendix A). The dominance of Plains Rush within the wetland in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.11 Lindsays Swamp (East)

This wetland of 15.9 ha is found in the eastern section of the wetlands, and has a rough firebreak slashed on its eastern boundary (Appendix M). Water flow into the wetland seems to emanate from natural surface runoff from slopes to the east and north east of the wetland in high rainfall events (Appendix M); it does not appear as if the firebreak will impede this potential flow.

The natural outlet is found on the northern edge of the wetland, and flows in westerly direction into Lindsay Swamp West (Appendix M; Fig. 3-33).

Fig. 3-33 The outlet from Lindsays Swamp (East) to Lindsays Swamp West.

The majority of the area around the wetland is composed of indigenous vegetation and provides an effective wetland buffer, with the exception of the eastern boundary area and the firebreak alignment, which is significantly disturbed, and is mostly composed of introduced species (Appendix M).

The wetland was dry at the time of assessment, with some small areas of moist soil, and it was obvious that the wetland was regularly grazed by cattle because of the heavy pugging throughout (Appendix M).

Fig. 3-34 A view of the centre of the Lindsays Swamp (East).

The vegetation of the wetland is dominated by two EVCs. While the wetland was dry at the time of assessment, and the dried wetland bed did have a moderate herb cover that would be more correctly labelled Lake Bed Herbland EVC (Fig. 3-34), amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, these open areas were named as the later EVC. There is a small patch of Tall Marsh EVC observed on the eastern edge of the open water area (Appendix M). All bordering areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Fig. 3-35; Appendix M).

Fig. 3-35 Plains Rushy Wetland EVC in the northern area of Lindsays Swamp (East).

The wetland has a low indigenous diversity, with 15 species noted, along with 9 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Shiny Dock, Fringed Heartwort, Common Sneezeweed, Hairy Carpet Weed and Ferny Azolla in low abundance, and graminoids such as Plains and Pale Rush, Leafy Flat-sedge, Blown Grass and Broad-leaf Cumbungi (Appendix A).

Weed species such as Wild and Prickly Lettuce, Water Couch, Hare's-foot Clover, Spear and Milk Thistle, Hare's-foot Clover, Curled Dock, Marsh Yellow-cress and Lesser Canary Grass are very

widespread, and in all areas adjacent to the open water high water mark and on the wetland bed (Appendix A).

3.1.12 Lindsays Swamp West

This wetland of 48.4 ha, and is found in the eastern section of the wetlands (Appendix L). Water flow into the wetland emanates from two sources: a natural inlet from Lindsays Swamp (East), and an inlet channel from Blacks Swamp (Fig. 3-36; Appendix L).

Fig. 3-36 The inlet channel into Lindsays Swamp West from Blacks Swamp.

The natural outlet is not well defined, but does appear to be towards Unnamed Swamp G and H (Appendix L).

The wetland and its environs are predominantly indigenous in composition, providing a significant wetland buffer (Appendix L).

The wetland was drying at the time of assessment with some surface water still present in the south of the wetland, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging throughout all areas of the wetland bed not covered with surface water (Appendix L).

The vegetation of the wetland is dominated by two EVCs. While at the time of assessment the surface waters were largely devoid of any vegetation, in the open areas, there was some evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have some patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the latter EVC. All bordering areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix L; Fig. 3-37).

Fig. 3-37 Plains Rushy Wetland EVC in the northern area of Lindsays Swamp West.

The wetland has a low indigenous diversity, with 16 species noted, along with 11 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Shiny Dock, Fringed Heartwort, Globular Pigweed, Common Sneezeweed and Ferny Azolla in low abundance, and graminoids such as Plains and Pale Rush, Leafy Flat-sedge, Blown Grass and Broad-leaf Cumbungi (Appendix A).

Fig. 3-38 A view of the centre of the Lindsays Swamp West.

Weed species such as Wild and Prickly Lettuce, Water Couch, Hare's-foot Clover, Spear and Milk Thistle, Hare's-foot Clover, Curled Dock, Paspalum, Plantain, Tall Fleabane, Marsh Yellow-cress and Lesser Canary Grass are very widespread, and in all areas adjacent to the open water high water mark, with Marsh Yellow-cress on the wetland bed (Appendix A).

3.1.13 Sadlers Swamp

Sadlers Swamp has an area of 16.8 ha, and is located in the eastern section of the wetlands, adjacent to a slashed firebreak track along its eastern and northern boundaries.

Water flow into the wetland emanates from a natural inlet from the north western edge of the wetland (Fig. 3-39), and the outlet is a channel on the south western boundary that flows to Show Creek (Fig. 3-40; Appendix N). This channel has recently been re-excavated, and there is some suggestion that reverse flow, i.e. the channel acting as an inlet from Show Creek, is now occurring (Saunders pers. comm. 2013).

Fig. 3-39 The inlet into Sadlers Swamp.

Fig. 3-40 The outlet channel from Sadlers Swamp to Show Creek.

The wetland and its environs are predominantly indigenous in composition, providing a significant wetland buffer, with the exception of the eastern boundary, which is adjacent to the firebreak track which is composed mostly of introduced species (Appendix N).

The wetland had significant surface water still present at the time of assessment, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging throughout all areas of the wetland bed not covered with surface water (Appendix N).

The vegetation of the wetland is dominated by two EVCs. While at the time of assessment the surface waters were largely devoid of any vegetation, in the open areas, there was some evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have some small patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC. All bordering areas of the wetland were dominated by Plains Rushy Wetland EVC, i.e. dense stands of Plains Rush (Appendix N; Fig. 3-41).

Fig. 3-41 Plains Rushy Wetland EVC in the eastern area of Sadlers Swamp with open water in the background.

The wetland has a moderate indigenous diversity, with 26 species noted, along with 21 introduced species (Table 3-1), with common herbs such as Creeping Knotweed, Red Water-milfoil, Fringed Heartwort, Annual Cudweed, Common Duckweed, Water Ribbons, Water Primrose, Creeping Mint, Poison Pratia, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains, Joint-leaf and Pale Rush, Rush Sedge, Leafy Flat-sedge, Blown Grass, Rigid Panic, Common Swamp Wallaby-grass, Common Spike-sedge, Brown's Love-grass and Wallaby-grasses (Appendix A).

Weed species such as Wild and Prickly Lettuce, Water Couch, Rat's-tail Fescue, Water Purslane, Wild Oat, Hare's-foot Clover, Spear and Milk Thistle, Hare's-foot Clover, Curled Dock, Sweet Briar, Lesser Hawksbit, Paspalum, Paterson's Curse, Flax-leaf Fleabane, Phalaris, and Lesser Canary Grass are very widespread, and in all areas adjacent to the open water high water mark, with Marsh Yellow-cress on the wetland bed (Appendix A).

3.1.14 Sergeants Swamp

Sergeants Swamp is an area of 598 ha that forms part of a contiguous wetland complex with Winton and Green Swamp that all maintain the same surface water elevation. The outlet for this wetland complex is the channel outlet on the western side of the wetland (Appendix O; Fig. 3-42). Despite this outlet having been lowered significantly with the decommissioning of Lake Mokoan, the maintained water level before water flows out of the system is potentially higher than would be the case with natural outflow conditions; this assertion requires further investigation (Saunders pers. comm. 2013). Waters for this wetland are derived ultimately from flows from Green and Winton Swamps, and from Winton Creek and other smaller creeks that link to the complex, and from surface runoff from the adjacent northern slopes during high rainfall events (Appendix O).

The high turbidity of waters in Green, Winton and Sergeants Swamp is a significant impediment to the improvement in biological diversity in this area of the wetlands. It is unclear whether this turbidity is a result of dispersive clay minerals already within the complex, or from new inflows from Winton Creek and other sources.

Areas to the east and south of the wetland are composed predominantly of indigenous vegetation, and form an excellent wetland buffer. However, the northern boundary (adjacent to Lake Mokoan Road and the North East Track) and on the western boundary (the dam wall) are dominated by introduced species, are heavily disturbed, and provide little buffer to the wetland (Appendix O). Much of the wetland is still experiencing cattle grazing; this was most evident in all moist areas where the surface waters had receded and were heavily disturbed by pugging (Appendix O).

Fig. 3-42 The outlet channel from Sergeants Swamp from the dam wall looking east.

The wetland is dominated by two EVCs: Aquatic Herbland EVC (in the predominantly open water sections), and Plains Rushy Wetland EVC in bordering areas (Fig. 3-43; Appendix O). While at the time of assessment the surface waters were largely devoid of any vegetation, in the open areas, there was some evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have some patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC. Significant patches of Tall Marsh EVC were observed across the open water areas (Appendix O), mostly on the northern side of the wetland.

Fig. 3-43 Plains Rushy Wetland EVC in the northern area of Sergeants Swamp with open water in the background.

The wetland has a moderate indigenous diversity, with 23 species noted, along with 23 introduced species (Table 3-1), with herbs such as Upright Water-milfoil, Pale, Slender and Creeping Knotweed, Lesser Joyweed, Common Duckweed, Fringed Heartwort, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains, Yellow and Pale Rush, Knob Sedge, Broad-leaf Cumbungi, Leafy Flat-sedge, Blown Grass, Southern Cane-grass and Wallaby-grasses (Appendix A).

Weed species such Stinkwort, Wild and Prickly Lettuce, Rat's-tail Fescue, Wild Oat, Tall Fleabane, Barrel Medic, Water Couch, Hare's-foot Clover, Spear and Milk Thistle, Great and Soft Brome, Yorkshire Fog, Curled Dock, Drain Sedge, Plantain, Paterson's Curse, Paspalum, Marsh Yellow-cress and Phalaris are very widespread, and in all areas adjacent to the open water high water mark (Appendix A).

3.1.15 Unnamed Swamp A

This wetland of 5.31 ha is part of a terminal wetland system found in the north eastern area of the wetlands. This system is based on surface flow from the southern edge of Boggy Bridge Swamp into Unnamed Swamp A, which then flows into Unnamed Swamp B, which then flows into Unnamed Swamp C. Unnamed Swamp C appears to be a terminal wetland (Appendix P).

The natural outlet for this wetland to Unnamed Swamp B is found in the north eastern corner of the swamp (Appendix P; Fig. 3-44).

Fig. 3-44 The outlet from Unnamed Swamp A to Unnamed Swamp B.

The wetland and its environs on all sides are predominantly indigenous in composition, providing a significant wetland buffer (Appendix P).

The wetland had no surface water present at the time of assessment, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging evident in the central open area of the wetland (Appendix P).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC (Fig. 3-46), with a smaller central open area of Aquatic Herbland EVC (Appendix P; Fig. 3-45).

At the time of assessment there was no surface water remaining, and the open areas were largely devoid of any vegetation. However, there was evidence of indicator species for Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have small patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the latter EVC.

The wetland has a low indigenous diversity, with 16 species noted, along with only 5 introduced species (Table 3-1), with common herbs such as Red Water-milfoil, Pale and Creeping Knotweed, Lesser Joyweed, Fringed Heartwort, Globular Pigweed, Clammy Goosefoot, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains Rush, Common Spike-sedge, Common Swamp wallaby-grass, Leafy Flat-sedge, Blown Grass and Southern Cane-grass (Appendix A).

Fig. 3-45 A view of the centre of Unnamed Swamp A.

Fig. 3-46 Plains Rushy Wetland EVC in the northern area of Unnamed Swamp A, with Unnamed Swamp B in the background.

Despite regular grazing, weed species such as Wild Lettuce, Curled Dock, Marsh Yellow-cress and Water Couch and Milk Thistle are not widespread, and tend to be confined to the border of the open areas and on the wetland bed (Appendix A). The dominance of Plains Rush within the wetland in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.16 Unnamed Swamp B

This wetland of 3.29 ha is part of a terminal wetland system found in the north eastern area of the wetlands. This system is based on surface flow from the southern edge of Boggy Bridge Swamp into Unnamed Swamp A, which then flows into Unnamed Swamp B, which then flows into Unnamed Swamp C. Unnamed Swamp C appears to be a terminal wetland (Appendix Q).

The natural inlet for this wetland from Unnamed Swamp A is found on the eastern edge (Fig. 3-47), and the outlet to Unnamed Swamp C is found on the southern edge of the swamp (Appendix Q).

Fig. 3-47 The inlet into Unnamed Swamp B.

The wetland had no surface water present at the time of assessment, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging evident in the central open area of the wetland (Appendix Q).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC (Fig. 3-48), with a smaller central open area of Aquatic Herbland EVC (Appendix Q; Fig. 3-52).

Fig. 3-48 Plains Rushy Wetland EVC in the northern area of Unnamed Swamp B.

At the time of assessment there was no surface water remaining, and the open areas were largely devoid of any vegetation. However, there was evidence of indicator species for Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have small patches of herbs that are more correctly labelled Lake Bed Herbland EVC (Fig. 3-49), however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC.

The wetland has a low indigenous diversity, with only 10 species noted, along with only 5 introduced species (Table 3-1), with common herbs such as Red Water-milfoil, Creeping Knotweed, Lesser Joyweed, Clammy Goosefoot and Hairy Carpet Weed, and graminoids such as Plains Rush, Common Spike-sedge, Common Swamp wallaby-grass, Leafy Flat-sedge and Blown Grass (Appendix A).

Fig. 3-49 A view of the centre of Unnamed Swamp B.

Despite regular grazing, weed species such as Wild Lettuce, Curled Dock, Marsh Yellow-cress, Water Couch and Milk Thistle are not widespread, and tend to be confined to the border of the open areas and on the wetland bed (Appendix A). The dominance of Plains Rush within the wetland in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.17 Unnamed Swamp C

This wetland of 4.47 ha is part of a terminal wetland system found in the north eastern area of the wetlands. This system is based on surface flow from the southern edge of Boggy Bridge Swamp into Unnamed Swamp A, which then flows into Unnamed Swamp B, which then flows into Unnamed Swamp C. Unnamed Swamp C appears to be a terminal wetland (Appendix R).

The natural inlet for this wetland from Unnamed Swamp B is found on the western edge (Fig. 3-50; Appendix R).

Fig. 3-50 The inlet into Unnamed Swamp C from Unnamed Swamp B.

The wetland had no surface water present at the time of assessment, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging evident in the central open area of the wetland (Appendix R).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC (Fig. 3-51), with a smaller open area of Aquatic Herbland EVC in the southern area (Appendix R; Fig. 3-52).

At the time of assessment there was no surface water remaining, and the open areas were largely devoid of any vegetation. However, there was evidence of indicator species for Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have small patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC.

Fig. 3-51 A view of the open area of Unnamed Swamp C.

Fig. 3-52 Plains Rushy Wetland EVC in the eastern area of Unnamed Swamp C.

The wetland has a low indigenous diversity, with only 12 species noted, along with only 5 introduced species (Table 3-1), with common herbs such as Red Water-milfoil, Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot and Hairy Carpet Weed, and graminoids such as Plains and Pale Rush, Common Spike-sedge, Common Swamp wallaby-grass, Leafy Flat-sedge and Blown Grass (Appendix A).

Despite regular grazing, weed species such as Wild Lettuce, Curled Dock, Marsh Yellow-cress, Water Couch and Milk Thistle are not widespread, and tend to be confined to the border of the open areas and on the wetland bed (Appendix A). The dominance of Plains Rush within the wetland in terms of competitive exclusion is also a major factor in this low weed abundance.

3.1.18 Unnamed Swamp D

Unnamed Swamp D has an area of 6.46 ha, and is found south east of Boggy Bridge Swamp.

The natural inlet for this wetland is the 11 Mile Creek; in the western boundary of the wetland along the creek alignment, there is natural constriction of the creek (Fig. 3-53), which is resulting in a 'pooling' effect on creek flow, and creating a pond. it would seem as this has been largely unsuccessful, as the extent of wetland plants would indicate. The outlet does continue on after this constriction for a short distance, to Unnamed Swamp E (Appendix S). There are at least two other similar 'pond' areas to the east of this occurrence, thus the wetland is an ephemeral system based on constriction of the channel in a number of places, with a series of pools forming upstream of these constriction; in a high flow, the water will escape these constrictions, and flow over the terrace/banks of the Creek. While it appears as if there has been some historical channel creating to overcome this pooling,

Fig. 3-53 The constriction and outlet along 11 Mile Creek on the western edge of Unnamed Swamp D.

The wetland had no surface water present at the time of assessment, and there was no evidence of cattle grazing (Appendix S).

Fig. 3-54 Plains Rushy Wetland EVC in Unnamed Swamp D.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC on the terrace of the 11 Mile Creek (the majority of the area of the wetland; Fig. 3-54), with the defined channel of 11 Mile Creek being occupied by Floodway Pond Herbland EVC (Fig. 3-55), and the 'pooled' areas Lake Bed Herbland EVC (Appendix S; Fig. 3-56).

The wetland has a low indigenous diversity, with only 18 species noted, along with 14 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot and Globular Pigweed, and graminoids such as Plains, Yellow and Pale Rush, Leafy Flat-sedge and Blown Grass (Appendix A).

Weed species such as Phalaris, Wild Lettuce, Curled Dock and Hare's-foot Clover are widespread, in the Plains Rushy EVC area, while Marsh Yellow-cress is common on the creek bed (Appendix A).

Fig. 3-55 Floodway Pond Herbland EVC along the creek channel in Unnamed Swamp D.

Fig. 3-56 Lake Bed Herbland EVC along the creek channel in Unnamed Swamp D.

3.1.19 Unnamed Swamp E

Unnamed Swamp E has an area of 39.4 ha, and is found south east of Boggy Bridge Swamp.

The natural inlet for this wetland (11 Mile Creek) is found on the north eastern edge of the site (Fig. 3-57), and the outlet to Boggy Bridge Swamp is found on the eastern edge of the swamp (Appendix T; Fig. 3-58). The outlet has a smaller open area associated with it, which is occupied by Aquatic Herbland EVC (Appendix T).

The wetland had no surface water present at the time of assessment, and it was obvious that the site was regularly grazed by cattle because of the heavy pugging evident in the north western areas of the wetland (Appendix T; Fig. 3-58).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC (Fig. 3-59), with the smaller open area of Aquatic Herbland EVC associated with the outlet on the western edge (Appendix T; Fig. 3-58).

Fig. 3-57 The inlet into Unnamed Swamp E.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC (Appendix T; Fig. 3-59), with an area of Aquatic Herbland EVC found around the outlet pond.

The wetland has a low indigenous diversity, with only 18 species noted, along with 14 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot and Globular Pigweed, and graminoids such as Plains, Yellow and Pale Rush, Leafy Flat-sedge and Blown Grass (Appendix A).

Weed species such as Phalaris, Wild Lettuce, Curled Dock and Hare's-foot Clover are widespread, in the Plains Rushy EVC area, while Marsh Yellow-cress is common on the outlet pond bed (Appendix A).

3.1.20 Unnamed Swamp F

Unnamed Swamp F has an area of 4.03 ha, and is found south Lindsay Swamp West.

The natural inlet for this wetland is found on the north eastern edge of the site (Fig. 3-60) running parallel to Unnamed Swamp G, and the outlet to Unnamed Swamp G is found on the south eastern edge of the swamp (Appendix U; Fig. 3-61).

The vegetation of the wetland is complex: the eastern side of the wetland is dominated by Floodway Pond Herbland EVC (Fig. 3-61), the south eastern edge by Plains Rushy Wetland EVC, a central area of Lake Bed Herbland EVC, with a fringing area of Plains Grassy Wetland EVC (Appendix U; Fig. 3-62). There was notably an invasion of Chinese Scrub around the periphery of the wetland, indicated a prolonged period of dryness.

The wetland has a low indigenous diversity, with 15 species noted, along with only 8 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot, Hairy Carpet Weed and Globular Pigweed, and graminoids such as Plains Rush, Common Swamp Wallaby-grass, Brown-backed Wallaby-grass, Leafy Flat-sedge, Common Spike-sedge and Blown Grass (Appendix A).

Weed species such as Phalaris, Wild Lettuce, Water Couch, Flax-leaf Fleabane and Hare's-foot Clover are found across the wetland, especially in the Plains Grassy Wetland EVC area, but are not widespread (Appendix A).

Fig. 3-58 The outlet from Unnamed Swamp E to Boggy Bridge Swamp.

Fig. 3-59 Plains Rushy Wetland EVC in the western area of Unnamed Swamp E.

Fig. 3-60 The inlet area on the north-eastern edge of Unnamed Swamp F.

The wetland had no surface water present at the time of assessment, and there was no evidence of cattle grazing (Appendix U).

Fig. 3-61 **The outlet on the south-eastern edge of Unnamed Swamp F towards Unnamed Swamp G.**

Fig. 3-62 **Looking across Plains Grassy Wetland and Floodway Pond Herbland EVCs across Unnamed Swamp F.**

3.1.21 Unnamed Swamp G

Unnamed Swamp G has an area of 8.50 ha, and is found south of Lindsay Swamp West.

The natural inlet for this wetland from Lindsay Swamp West is found on the north western edge of the site (Fig. 3-63), and the inlet from Unnamed Swamp F is found on the south western edge of the swamp (Appendix V).

Fig. 3-63 The inlet area on the north-western edge of Unnamed Swamp G.

The outlet to the site is found on the southern edge of the site and drains towards Unnamed Swamp H (Fig. 3-64; Appendix V).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC on the periphery of the wetland (Fig. 3-64, with the centre of the wetland occupied by Floodway Pond Herbland EVC (Appendix V; Fig. 3-65).

The wetland has a low-moderate indigenous diversity, with 23 species noted, along with 11 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Shiny Dock, Common Sneezeweed, Clammy Goosefoot, Hairy Carpet Weed and Globular Pigweed, and graminoids such as Plains Rush, Common Swamp Wallaby-grass, Brown-backed Wallaby-grass, Leafy Flat-sedge and Blown Grass (Appendix A).

Weed species such as Paspalum, Wild Lettuce, Cat's Ear, Water Couch, Quaking Grass and Curled Dock are found around the periphery of the wetland, but are not widespread (Appendix A).

Fig. 3-64 The outlet on the southern edge of Unnamed Swamp G towards Unnamed Swamp H.

Fig. 3-65 Floodway Pond Herbland EVC in Unnamed Swamp G.

Fig. 3-66 Plains Rushy Wetland EVC in Unnamed Swamp G.

3.1.22 Unnamed Swamp H

Unnamed Swamp H has an area of 4.29 ha, and is found south of Unnamed Swamp G.

The natural inlet for this wetland from Unnamed Swamp G is found on the northern edge of the site (Fig. 3-67), and the outlet is found on the southern edge of the swamp (Appendix W).

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC around the periphery of the wetland (Fig. 3-68), with a central area covered by Lake Bed Herbland EVC (Appendix W).

The wetland has a low-moderate indigenous diversity, with 23 species noted, along with 12 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Common Sneezeweed, Clammy Goosefoot, Hairy Carpet Weed and Globular Pigweed, and graminoids such as Plains Rush, Common Swamp Wallaby-grass, Brown-backed Wallaby-grass, Leafy Flat-sedge, Southern Cane-grass, Common Spike-sedge and Blown Grass (Appendix A).

Weed species such as Curled Dock, Spear Thistle, Milk and Rough-sow Thistle, Dandelion, Cat's Ear, Wild Lettuce and Sweet Briar are found around the periphery of the wetland, but are not widespread (Appendix A).

The north-central area of the wetland had been burnt in recent months by a low intensity fire, most likely ignited by a lightning strike (Fig. 3-69).

Fig. 3-67 The inlet area on the northern edge of Unnamed Swamp H.

Fig. 3-68 Plains Rushy Wetland EVC in Unnamed Swamp H.

Fig. 3-69 The burnt area in Unnamed Swamp H.

3.1.23 Unnamed Swamp I

Unnamed Swamp I has an area of 14.9 ha, and is found east of Green Swamp and north of Ashmeads Swamp.

The source for this wetland is surface runoff from the eastern side of the site (Fig. 3-70), and the outlet is found on the western edge of the swamp (Fig. 3-71; Appendix X).

Fig. 3-70 The inlet area on the eastern edge of Unnamed Swamp I.

The wetland is bisected by the Winton North Road on a north-south alignment, with a culvert underneath the road providing relatively unrestricted drainage (Fig. 3-72). A feature that has greater influence on the wetland hydrology is the dam that is found on the western side of the road (Fig. 3-73), and which appears to be the central point for drainage of the wetland, and has probably reduced the extent of the wetland to the east and south of the dam. A dam on the northern edge of the eastern side of the road has less influence on wetland hydrology, but probably has reduced the extent of the wetland to the east and north of the dam. Evidence of this reduction in extent is provided by the encroachment of Chinese scrub into the periphery of the wetland on the western side of the road south and west of the dam.

Fig. 3-71 The outlet on the western edge of Unnamed Swamp I towards Green Swamp.

Fig. 3-72 The culvert under the Winton North Road looking west.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC around the periphery of the wetland (Fig. 3-70 and 3-71), with small areas Lake Bed Herbland and Floodway Pond Herbland EVCs on the eastern side of the road close to the culvert draining that side of the wetland (Appendix X).

The wetland has a low indigenous diversity, with only 13 species noted, along with 15 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Common Sneezeweed, Clammy Goosefoot, Lesser Joyweed and Globular Pigweed, and graminoids such as Plains and Yellow Rush, Leafy Flat-sedge and Blown Grass (Appendix A).

Fig. 3-73 The dam on the western side of the Winton North Road.

Weed species such as Prickly and Wild Lettuce, Curled Dock, Wild Oat, Great Brome, Phalaris, Flax-leaf Fleabane, Spear Thistle, Milk and Rough-sow Thistle and Cat's Ear are widespread across the wetland (Appendix A).

3.1.24 Unnamed Swamp J

Unnamed Swamp J has an area of 3.12 ha, and is found south of Ashmeads Swamp.

The source for this wetland is surface runoff from the eastern side of the site, and the outlet to Green Swamp is found on the western edge of the swamp (Fig. 3-74; Appendix Y). There appears to be no flow or surface runoff from Ashmeads or Bill Friday Swamp to this wetland, and as a wetland with a relatively small catchment, is unlikely to be filled frequently.

Fig. 3-74 The outlet area on the western edge of Unnamed Swamp J towards Green Swamp.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC around the periphery of the wetland, with areas of Lake Bed Herbland and Floodway Pond Herbland EVCs on the eastern side of the road close to the culvert draining that side of the wetland (Fig. 3-75; Appendix Y).

Fig. 3-75 Floodway Pond Herbland and Lake Bed Herbland EVCs in Unnamed Swamp J.

The wetland has a low indigenous diversity, with 19 species noted, along with 11 introduced species (Table 3-1), with common herbs such as Pale and Creeping Knotweed, Common Sneezeweed, Clammy Goosefoot, Lesser Joyweed, Starfruit, Star Cudweed, and Globular Pigweed, and graminoids such as Plains and Pale Rush, Southern Cane-grass, Common Swamp Wallaby-grass, Common Spike-sedge, Leafy Flat-sedge and Blown Grass (Appendix A).

Weed species such as Blackberry Nightshade, Wild Lettuce, Curled Dock, Phalaris, Paspalum, Flax-leaf Fleabane, Cat's Ear, Spear Thistle, Milk and Rough-sow Thistle and Cat's Ear are widespread in the Plains Rushy Wetland EVC area (Appendix A).

3.1.25 Unnamed Swamp K

Unnamed Swamp K has an area of 2.12 ha, and is found east of Bill Friday Swamp, close to the Hume Freeway.

The source for this ephemeral wetland is surface runoff along a poorly defined drainage line running from the north of the site, and the outlet is a continuation of the drainage line running south; the wetland itself is a slight depression in this drainage line which would 'pool' water in a flow event (Appendix Z).

It is worth noting that this wetland was beyond the fringe of the high water mark of the old Lake Mokoan, and on this basis, would have had little surface water from that impoundment over the last 30 years.

The site has been disturbed in the past. An old road alignment running NNE-SSW passes along the western edge of the wetland (Fig. 3-76) ; while this raised alignment does not alter the bathymetry of the site, it will influence the flow of surface flow into the wetland. A small shallow dam on the western edge of the wetland (Fig. 3-77) is unlikely to have an significant influence on the site, other than retain water within it for a longer period flowing a flow event.

The site is considered wholly Red Gum Swamp EVC (Fig. 3-78; Appendix Z), and is dominated by multiple age classes of River Red Gum throughout, with a number of old mature individuals present. There is evidence of clearing of some patches of the site in the past; however, recruitment over the last 20-30 years (not necessarily related to the high water mark of Lake Mokoan) appears to have filled most of these former gaps.

Fig. 3-76 The old road alignment on the western edge of Unnamed Swamp K looking north.

Fig. 3-77 The shallow dam on the western side of Unnamed Swamp K.

Fig. 3-78 Red Gum Swamp EVC in Unnamed Swamp K.

The wetland has a low indigenous diversity, with only 10 species noted, along with 16 introduced species (Table 3-1), with a ground layer of dominant graminoids such as Hollow and Yellow Rush, Rush Sedge, Hill, Red-anthered and Brown-backed Wallaby-grass, and Blown Grass (Appendix A).

Weed species such Annual Ryegrass, Great Brome, Wild Oat, Onion Grass, Hare's-foot Clover, Plantain, Phalaris , Curled Dock, Bathurst Burr and Cat's Ear are widespread across the wetland; an individual Honey Locust plant was observed on the western edge of the site, along the old road alignment (Appendix A).

3.1.26 Unnamed Swamp L

Unnamed Swamp L has an area of 46.2 ha, and is found south of Sergeants Swamp.

The source for this wetland is surface runoff from the flat plain to the south of the site (Fig. 3-79), and the outlet to Sergeants Swamp is found on the north western edge of the swamp (Fig. 3-80; Appendix AA).

Fig. 3-79 The inlet area on the southern edge of Unnamed Swamp L.

Fig. 3-80 The outlet area on the north western edge of Unnamed Swamp K towards Sergeants Swamp. Note the Chinese Scrub plants in the foreground.

The wetland is on the eastern side of the South West Link Track; however, this appears to have little influence on inflows or outflows to the wetland. The wetland has two shallow dams within it (Fig. 3-81), but they appear to have little influence on the extent, hydrology or filling regime of the wetland, other than retain water within them for a longer period flowing a flow event.

Fig. 3-81 The shallow dams in the north (left) and centre (right) of Unnamed Swamp L.

This wetland appears to be highly ephemeral and was dry for many years during the drought even during the Lake Mokoan period, as evidenced by the past encroachment of Chinese scrub into the centre of the swamp; dead plants that have been killed by recent filling can be found across the bed of the wetland (Fig. 3-82).

Fig. 3-82 A dead Chinese Scrub plant in the centre of Unnamed Swamp L.

The vegetation of the wetland is complex: the central area of the wetland is dominated by Floodway Pond Herbland EVC, ringed by areas of Lake Bed Herbland EVC (to the north) and Plains Grassy Wetland EVC (to the west, south and east). Plains Rushy Wetland EVC dominates the peripheral areas of the swamp (Appendix AA; Fig. 3-83).

Notably, the Plains Grassy Wetland EVC area is dominated by dense swards of Southern Cane-grass – the largest expanse of this species observed during this assessment across the whole Winton system (Fig. 3-84).

The wetland has a low indigenous diversity, with 17 species noted, along with 13 introduced species (Table 3-1), with dominant indigenous herbs such as Pale Knotweed, Common Sneezeweed, Clammy Goosefoot, Shiny Dock, Starfruit and Globular Pigweed, and graminoids such as Southern Cane-grass, Plains Rush, Common Swamp Wallaby-grass, Brown-backed Wallaby-grass, Broad-leaf Cumbungi, Leafy Flat-sedge, Common Spike-sedge and Blown Grass (Appendix A).

Weed species such as Wild Lettuce, Curled Dock, Spear Thistle, Milk Thistle, Hare's-foot Clover and Cat's Ear are found particularly around the periphery of the wetland, but are not widespread; there were small areas of Noogoora Burr around the central dam, as well as one Crack Willow individual, and some Water Couch was observed on the wetland bed (Appendix A).

Fig. 3-83 **Lake Bed Herbland EVC merging into Plains Rushy Wetland EVC on the eastern side of Unnamed Swamp L.**

Fig. 3-84 **A dense sward of Southern Cane-grass (Plains Grassy Wetland EVC) on the western side of Unnamed Swamp L.**

3.1.27 Unnamed Swamp M

Unnamed Swamp M has an area of 2.93 ha, and is found south of Sergeants Swamp.

The source for this wetland is surface runoff from the flat plain to the south of the site, and the outlet ultimately to the drainage line that is the outflow for Unnamed Swamp N (to Sergeants Swamp) has been channelised (from the dam on the site), and is found on the north eastern edge of the swamp (Fig. 3-85; Appendix AB).

There appears to be no flow or surface runoff from Unnamed Swamp L to this wetland despite its close proximity, and as a wetland with a relatively small catchment, is unlikely to be filled frequently.

A feature that has greater influence is the dam that is found in the north of the wetland (Fig. 3-86; Appendix AB), and which appears to be the central point for drainage and will increase the duration of waters on-site with flow; however, it appears to have had little impact on the extent of the swamp.

Fig. 3-85 The outlet area on the north eastern edge of Unnamed Swamp M looking east.

Fig. 3-86 The dam in the north (on the right-hand side of frame) of Unnamed Swamp M.

The vegetation of the wetland is complex: Tall Marsh EVC is found around and within the dam in the central areas of the site, ringed by areas of Lake Bed Herbland EVC (to the south) and Plains Grassy Wetland EVC (to the north). Plains Rushy Wetland EVC dominates the southern peripheral areas of the swamp (Appendix AB; Fig. 3-87). The Plains Grassy Wetland EVC area is dominated by dense swards of Southern Cane-grass.

The wetland has a low indigenous diversity, with 18 species noted, along with only 5 introduced species (Table 3-1), with dominant indigenous herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot, Starfruit and Globular Pigweed, and graminoids such as Broad-leaf Cumbungi, Southern Cane-grass, Plains and Yellow Rush, Common Swamp Wallaby-grass, Brown-backed Wallaby-grass, Leafy Flat-sedge and Blown Grass (Appendix A).

Weed species such as Wild Lettuce, Stinkwort, Water Couch, Flax-leaf Fleabane and Cat's Ear are found particularly around the periphery of the wetland, but are quite low in abundance (Appendix A).

Fig. 3-87 **Plains Grassy Wetland EVC merging into Plains Rushy Wetland EVC on the eastern side of Unnamed Swamp M, with Tall Marsh EVC in the background.**

3.1.28 Unnamed Swamp N

Unnamed Swamp N has an area of 8.70 ha, and is found south of Sergeants Swamp.

The source for this wetland is surface runoff from the flat plain to the south east of the site, and the outlet is on the north western side ultimately to Sergeants Swamp (Fig. 3-88; Appendix AC).

Fig. 3-88 **The outlet area on the north western edge of Unnamed Swamp N looking north towards Sergeants Swamp.**

The wetland is bisected by Flynns Road on a north-south alignment (Appendix AC), and the slight mounding of the road alignment may have a slight impounding/retarding effect on the natural flow of water from east to west (Fig. 3-89).

A feature likely to have a greater influence on the wetland hydrology are the three dams that are found on the periphery of the site (Appendix AC); two on the eastern side and one on the western side. These dams do appear to be the central point for drainage from the wetland, and seem to have influenced a reduction in the wetland extent north of the dams on the eastern side of the road, and the westerly extent on the western side of the road (Fig. 3-90).

Fig. 3-89 **Along the Flynns Road alignment that bisects Unnamed Swamp N, looking south.**

Fig. 3-90 **Two of the dams of Unnamed Swamp L; on the eastern side (left) and on the western side (right) of the wetland.**

Fig. 3-91 **Floodway Pond Herbland EVC merging into Plains Rushy Wetland EVC on the western side of Unnamed Swamp N, taken from Flynns Road looking north west.**

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC around the periphery of the wetland and across all of the western side (Fig. 3-91), with an area of Floodway Pond Herbland EVC on the eastern side of the road close to the road (Appendix AC). It is highly likely that the extent

of the Floodway Pond Herbland EVC has been reduced by the impact of the three dams and the road alignment, and the commensurate alteration of drainage patterns

The wetland has a low indigenous diversity, with only 14 species noted, along with 11 introduced species (Table 3-1), with dominant indigenous herbs such as Pale and Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Clammy Goosefoot, False Loosestrife and Globular Pigweed, and graminoids such as Plains and Pale Rush, Broad-leaf Cumbungi and Blown Grass (Appendix A).

Weed species such as Wild Lettuce, Stinkwort, Spear and Slender Thistle, Flax-leaf Fleabane Wild Oat and Lesser Canary Grass are found particularly around the periphery of the wetland and on the road edge in some abundance, with Yellow Marsh-cress and Water Couch common on the bed of the swamp (Appendix A).

3.1.29 Unnamed Swamp O

Unnamed Swamp K has an area of 2.61 ha, and is found north of 7 Mile Wetland and south of Unnamed Swamp N, in the south western corner of the Winton Wetlands

The source for this ephemeral wetland is surface runoff along a poorly defined drainage line running from the east of the site (Fig. 3-92), and the outlet is a continuation of the drainage line running west ultimately towards drainage Unnamed Swamp L; the wetland itself is a slight depression in this drainage line which would 'pool' water in a flow event (Appendix AD).

Fig. 3-92 The inlet area on the eastern edge of Unnamed Swamp O looking east towards Winton Creek.

A feature that has significant influence on the wetland hydrology is the dam that is found on the western side of the site (Fig. 3-93 Appendix AD), and which appears to be the central point for drainage of the wetland; this may have reduced the extent of the wetland to the north west of the dam.

The vegetation of the wetland is dominated by Plains Rushy Wetland EVC around the periphery of the wetland (Fig. 3-94), with a central area covered by Floodway Pond Herbland EVC (Appendix AD).

The wetland has a low-moderate indigenous diversity, with 20 species noted, along with 12 introduced species (Table 3-1), with dominant indigenous herbs such as Creeping Knotweed, Lesser Joyweed, Common Sneezeweed, Starfruit, Small Loosestrife, Clammy Goosefoot and Globular Pigweed, and graminoids such as Plains and Yellow Rush, Southern Cane-grass, Leafy Flat-sedge, Common Spike-sedge, Brown-backed Wallaby-grass and Blown Grass (Appendix A).

Fig. 3-93 The dam in the west of Unnamed Swamp O, looking west.

Weed species such as Wild Lettuce, Spear Thistle, Curled Dock, Rough Sow-Thistle, Phalaris, Hare's-foot Clover, Cat's Ear and Plantain are found throughout the wetland in some abundance, with Yellow Marsh-cress and Water Couch common on the bed of the swamp (Appendix A).

Fig. 3-94 Floodway Pond Herbland EVC merging into Plains Rushy Wetland EVC on the eastern side of Unnamed Swamp O, looking north.

3.1.30 Winton Swamp

Winton Swamp is an area of 1,791 ha that forms part of a contiguous wetland complex with Sergeants and Green Swamp that all maintain the same surface water elevation. The outlet for this wetland complex is the channel outlet on the western side of Sergeants Swamp (Appendix AE). Despite this outlet having been lowered significantly with the decommissioning of Lake Mokoan, the maintained water level before water flows out of the system is potentially higher than would be the case with natural outflow conditions; this assertion requires further investigation (Saunders pers. comm. 2013). Waters for this wetland are derived ultimately from flows from Green Swamp (Fig. 3-96) and from Winton Creek and other smaller creeks that link to the complex, and from surface runoff from the adjacent northern slopes during high rainfall events (Appendix AE). The Winton Creek inlet is found in the south eastern area of the wetland (Appendix AE; Fig. 3-95).

Fig. 3-95 The Winton Creek inlet into Winton Swamp.

The high turbidity of waters in Green, Winton and Sergeants Swamp is a significant impediment to the improvement in biological diversity in this area of the wetlands. It is unclear whether this turbidity is a result of dispersive clay minerals already within the complex, or from new inflows from Winton Creek and other sources.

Fig. 3-96 The junction between Green Swamp and Winton Swamp at the end of The Spit.

Areas to the south west, south and east of the wetland are composed predominantly of indigenous vegetation, and form an excellent wetland buffer. However, the northern boundary (adjacent to Lake Mokoan Road and the Diversion Pipeline easement) and on the western boundary are dominated by introduced species, are heavily disturbed, and provide little buffer to the wetland (Appendix AE). Much of the wetland is still experiencing cattle grazing; this was most evident in all moist areas where the surface waters had receded and were heavily disturbed by pugging (Appendix AE; Fig. 3-97).

Fig. 3-97 The northern edge of Winton Swamp showing significant cattle pugging.

The wetland is dominated by two EVCs: Aquatic Herbland EVC (in the predominantly open water sections), and Plains Rushy Wetland EVC in bordering areas (Fig. 3-98; Appendix AE). While at the time of assessment the surface waters were largely devoid of any vegetation, in the open areas, there was some evidence of Aquatic Herbland EVC (or possibly Dwarf Floating Aquatic Herbland EVC). The dried or drying wetland bed did have some patches of herbs that are more correctly labelled Lake Bed Herbland EVC, however, amongst this live vegetation was evidence of typical Aquatic Herbland EVC species, and given the small scale of lake bed growth, these areas were named as the later EVC. Significant patches of Tall Marsh EVC were observed across the open water areas (Appendix AE), mostly on the northern and southern side of the wetland, especially in the vicinity of the Winton Creek inlet (Fig. 3-95).

The wetland has a moderate indigenous diversity, with 28 species noted, along with 23 introduced species (Table 3-1), with herbs such as Upright Water-milfoil, Pale, Slender and Creeping Knotweed, Lesser Joyweed, Common Duckweed, Shiny Dock, Fringed Heartwort, Hairy Carpet Weed and Ferny Azolla, and graminoids such as Plains, Yellow and Pale Rush, Knob Sedge, Common Spike-sedge, Broad-leaf Cumbungi, Common Reed, Leafy Flat-sedge, Blown Grass, Spiny Mud-grass, Southern Cane-grass and Wallaby-grasses (Appendix A).

Weed species such as Stinkwort, Wild and Prickly Lettuce, Rat's-tail Fescue, Wild Oat, Flax-leaf Fleabane, Barrel Medic, Water Couch, Hare's-foot Clover, St. John's Wort, Spear and Milk Thistle, Great and Soft Brome, Yorkshire Fog, Curled Dock, Drain Sedge, Ox's-tongue, Plantain, Paterson's Curse, Paspalum, Marsh Yellow-cress and Phalaris are very widespread, and in all areas adjacent to the open water high water mark (Appendix A).

Fig. 3-98 Plains Rushy Wetland EVC on the northern edge of Winton Swamp.

3.2 Observed Surface Hydrology of the Wetlands

During the course of undertaking the IWC assessments, observations were made in regards to the flow of water in and out of each site. These observations were made by an ecologist without the benefit of any technology to assist with the field determination of surface elevations and levels, and without the use of a digital elevation or surface elevation model on GIS spatial layers to facilitate desktop interpretation. On the basis, the likely basic hydrology of the Winton Wetland 'complex' has been prepared and presented in Fig. 3-99. It is strongly recommended that the WWCoM engage an appropriate person to definitively ascertain the hydrology of the Winton Wetlands, using Fig. 3-99 as a starting point.

The development of the thinking behind the hydrological patterns has been further informed by the viewing of two aerial views of the wetland complex: (1) video taken in 2012 during the flooding event, and (2), an aerial image of the wetlands in 1971 (both Saunders pers. comm. 2012).

The aerial image taken in 1971 shows clearly the Lake Mokoan wall as a built or partly built structure, and the flooding pattern that is shown is unlikely to be 'natural' (i.e. not as a result of natural draining and filling of the system), and is more an artefact of the rise in surface water elevation for the first time because of the presence of the dam wall. It is also inferred from this image that the source of the water present is because of inflows from 11 Mile and Winton Creek (i.e. as a result of a large rainfall event higher in the catchment) rather than local surface runoff from the wetland estate itself, due to the lack of filling of those wetlands now known to be filled by local runoff. Notwithstanding these caveats to the use of this image, some pertinent observations can be made:

- While the Black/Lindsay complex is flooded by backflow from the wall in the 1971 image, and would normally be filled by local runoff from the north and east, it does show that water is likely to flow from Lindsay Swamp West through the Unnamed F/G/H/Sadlers Swamp complex as inferred from field assessment;
- The wetlands found to the south of Sergeants Swamp – Unnamed Swamps L/M/N/O – are likely to derive their water solely from local runoff, as hypothesised in the field;
- Bill Friday Swamp and Unnamed Swamp J and K also are likely to derive their water solely from local runoff, as hypothesised in the field;

- The Unnamed Swamp A/B/C complex is likely to derive its water from local runoff and from flow from the southern edge of Boggy Bridge North Swamp in a large flooding event, but are rarely filled, as hypothesised in the field;
- Unnamed Swamp J and Ashmeads Swamp are not connected, even in a large flooding event;
- In a large flooding event, Ashmeads Swamp can become continuous with Green Swamp, and that the expanded extent of Ashmeads Swamp to the north of Ashmeads Road to Winton North Road is justified. It can also inferred that both of these roads are a significant impediment to water movement;
- Unnamed Swamps E and I drain towards the eastern side of Green Swamp through a low-lying sedgy area east of Greens Hill that can be inundated in a large flooding event (this low-lying area contains Unnamed Swamp I);
- The enlarged extents of Sergeants and Winton Swamp in the south of both swamps are justifiable, and these areas will be covered with water in a large flooding event.

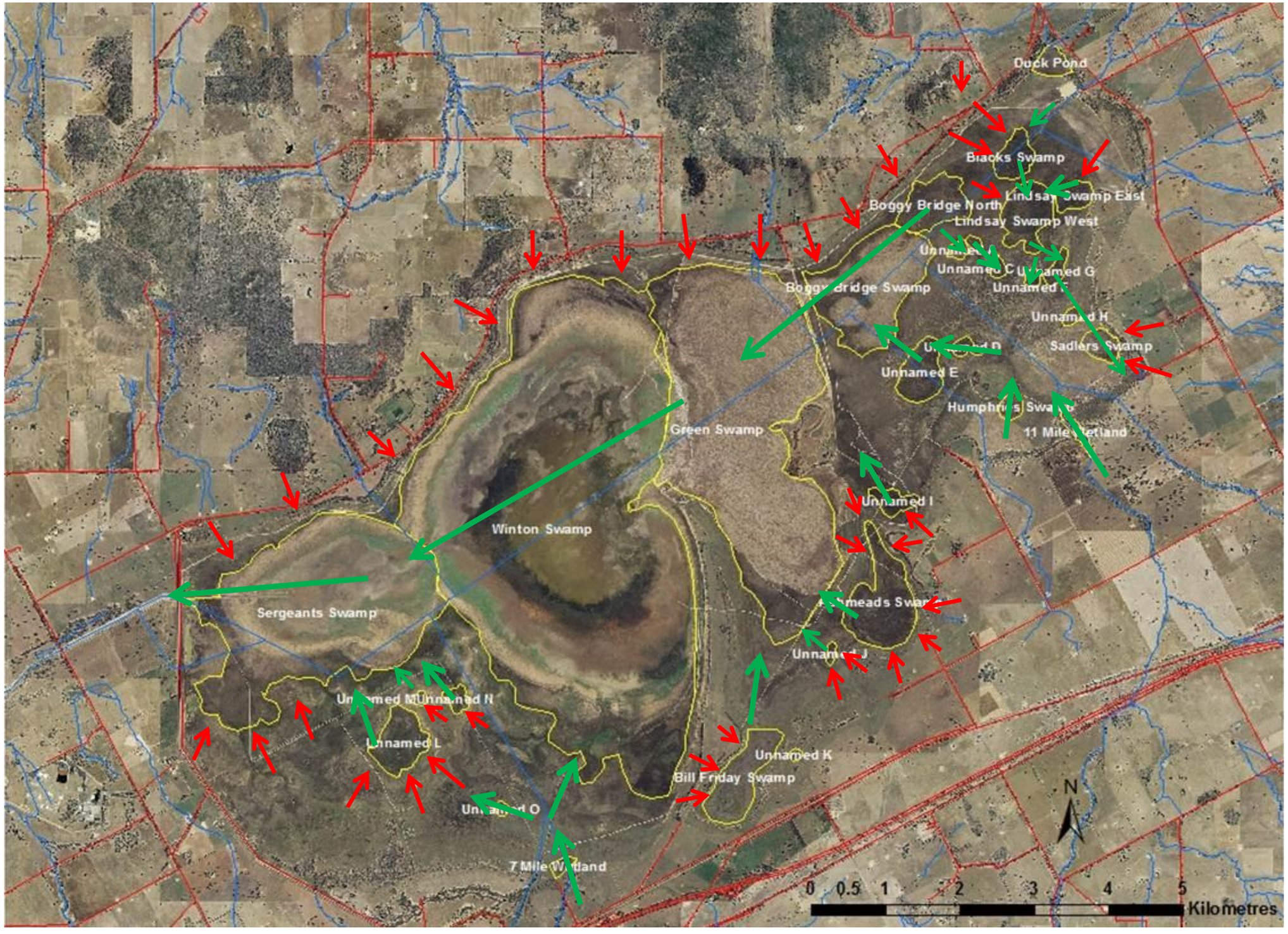

Figure 3-99 **Likely hydrology of the thirty assessed wetlands in the Winton Wetlands. Green arrows indicate direction of usual water flow, while red arrows indicate surface runoff.**

3.3 Summary of IWC Results and Conclusion

Table 3-2 outlines the sub-index and overall score for all thirty assessed wetlands.

Unnamed Swamps C, B, F, G, H and L, Boggy Bridge North Swamp and Boggy Bridge Swamp had the highest overall scores, largely due to their undisturbed buffer areas and very low adjacent land use intensity, unaltered hydrology and bathymetry, high water quality, and relative lack of soil disturbance (Table 3-2).

On the other hand, the lowest overall scores were recorded by Sergeants and Winton Swamps, due to their lower proportion of wetland boundaries with a buffer, significant land use intensity in some adjacent areas, altered hydrology, poor water quality, and significant soil disturbance (Table 3-2). Green Swamp and Sadlers Swamp also posted low scores for water quality.

The constructed wetlands, Duck Pond and 7 Mile Wetland, score in the lower range due to low scoring in altered hydrology and disturbed catchments (Table 3-2).

It is a noticeable trend that there is quite strong inverse relationship between the frequency and intensity of stock grazing in a natural wetland, and the overall score obtained. This is a reflection of the influence that stock grazing will have on the Biota, Soils and Wetland Catchment scoring (Table 3-2).

Most of the wetlands have scored well in Physical Form, as they have retained their extent as mapped, or the area of the wetland has increased relative to this previous mapping (Table 3-2).

4. RECOMMENDATIONS

4.1 Mapping and Wetland Identification Issues

- That DSE be provided with a definitive name for each of the 19 wetlands, and the provided 2012 wetland extent spatial layer;
- To ensure that all 30 wetlands have a wetland identifier number provided by DSE, and that the provision of these numbers, combined with a name, will allow interrogation of the IWC Wetland Mapping Tool to zoom to any of the wetlands as a discrete wetland entity;
- To request DSE remove the Lake Mokoan extent from the WETLAND_1994 spatial layer on the IWC Wetland Mapping Tool;
- To provide DSE with the information collected in this report, so that it can be imported into their database and that the IWC Assessment information for each wetland is publically available on-line using the IWC Wetland Mapping Tool.

Table 3-2 IWC sub-indices and total condition scores for the thirty assessed wetlands.

Wetland	Wetland catchment	Physical form	Hydrology	Water properties	Soils	Biota	Overall
	out of 20	*out of 20*	*out of 20*	*out of 20*	*out of 20*	*out of 20*	*out of 120*
7 Mile Wetland	8	10	10	17	20	18.2	83.2
11 Mile Wetland	11	18	10	15	19.2	14.5	87.7
Ashmeads Swamp	16	20	15	17	19.5	16.3	103.8
Bill Friday Swamp	14	16	15	17	20	18.3	100.3
Blacks Swamp	20	18	15	17	17.5	18.2	105.7
Boggy Bridge Swamp	20	20	20	20	20	14	114.0
Boggy Bridge North Swamp	20	20	15	20	19.75	19.4	114.2
Duck Pond	8.5	16	0	17	20	18.2	79.7
Green Swamp	10	20	15	10	18.5	8.6	82.1
Humphries Swamp	14.5	20	20	17	19.75	19.4	110.7
Lindsay East Swamp	18	20	15	15	13.5	9.9	91.4
Lindsay Swamp (West)	20	20	15	15	15	6.2	91.2
Sadlers Swamp	9.5	20	20	10	8	14.4	81.9
Sergeants Swamp	8	18	10	10	15.5	8.3	69.8
Unnamed Swamp A	20	20	20	15	18	17.1	110.1
Unnamed Swamp B	20	20	20	17	18.5	17.7	113.2
Unnamed Swamp C	20	20	20	20	20	17.9	117.9
Unnamed Swamp D	20	14	15	17	19.8	17.8	103.6
Unnamed Swamp E	20	20	15	15	18.5	17.5	106.0
Unnamed Swamp F	20	20	20	17	19.5	18.1	114.6
Unnamed Swamp G	20	20	20	17	19.5	18.4	114.9
Unnamed Swamp H	20	20	20	17	19.2	18.9	114.8
Unnamed Swamp I	20	16	15	20	19.8	14.2	105
Unnamed Swamp J	14.5	20	20	20	20	18	112.5
Unnamed Swamp K	12	14	15	17	19.5	14.4	91.9
Unnamed Swamp L	20	20	20	20	20	17.6	117.6
Unnamed Swamp M	20	18	15	20	20	16.7	109.7
Unnamed Swamp N	20	12	15	17	19	16.6	99.6
Unnamed Swamp O	20	20	15	17	19.5	16.5	108
Winton Swamp	8	20	10	10	19.5	7.8	75.3

4.2 Future Monitoring and Interpretation of Results

- As previously stated, it must be fully acknowledged that aspects of the assessments, especially the Biota sub-index information, is highly reliant upon the prevailing environmental conditions, i.e. presence or recent presence of water in the wetland and indeed the water level within the wetland at the time of assessment, and is therefore a product of the recent climate, and this must be considered in interpretation of all results and comparison from one monitoring period to the next;
- To repeat the IWC assessment process for all wetlands on a 3-5 yearly basis to monitor wetland health and condition;

- As indicated, many assessed EVCs are different to what would have been allocated pre-Lake Mokoan because of the loss of the River Red Gum layer. Given future efforts to re-instate River Red Gum into wetlands, this change in EVC, and therefore a change in the Biota sub-index conditions score as a result, must be considered in interpretation of results.

4.3 Management Considerations

- While re-instatement of a River Red Gum canopy into most of the wetlands will lead to a change in the EVC allocated, it would seem obvious that a true restoration process must re-instate this tree layer in all wetlands in areas where a standing dead tree layer exists;
- Stock grazing has been observed in a number of wetlands. Grazing in wetlands is not an intentional management practice, and grazing in wetlands is an artefact of the progress with the establishment of appropriate fencing, which will soon be completed (Saunders pers. comm. 2013). Stock grazing in wetlands is a deleterious practice to the majority of wetland flora as a result of direct grazing and trampling, and additionally will result in significant soil disturbance (pugging), sediment mobilisation (turbidity) and nutrient enhancement of surface waters. There will be no improvement in the IWC condition score of relevant wetlands until grazing is removed, as any improvement through direct management action or natural regeneration is likely to be cancelled out by continuation of the practice. It is strongly recommended that grazing be phased out of all wetlands by the eventual fencing-out of all areas;
- The high turbidity of waters in Green, Winton and Sergeants Swamp will be a significant impediment to the improvement in biological diversity in this area of the wetlands. It needs to be ascertained if this turbidity is a consequence of: (a) dispersive clay minerals already present in the wetland sediments that have been transported into the system during the Lake Mokoan period with sediment movement facilitated by carp activity, (b) transporting with inflows from Winton Creek and other sources, or (c), a combination of (a) and (b). If (a) is the major contributor, then there is probably little that can be done to ameliorate water quality in the short-medium term, however, if (b) is the major contributor, and there is active sediment mobilisation in the Winton Creek catchment, then the WWCoM could act to motivate landholders with frontage, relevant community groups and government agency in actions to improve the water quality of Winton Creek by minimising sediment (and nutrient) mobilisation;
- While some attempt has been made in this report to document likely direction and points of water movement in and out of wetlands, this has done by field observation without the use of technology and without the use of a digital elevation or surface elevation model on GIS spatial layers. It would seem prudent to definitively establish this hydrology as a matter of course.

5. CONCLUSION

Hamilton Environmental Services undertook an evaluation of 13 named and 27 unnamed wetlands within the Winton Wetlands Estate in December 2012 and March 2013, using the Index of Wetland Condition (IWC) assessment tool. The IWC assessment has been developed by DSE, and is a standard for the evaluation of all wetlands in Victoria.

Assessments indicated that the thirty wetlands ranged from moderate to excellent overall condition scores. Nineteen of the thirty wetlands recorded 'excellent' overall condition scores of over 100 (out of 120). These wetlands generally have unaltered hydrology and bathymetry, excellent water quality, a diverse indigenous flora, and largely undisturbed vegetation buffers.

The three largest wetlands – Winton, Green and Sergeants Swamps – provided three of the lower scores (69 to 82 out of 120), primarily as a consequence of water quality, vegetation and soil disturbance due to stock grazing, and disturbed vegetation in the wetland surrounds.

These findings do suggest that the Winton Wetlands complex overall is in good condition, with none of the wetlands evaluated being rated lower than 'Moderate', and with most considered to be in 'Good' or Excellent' condition.

A number of recommendations have been made in reference to the identification and mapping of the wetlands within the DSE IWC database, the future monitoring and interpretation issues, and management considerations and actions to undertake to improve future condition, and to improve knowledge of the Estate.

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6.1 Personal communications

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APPENDIX A FLORA INVENTORY OF ALL EVALUATED WETLANDS

Vascular flora have been recorded for presence in individual wetlands (see Fig. 2-1), using a cover-abundance scale that is shown in the Table immediately below.

An asterisk denotes an introduced species.

Each plant species present were assessed for cover-abundance using the scale outlined below. Nomenclature and taxonomy of plants based variously on the *Flora of Victoria* (Walsh and Entwisle 1994, 1996 and 1999), and PlantNet Flora On-line (Royal Botanic Gardens Sydney 2012).

Visual assessment of cover/abundance	
Symbol	*Description*
0	rare, cover < 5%
1	Uncommon, cover < 5 %
2	Very common, cover < 5 % or cover 5-25 % with any number of individuals
3	Cover 25-50 % with any number of individuals
4	Cover 50-75 % with any number of individuals
5	Cover 75-100 % with any number of individuals

Common name	Scientific name	Lifeform#	7 Mile	11 Mile	Ashmeads	Bill Friday	Blacks	Boggy Bridge	Boggy Bridge North	Duck Pond	Greens	Humphries	Lindsay East	Lindsay West	Sadlers	Sergeants
Sheep Sorrel	*Acetosella vulgaris**	MH										0				
Delicate Hairgrass	*Aira elegantissima**	MNG														
Water Plantain	*Alisma lanceolata**	MTG	0													
Lesser Joyweed	*Alternanthera denticulata*	MH	1	1	2	2	3	2	2	1	2	2	3	2		2
Common Swamp Wallaby-grass	*Amphibromus nervosus*	LTG	2	1		2	1	0		2		2			2	
Brush Wire-grass	*Aristida behriana*	MTG		0		0									0	
Lagoon Saltbush	*Atriplex suberecta*	MS														
Brown-backed Wallaby-grass	*Austrodanthonia duttoniana*	MNG		1	1						0					0
Hill Wallaby-grass	*Austrodanthonia eriantha*	MNG				1					1					1
Copper-awned Wallaby-grass	*Austrodanthonia fulva*	MTG		1							1				2	1
Wild Oat	*Avena fatua**	LNG	1	1	2	1					2	0			2	2
Ferny Azolla	*Azolla pinnata*	SH	2		3	2	3	1		3		2	3	1	2	1
Quaking Grass	*Briza maxima**	MNG													1	
Prairie Grass	*Bromus catharticus**	LTG														
Great Brome	*Bromus diandrus**	LNG			2	0	1			1	2	0			0	2
Soft Brome	*Bromus mollis**	MNG														0
Shepherd's Purse	*Capsella bursa-pastoris**	MH							2							
Slender Thistle	*Carduus tenuiflorus**	LH														
Tall Sedge	*Carex appressa*	LTG				0										
Knob Sedge	*Carex inversa*	MTG		1							0					0
Rush Sedge	*Carex tereticaulis*	LTG	1	2		1				2		1			1	
Dogwood	*Cassinia aculeata*	MS									0					0
Chinese Scrub	*Cassinia arcuata*	MS		2							0					0
Common Centaury	*Centarium erythraea**	SH	1	0	2						0				2	
Common Sneezeweed	*Centipida cunninghamii*	SH		2	0		0	2			1		0	0		
Clammy Goosefoot	*Chenopodium pumilio*	SH	0	2	1	2	2	2			2					
Windmill Grass	*Chloris truncata`*	MTG		1												
Spear Thistle	*Cirsium vulgare**	LH		0	2	0		1			2	1	2	2	1	2
Leafy Twig-sedge	*Cladium procerum*	SH				1	1									
Blushing Bindweed	*Convolvulus erubescens*	SH														
Flax-leaf Fleabane	*Conyza bonariensis**	LH		2	2						2				0	2
Canadian Fleabane	*Conyza canadiensis**	LH					1									
Tall Fleabane	*Conyza sumatrensis**	LH		1	1						2			1		1
Spreading Crassula	*Crassula decumbens*	SH														
Australian Stonecrop	*Crassula sieberiana*	SH														
Paddy Melon	*Cucumis myriocarpus**	MH									1					
Couch	*Cynodon dactylon*	MNG								2						
Drain Sedge	*Cyperus eragrostis**	MTG								1	1				2	1
Tall Flat-sedge	*Cyperus exaltatus*	LTG		1												
Leafy Flat-sedge	*Cyperus lucidus*	LTG	2	2		1	2	1	2		2	2	2	1	2	2

Common name	Scientific name	Lifeform#	7 Mile	11 Mile	Ashmeads	Bill Friday	Blacks	Boggy Bridge	Boggy Bridge North	Duck Pond	Greens	Humphries	Lindsay East	Lindsay West	Sadlers	Sergeants
Starfruit	*Damasonium minus*	LH	3			2	0		1	0	0					
Stinkwort	*Dittrichia graveolens**	LH									2					1
Globular Pigweed	*Dysphania glomulifera* ssp. *glomulifera*	SH			1	2	1	1			1			1		
Paterson's Curse	*Echium plantigineum**	LH													1	1
Common Spike-sedge	*Eleocharis acuta*	MTG	2	2		3		0	1	3		1			2	
Grey Spike-sedge	*Eleocharis macbarronii*	LTG										2				
Small Spike-sedge	*Eleocharis pusilla*	STG				2						1				
Common Wheatgrass	*Elymus scaber*	MTG		0												
Spider Grass	*Enteropogon acicularis*			0												
Smooth Willow-herb	*Epilobium billardierianum*	MH	1		1	0		1			1			1	0	1
Hairy Willow-herb	*Epilobium hirtigerum*	MH						1			1					1
Brown's Love-grass	*Eragrostis brownii*	MTG													1	
Southern Cane-grass	*Eragrostis infecundus*	LTG			1	2	0			2	0	2				2
River Red Gum	*Eucalyptus camaldulensis*	T		3						2						
Star Cudweed	*Euchiton involucratus*	MH									0					
Annual Cudweed	*Euchiton sphaericus*	MH		1	0										0	
Spiked Cudweed	*Gamochaeta purpurea**	SH						1								
Honey Locust	*Gleditsia triacanthos**	MS														
Hairy Carpet Weed	*Glinus lotoides*	SH	2	1	1	2	2	2		2		1	2		1	
Ox's-tongue	*Helminthotheca echioides**	LH	0		2	1	1			1	1					2
Yorkshire Fog-grass	*Holcus lanatus**	MNG			1	0				2	2	1				2
Barley Grass	*Hordeum leporinum**	MNG										1				
St. John's Wort	*Hypericum performatum**	MH		2	0						1					1
Cat's Ear	*Hypochoeris radicata**	MH		2							2				2	2
Red-anthered Wallaby-grass	*Joycea pallida*	LTG		1												
Hollow Rush	*Juncus amabilis*	LTG		1				1				1				
Yellow Rush	*Juncus flavidus*	LTG		2	1	2	2		1		0					1
Joint-leaf Rush	*Juncus holoschoenus*	LTG		0											0	
Pale Rush	*Juncus pallidus*	LTG	2	2	2	2			2		1		2	2	1	2
Plains Rush	*Juncus semisolidus*	LTG		3	3	2	4	2	4	1	3	3	3	2	3	3
Blown Grass	*Lachnagrostis filiformis*	MNG	2	2	3	2	2	3	3	2	2	3	1	2	2	2
Wild Lettuce	*Lactuca saligna**	LH		2	2	1	2	2	2	1	2	2	2	2	1	2
Prickly Lettuce	*Lactuca serriola**	LH			2	1	1	1		1	0	1	1	1		1
Common Duckweed	*Lemna disperma*	SH				2	1			1					1	
Lesser Hawkbit	*Leontodon taraxacoides* ssp. *taraxacoides**	LH	0												0	
Wimmera Ryegrass	*Lolium rigidum**	MNG		1											1	
Birds-foot Trefoil	*Lotus corniculatus**	MH				0									0	
Water Purslane	*Ludwigia palustris**	MH													2	
Water Primrose	*Ludwigia peploides*	MH	1	0	1	0		0		2	0		0		2	
Small Loosetrife	*Lythrum hyssopifolia*	MH	2	1		1		1								

Common name	Scientific name	Lifeform#	7 Mile	11 Mile	Ashmeads	Bill Friday	Blacks	Boggy Bridge	Boggy Bridge North	Duck Pond	Greens	Humphries	Lindsay East	Lindsay West	Sadlers	Sergeants
Barrel Medic	*Medicago truncatula**	MH									2					2
Creeping Mint	*Mentha satureoides*	SH	2			1				0					1	
Upright Milfoil	*Myriophyllum crispatum*	MH	2			1					2		0	1		0
Red Water-milfoil	*Myriophyllum verrucosum*	MH			2	3	2			3	0				2	
Swamp Lily	*Ottelia ovalifolia* ssp. *ovalifolia*	MH	1			2						1				
Warrego Summer Grass	*Paspalidium jubiflorum*	LTG								0						
Paspalum	*Paspalum dilitatum**	LTG	1	2	1	1					0	0			2	1
Water Couch	*Paspalum distichum**	MNG	2	2	2	3					2		1	1		2
Kikuyu	*Pennisetum clandestinum**	MNG										0				
Slender Knotweed	*Persicaria decipiens*	MH									0					0
Pale Knotweed	*Persicaria lapathifolia*	MH	1	1	2	0	2	2	2	1	2	2	2	2		2
Creeping Knotweed	*Persicaria prostrata*	SH	1		2	1	2		2		2	2	3	2	1	2
Toowoomba Canary Grass	*Phalaris aquatica**	LTG	2	2	2	2	1	1	2	2		2			2	2
Lesser Canary Grass	*Phalaris minor**	MTG											1	2	1	
Plantain	*Plantago lanceolata**	MS	0	2							1			1		1
Wireweed	*Polygonum aviculare**	MH														
Poison Pratia	*Pratia concolor*	MH	1			0				0					1	
Matted Pratia	*Pratia pedunculata*	SH				0										
	Prunus sp.*	MS														
Jersey Cudweed	*Pseudognaphalium luteoalbum*	MH			1						1					
Spiny Mud-grass	*Pseudoraphis spinescens*	MNG	2			2					0					
River Buttercup	*Ranunculus inundatus*	SH	0			1										
Australian Buttercup	*Ranunculus lappaceus*	LH														
Fringed Heartwort	*Ricciocarpus natans*	SH		1	2	2	3				2	2	0	2	2	
Onion Grass	*Romulea rosea**	STG		1												
Marsh Yellow-cress	*Rorippa palustris**	SH	0	2	1				2		2	2	3	2		2
Sweet Briar	*Rosa rubiginosa**	MS			0										0	
Clustered Dock	*Rumex conglomeratus**	LH														
Curled Dock	*Rumex crispus**	LH	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Shiny Dock	*Rumex tenax*	LH	1		2				1				1	1		
Crack Willow	*Salix fragilis**	T														
Peppercorn	*Schinus molle**	T			0											
Cotton Fireweed	*Senecio quadridentatus*	LH														
Slender Pigeon Grass	*Setaria gracilis*	LTG	0													
Blackberry Nightshade	*Solanum nigrum**	MH									1					
Rough Sow-thistle	*Sonchus asper**	LH														
Milk Thistle	*Sonchus oleraceus**	LH	0	0	1	1		0			1	0	0	1	1	1
Dandelion	*Taraxacum officinale**	MH														
Hare's-foot Clover	*Trifolium angustifolium**	MH		2	1		2				2		1	1	1	2
Strawberry Clover	*Trifolium fragiferum**	MH				0										

Common name	Scientific name	Lifeform#	7 Mile	11 Mile	Ashmeads	Bill Friday	Blacks	Boggy Bridge	Boggy Bridge North	Duck Pond	Greens	Humphries	Lindsay East	Lindsay West	Sadlers	Sergeants
Subterrenean Clover	*Trigfolium subterraneum**	MH														
Water Ribbons	*Triglochin procera*	MH	1		1	1	0	1			1	1		1	0	
Broad-leaf Cumbungi	*Typha orientalis*	LNG	2	1	0	2	1		1	1	2		2	1		2
Rat's-tail Fescue	*Vulpia myuros**	MNG			2						2				2	2
River Bluebell	*Wahlenbergia fluminalis*	SH									1				0	
Rigid Panic	*Whalleya proluta*	LNG		1				1				1			2	
Bathurst Burr	*Xanthium spinosa**	LH														
Noogoora Burr	*Xanthium strumarium**	LH														

Note: abbreviations for lifeform for indigenous species are T = tree, MS = medium shrub, SS = small shrub, LH = large herb, MH = medium herb, SH = small herb, LTG = large tufted graminoid, LNG = Large non-tufted graminoid, MTG = medium tufted graminoid, STG = small tufted graminoid, MNG = medium non-tufted graminoid, SC = scrambler/climber, GF = ground fern

Common name	Scientific name	Lifeform#	Unnamed A	Unnamed B	Unnamed C	Unnamed D	Unnamed E	Unnamed F	Unnamed G	Unnamed H	Unnamed I	Unnamed J	Unnamed K	Unnamed L	Unnamed M	Unnamed N	Unnamed O	Winton
Sheep Sorrel	*Acetosella vulgaris**	MH																
Delicate Hairgrass	*Aira elegantissima**	MNG								0								
Water Plantain	*Alisma lanceolata**	MTG																
Lesser Joyweed	*Alternanthera denticulata*	MH	2	2	2	2	3	2		2	2	2		2	2	2	2	2
Common Swamp Wallaby-grass	*Amphibromus nervosus*	LTG	1	1	0			2	2	1		1		1	1		2	
Brush Wire-grass	*Aristida behriana*	MTG																1
Lagoon Saltbush	*Atriplex suberecta*	MS				0												
Brown-backed Wallaby-grass	*Austrodanthonia duttoniana*	MNG				2		2	2				3	2			2	0
Hill Wallaby-grass	*Austrodanthonia eriantha*	MNG								1			1					
Copper-awned Wallaby-grass	*Austrodanthonia fulva*	MTG																2
Wild Oat	*Avena fatua**	LNG				2	2				2		1			1		2
Ferny Azolla	*Azolla pinnata*	SH	2							2						1		2
Quaking Grass	*Briza maxima**	MNG							1									
Prairie Grass	*Bromus catharticus**	LTG																
Great Brome	*Bromus diandrus**	LNG					1				2		2					2
Soft Brome	*Bromus mollis**	MNG																1
Shepherd's Purse	*Capsella bursa-pastoris**	MH																
Slender Thistle	*Carduus tenuiflorus**	LH														1		
Tall Sedge	*Carex appressa*	LTG																
Knob Sedge	*Carex inversa*	MTG																
Rush Sedge	*Carex tereticaulis*	LTG											2					
Dogwood	*Cassinia aculeata*	MS																0
Chinese Scrub	*Cassinia arcuata*	MS				1			2	0	2							0
Common Centaury	*Centarium erythraea**	SH				1		1	1	1				2				
Common Sneezeweed	*Centipida cunninghamii*	SH			0	2		2	2	2	2	3		3	2	2	2	
Clammy Goosefoot	*Chenopodium pumilio*	SH	1	1	1	2	1	1	2	2	2	1		2		1	2	1
Windmill Grass	*Chloris truncata`*	MTG													1			1
Spear Thistle	*Cirsium vulgare**	LH				2	1		1	2	2	1	0	2		2	2	2
Leafy Twig-sedge	*Cladium procerum*	SH																
Blushing Bindweed	*Convolvulus erubescens*	SH								0								
Flax-leaf Fleabane	*Conyza bonariensis**	LH				2		1			2	2		2	2	2		2
Canadian Fleabane	*Conyza canadiensis**	LH																
Tall Fleabane	*Conyza sumatrensis**	LH				0	1		1				1					1
Spreading Crassula	*Crassula decumbens*	SH							1									
Australian Stonecrop	*Crassula sieberiana*	SH						2	1									
Paddy Melon	*Cucumis myriocarpus**	MH																
Couch	*Cynodon dactylon*	MNG	1															
Drain Sedge	*Cyperus eragrostis**	MTG					1											2
Tall Flat-sedge	*Cyperus exaltatus*	LTG																
Leafy Flat-sedge	*Cyperus lucidus*	LTG	1	2	2	2	2	2	2	2	0			1	2		1	1

Common name	Scientific name	Lifeform#	Unnamed A	Unnamed B	Unnamed C	Unnamed D	Unnamed E	Unnamed F	Unnamed G	Unnamed H	Unnamed I	Unnamed J	Unnamed K	Unnamed L	Unnamed M	Unnamed N	Unnamed O	Winton
Starfruit	*Damasonium minus*	LH				1			0			1		1	2		0	
Stinkwort	*Dittrichia graveolens**	LH				1			1		2				1	2		
Globular Pigweed	*Dysphania glomulifera* ssp. *glomulifera*	SH	1			2		2	2	2	2	2		2	2	2	2	
Paterson's Curse	*Echium plantigineum**	LH																2
Common Spike-sedge	*Eleocharis acuta*	MTG	1	1	1		0	1		1		1		1	1		2	0
Grey Spike-sedge	*Eleocharis macbarronii*	LTG																
Small Spike-sedge	*Eleocharis pusilla*	STG							1									
Common Wheatgrass	*Elymus scaber*	MTG																
Spider Grass	*Enteropogon acicularis*																	1
Smooth Willow-herb	*Epilobium billardierianum*	MH				2	1					1		1	1	2	2	1
Hairy Willow-herb	*Epilobium hirtigerum*	MH										1			1		1	
Brown's Love-grass	*Eragrostis brownii*	MTG																
Southern Cane-grass	*Eragrostis infecundus*	LTG	1						1	1		2	1	3	2		1	2
River Red Gum	*Eucalyptus camaldulensis*	T									0		3					
Star Cudweed	*Euchiton involucratus*	MH										1		1				
Annual Cudweed	*Euchiton sphaericus*	MH																
Spiked Cudweed	*Gamochaeta purpurea**	SH												1				
Honey Locust	*Gleditsia triacanthos**	MS											0					
Hairy Carpet Weed	*Glinus lotoides*	SH	2	2	2		2	1	2	1								
Ox's-tongue	*Helminthotheca echioides**	LH					0											2
Yorkshire Fog-grass	*Holcus lanatus**	MNG			0													2
Barley Grass	*Hordeum leporinum**	MNG																
St. John's Wort	*Hypericum performatum**	MH											1					1
Cat's Ear	*Hypochoeris radicata**	MH				2	0	1	2	1	2	2	2	2	2		2	2
Red-anthered Wallaby-grass	*Joycea pallida*	LTG											1					
Hollow Rush	*Juncus amabilis*	LTG											2					
Yellow Rush	*Juncus flavidus*	LTG				2	1			1	2				2		2	1
Joint-leaf Rush	*Juncus holoschoenus*	LTG																
Pale Rush	*Juncus pallidus*	LTG			1	2	2		1	1		2	2			1	1	2
Plains Rush	*Juncus semisolidus*	LTG	4	4	4	4	4	4	3	3	4	3	1	4	3	4	4	3
Blown Grass	*Lachnagrostis filiformis*	MNG	2	2	2	3	3	3	2	2	3	2	2	3	2	3	3	2
Wild Lettuce	*Lactuca saligna**	LH	2	2	2	2	1	2	2	0	3	2		2	1	2	2	2
Prickly Lettuce	*Lactuca serriola**	LH					1				2							2
Common Duckweed	*Lemna disperma*	SH																
Lesser Hawkbit	*Leontodon taraxacoides* ssp. *taraxacoides**	LH																
Wimmera Ryegrass	*Lolium rigidum**	MNG											3					
Birds-foot Trefoil	*Lotus corniculatus**	MH										1						0
Water Purslane	*Ludwigia palustris**	MH					1											
Water Primrose	*Ludwigia peploides*	MH					1											
Small Loosetrife	*Lythrum hyssopifolia*	MH							1	1		0				1	1	

Common name	Scientific name	Lifeform#	Unnamed A	Unnamed B	Unnamed C	Unnamed D	Unnamed E	Unnamed F	Unnamed G	Unnamed H	Unnamed I	Unnamed J	Unnamed K	Unnamed L	Unnamed M	Unnamed N	Unnamed O	Winton
Barrel Medic	*Medicago truncatula**	MH																1
Creeping Mint	*Mentha satureoides*	SH								0		0						
Upright Milfoil	*Myriophyllum crispatum*	MH																0
Red Water-milfoil	*Myriophyllum verrucosum*	MH	2	2	2		1											
Swamp Lily	*Ottelia ovalifolia* ssp. *ovalifolia*	MH																
Warrego Summer Grass	*Paspalidium jubiflorum*	LTG																
Paspalum	*Paspalum dilitatum**	LTG										1						1
Water Couch	*Paspalum distichum**	MNG	1	1	1			1	1		1		1	2	2	2	1	2
Kikuyu	*Pennisetum clandestinum**	MNG																
Slender Knotweed	*Persicaria decipiens*	MH					1											0
Pale Knotweed	*Persicaria lapathifolia*	MH	1			2		3	3	2	2	3		2	2	2	0	1
Creeping Knotweed	*Persicaria prostrata*	SH	2	2	2	1	2	3	3	2	1	1			1	1	2	2
Toowoomba Canary Grass	*Phalaris aquatica**	LTG				3	2	1	1		2	2	2				2	2
Lesser Canary Grass	*Phalaris minor**	MTG														1		
Plantain	*Plantago lanceolata**	MS											2				1	0
Wireweed	*Polygonum aviculare**	MH				1		1			2							
Poison Pratia	*Pratia concolor*	MH																
Matted Pratia	*Pratia pedunculata*	SH																
	Prunus sp.*	MS											0					
Jersey Cudweed	*Pseudognaphalium luteoalbum*	MH							1								0	
Spiny Mud-grass	*Pseudoraphis spinescens*	MNG								0								0
River Buttercup	*Ranunculus inundatus*	SH																
Australian Buttercup	*Ranunculus lappaceus*	LH							0									
Fringed Heartwort	*Ricciocarpus natans*	SH	2				0											
Onion Grass	*Romulea rosea**	STG											2				2	
Marsh Yellow-cress	*Rorippa palustris**	SH	2	2	2	2	2									2	1	2
Sweet Briar	*Rosa rubiginosa**	MS								0								
Clustered Dock	*Rumex conglomeratus**	LH				0												
Curled Dock	*Rumex crispus**	LH	2	2	2	2	2		2	2	2	1	2	2			2	2
Shiny Dock	*Rumex tenax*	LH				2	1		2	1				2				2
Crack Willow	*Salix fragilis**	T												0				
Peppercorn	*Schinus molle**	T									0							
Cotton Fireweed	*Senecio quadridentatus*	LH							0						0	0		
Slender Pigeon Grass	*Setaria gracilis*	LTG																
Blackberry Nightshade	*Solanum nigrum**	MH							0	0		2		1				
Rough Sow-thistle	*Sonchus asper**	LH								0	1	1				0	2	
Milk Thistle	*Sonchus oleraceus**	LH	1	1		0	1			1	1	1		1				1
Dandelion	*Taraxacum officinale**	MH								0								
Hare's-foot Clover	*Trifolium angustifolium**	MH				2	1	1		0			2	2			1	2
Strawberry Clover	*Trifolium fragiferum**	MH																

Common name	Scientific name	Lifeform#	Unnamed A	Unnamed B	Unnamed C	Unnamed D	Unnamed E	Unnamed F	Unnamed G	Unnamed H	Unnamed I	Unnamed J	Unnamed K	Unnamed L	Unnamed M	Unnamed N	Unnamed O	Winton
Subterrenean Clover	*Trigfolium subterraneum**	MH														1	1	
Water Ribbons	*Triglochin procera*	MH																
Broad-leaf Cumbungi	*Typha orientalis*	LNG				0		1			1	1		2	4	0		2
Rat's-tail Fescue	*Vulpia myuros**	MNG					1											2
River Bluebell	*Wahlenbergia fluminalis*	SH																
Rigid Panic	*Whalleya proluta*	LNG																1
Bathurst Burr	*Xanthium spinosa**	LH											2					
Noogoora Burr	*Xanthium strumarium**	LH												0				

Note: abbreviations for lifeform for indigenous species are T = tree, MS = medium shrub, SS = small shrub, LH = large herb, MH = medium herb, SH = small herb, LTG = large tufted graminoid, LNG = Large non-tufted graminoid, MTG = medium tufted graminoid, STG = small tufted graminoid, MNG = medium non-tufted graminoid, SC = scrambler/climber, GF = ground fern.