WETLAND MAPPING AND CLASSIFICATION:

AREA D, SHIRE OF WEST ARTHUR

Prepared for:

Department of Environment and Conservation

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STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and ENV.Australia Pty Ltd (ENV) ("scope of services"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

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1 INTRODUCTION

ENV Australia Pty Ltd (ENV) was commissioned by the Department of Environment and Conservation (DEC) to undertake mapping and classification of wetlands for a project area referred to as "Area D". Area D is approximately 150,000ha and located within the Wheatbelt region of Western Australia in the vicinity of Duranillin in the Shire of West Arthur.

For the purpose of this study the definition of a wetland is consistent with that presented in the *Wetlands Conservation Policy for Western Australia* and is adopted from the Ramsar Bureau (UNESCO, 1971).

> *"Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six metres."* (UNESCO, 1971)

Western Australia has significant wetland resources providing a broad range of ecological, hydrological and economic values. The State's wetlands are subject to ongoing degradation and loss through direct and indirect impacts of clearing and development including groundwater extraction, and large-scale processes such as salinisation and climate change.

Mapping, classification and evaluation of wetland resources is required to document locations, extents and values of wetlands and to provide a systematic and robust basis for protection and management. Improved knowledge is also required to provide meaningful input to environmental impact assessment and related decision making processes.

1.1 BACKGROUND

The DEC is responsible for coordinating the mapping, classification and evaluation of wetlands around the State. It coordinates the Wetland Status Working Group, a subcommittee of the (State) Wetlands Coordinating Committee, to address wetland mapping, classification, and evaluation and status matters in accordance with the Wetlands Conservation Policy for Western Australia (Government of Western Australia, 1997). In this respect, the DEC has prepared a document entitled *Framework for mapping, classification and evaluation of wetlands in Western Australia* (DEC, in publication), in cooperation with the Wetland Status Working Group, which has been endorsed by the Wetlands Coordinating Committee.

Wetland mapping in Western Australia has been an ongoing project. In 1996 the publication of the *Wetlands of the Swan Coastal Plain* (Hill. et al, 1996) comprised the first mapping effort that considered water permanence, soil and vegetation in wetland mapping. The approach of this original project was highly

focused on the use of field work and hard copy stereoscopic aerial photographs to delineate wetland boundaries. Since then, methods for mapping wetlands in Australia have evolved to include the use of geographic information systems and digital spatial datasets to help streamline the mapping process (Queensland Government, 2007).

1.2 AIMS AND OBJECTIVES

The two overarching aims of this study are to:

1. Gather sufficient information on the mapped boundaries of wetland areas to contribute to the knowledge of their values, functions and attributes within Area D to provide this basis for protection, management and decision making purposes.

2. Develop a mapping methodology that utilises computer based geographic information systems to delineate and classify wetlands.

Further objectives of this study are to:

- Compile a spatial dataset of relevant mapped phenomena.
- Conduct a field survey of approximately 10% of mapped wetlands to assess the methodology of mapped wetland boundaries and classification.
- Identify wetland boundaries in the field through assessing landform, hydrology, soils and vegetation.
- Assess and refine mapped wetland boundaries based on observations and data collected in the field.
- Provide a measure of accuracy for the desktop mapping based on field observations.
- Compile a dataset of mapped wetland boundaries and their classification throughout Area D.

1.3 SCOPE OF WORKS

ENV has undertaken this study to be consistent with the requirements for a Stage 2 Assessment according to the *Framework* for *mapping, classification, and evaluation of wetlands in Western Australia* (DEC, in publication).

The DEC defines a Stage 2 assessment as *"including identification of preliminary wetland boundaries, classification of wetlands into geomorphic types and identification of groups of wetlands (consanguineous suites)"* (DEC, in

publication). The purpose of a Stage 2 assessment is to provide precise or approximate boundaries and has a requirement for field sampling of a sub-set and extrapolation of information (DEC, in publication).

In the tender document the DEC identified that consanguineous suites and artificial wetlands are **not** required as part of this study.

ENV has adopted the following scope of works to map and classify wetlands in Area D:

- Identify, collate and review reference documents and digital datasets collected from State agencies.
- Map and identify wetland boundaries to a scale of 1:25,000 using remotely sensed data and geographic information systems.
- Provide a geomorphic classification for each mapped wetland (types listed in Table 1 Section 3.2).
- Conduct a field survey to clarify and assess the accuracy of the provisionally mapped wetlands across Area D
- Provide a final report detailing the information and methodology that were applied to determine wetland boundaries and types, and
- Deliver final mapping deliverable to be supplied as an ESRI shapefile in polygon format.

2 PHYSICAL ENVIRONMENT

2.1 LOCATION

Area D is approximately 150,000ha and located within the Wheatbelt region of Western Australia (Figure 1). Area D is in the vicinity of Duranillin in the Shire of West Arthur. The area is encompassed by the following 1:25,000 map sheets for the Middle Blackwood:

- 2231-III NE;
- 2231-III SE;
- 2230-IV NE;
- 2231-II NW;
- 2231-II SW;
- 2230-I NW;
- 2231-II NE;
- 2231-II NE; and
- 2230-I NE.

2.2 EXISTING LAND USE

Area D is predominantly cleared land with the majority of the area being used for stock grazing and agriculture. The area is regarded as a high yielding area for sheep wool production but other stock is found including cattle and horses (Shire of West Arthur, 2004).

The townsites of Darkan, Hillman, Cordering, Duranillin, Moodiarrup, and Boolading are located within Area D (Figure 1).

2.3 CLIMATE

Area D is characterised by a Mediterranean climate with cool wet winters and dry hot summers. Rainfall is greater from mid-May to the end of August (Figure 3). Long-term average annual rainfall in the area from 1885-2008 is 519mm according to Bureau of Meteorology (BOM) recordings from the nearby Kojonup Station, station number 10582 (BOM, 2009).

2.4 TOPOGRAPHY

The topography for Area D is undulating hills and river valleys associated with the Arthur River, Beaufort River and Hillman River. Area D is within the upper reaches of the Blackwood River catchment and generally falls from the north of the project area towards the Southern Ocean.

Topography generally varies between 200 and 390 mAHD across Area D. See Section 2.5 below for a description of the relationship of topography to geology.

2.5 GEOLOGY AND SOILS

Area D is comprised of a number of geological subsystems as presented in Figure 4. Generally, Area D is composed of sandy soils in gravel with varying salinity and is underlain by granite. A description of the general properties of each geological subsystem taken from the Department of Agriculture and Foods' (2003) soil mapping is described below.

Beaufort Subsystem: Broad valley floors consisting of grey and brown, deep and shallow duplex sandy soils, generally saline in character and underlain by granite.

Boscabel Subsystem: Gently undulating rises and narrow valley floors consisting of yellow, brown and grey pale deep sands with sandy gravels, generally saline in character formed from alluvial and aeolian deposits and underlain by granite.

Dalmore Subsystem: Undulating ridges and hill crests consisting of deeply weathered gravels, pale sands, brown deep loamy duplex and grey deep sandy duplex soils underlain by granite.

Darkan Subsystem: Undulating rises and rolling low hills consisting of mostly duplex sandy gravels, deep sandy gravels, shallow gravels and grey deep sandy duplexes formed from laterite and colluvium underlain by granitic rocks.

Dellyanine Subsystem: Undulating rises and low hills on granite consisting of grey and brown sandy duplex (shallow and deep), sandy gravel underlain by granite intruded by dolerite and diorite dykes.

Dwellingup Subsystem: Divides lower to upper slopes and hillcrests consisting of sandy gravels and loamy gravels with minor areas of shallow gravels, deep sandy gravels, yellow and pale deep sands (often gravelly) underlain by granitic rocks.

Farrar Substystem: Undulating rises and low hills consisting of grey deep sandy duplex, sandy gravel, bare rock and red shallow loamy duplex formed from colluvium and deeply weathered mantle over granitic rocks.

Harris Subsystem: Broad poorly drained alluvial flats on the surface of the Darling Plateau consisting of saline wet soils with grey deep sandy duplex soils, formed from alluvium.

Kulikup Subsystem- Within Area D the ironstone gravel flats phase is present which is moderately well drained to poorly drained gravels formed from laterised sedimentary deposits over weathered mantle over gneiss and granite. Soils present are predominantly duplex sandy gravels, semi-wet soils and loamy gravels.

Lukin Subsystem: Shallow minor valleys with swampy floors incised into lateritic terrain consisting of sandy and loamy gravels, loamy duplex soils and deep sands from lateritic colluvium origin underlain by granite and gneiss.

Mornington Hill Subsystem: Low hills on laterite overlying granite consisting of sandy and loamy gravels with some deep sands and loamy earths formed from deeply weathered mantle and underlain by granitic rocks.

Pindalup Subsystem: Shallow minor valleys with gentle side slopes and broad swampy floors consisting of loamy gravels, deep sands and non-saline wet soils formed from alluvium and lateritic colluvium over weathered granitic rocks.

Qualeup Subsystem: Broad poorly drained flats between low hills, circular lakes and swampy depressions are common consisting of sandy gravels, deep sands and non-saline wet soils formed from laterised sedimentary deposits over weathered mantle, gneiss and granite.

Sandalwood Subsystem: Low hills rising above the general landscape consisting of loam and sandy gravels underlain by granitic rocks.

2.6 REGIONAL VEGETATION

Area D is the Darling Botanical District within the Southwest Province. Within the Darling Botanical District, four subdistricts exist. Area D is located within the Menzies and Dale Botanical Subdistricts of the Southern and Northern Jarrah Forest Subregions.

The region is characterised by Jarrah forest in its northern and southern extents and is distinguished more by the nature of the understorey than by variation in the forest itself. In the southern region the understorey more resembles that occurring in the Karri region, in the northern it possesses a more strongly sclerophyll character (Gibson *et al.* 1994).

Remnant vegetation in the project area consists of mosaic plant communities but largely consists of woodlands of *Eucalyptus marginata* (Jarrah), *Corymbia calophylla* (Marri) and *Eucalyptus wandoo* (Wandoo) (Department of Agriculture and Food, 2003).

3 LITERATURE REVIEW

3.1 GEOMORPHIC CLASSIFICATIONS OF WETLANDS

The geomorphic classification of wetlands is based landform and wetness attributes of a wetland.

The classification is based on the two key features present in all wetlands in Western Australia; presence of water and type of landform (Semeniuk & Semeniuk, 1995).

The four types of water permanence (or “wetness”) that determine the occurrence of wetlands are:

- permanent inundation;
- seasonal inundation;
- seasonal waterlogging; and
- intermittent inundation.

The five landform types that are typically host to wetland types are listed below and depicted in Figure 4:

- basins;
- flats;
- channels;
- slopes; and
- highlands.

The categorisation of the water permanence associated with each wetland landform provides the basis for classification and is presented in Table 1 below:

Table 1: Wetland types according to the geomorphic classification system

	Landform				
Water Permanence	**Basin**	**Flat**	**Slope**	**Channel**	**Highland**
Permanent Inundation	Lake	-	-	River	-
Seasonal Inundation	Sumpland	Floodplain	-	Creek	-
Intermittent Inundation	Playa	Barlkarra	-	Wadi	-
Seasonal Waterlogging	Dampland	Palusplain	Paluslope	Trough	Palusmont

(Semeniuk & Semeniuk, 1995)

3.2 WETLANDS OF THE SWAN COASTAL PLAIN

In 1996, *Wetlands of the Swan Coastal Plain* was published in seven volumes based on the efforts of the (then) Water Authority of Western Australia, Department of Environment Protection, and private consultants. The document as a whole provided a comprehensive approach to planning, management and understanding of water resources across the Swan Coastal Plain.

Volume 2a of the series, *Wetland Mapping, Classification and Evaluation – Main Report* provides information regarding the extent of wetland studies done on the Swan Coastal Plain. This study considered wetlands and their characteristics as being influenced by a number of factors including soil types, vegetation, and landforms whereas previous efforts for wetland mapping focused on wetlands being identified through topographic mapping.

The methodology for wetland mapping is generally described in the document as a process involving the use of hard copy 1:25,000 stereoscopic aerial orthophotographs (herein referred to as stereoscopic aerials). The stereoscopic aerials provided the ability to identify, delineate and classify wetland types at a scale of 1:25,000. Additionally, stereoscopic aerials were a resource for estimating wetland vegetation disturbance, vegetation cover, and remnant vegetation.

Volume 2a provides detailed description and justification for the geomorphic classification system which has been adopted for this study. A full description of classifications is given above in Section 3.1.

Volume 2b of *Wetlands of the Swan Coastal Plain – Wetland Atlas* is a series of 52, 1:50,000 scale plans showing the extent, type and management category of each mapped wetland. A number of key attributes are also provided in table format for each wetland. Since the original publication of Volume 2b the wetland

mapping has been converted into a digital format for use in a geographic information system (the DEC's *Geomorphic Wetlands Swan Coastal Plain* dataset).

The evaluation of wetlands is the process used to describe and weigh a wetland's existing values. Management and planning objectives can be derived from wetland evaluation as it provides values, characteristics, function, use and attributes of each wetland. The evaluation of wetlands is not included as part of this study.

3.3 WETLANDS CONSERVATION POLICY FOR WESTERN AUSTRALIA

The *Wetlands Conservation Policy for Western Australia* (Government of WA, 1997) outlines the State's commitment to identifying, maintaining and managing wetland resources.

The Policy consists of five principal objectives with respect to the conservation of wetlands:

1. To prevent further loss or degradation of valuable wetlands and wetland types, and promote wetland conservation, creation and restoration.

2. To include viable representatives of all major wetland types and key wildlife habitats and associated flora and fauna within a Statewide network of appropriately located and managed conservation reserves which ensure the continued survival of species, ecosystems, and ecological functions.

3. To maintain, in viable wild populations, the species and genetic diversity of wetland-dependent flora and fauna.

4. To maintain the abundance of waterbird populations, particularly migratory species.

5. To greatly increase community awareness and appreciation of the many values of wetlands and the importance of sound management of the wetlands and their catchments in the maintenance of those values.

This project is consistent with this policy as it seeks to represent and identify wetland types as a contribution to facilitate the specified objectives being met.

3.4 FRAMEWORK FOR MAPPING, CLASSIFICATION AND EVALUATION OF WETLANDS IN WESTERN AUSTRALIA

The DEC has established a draft framework for the mapping, classification and evaluation of wetlands in the State to document wetland resources, identify

wetland values, and ensure the preservation and improved management of wetlands in the long-term.

The framework provides information relating to the levels of detail expected at the three stages of assessment. The three stages range from broad to detailed and are generally described below:

- Stage 1 assessment refers to the broad scale identification of the occurrence of wetlands within a study area to provide approximate boundaries and basic mapping of the wetland resource.

- Stage 2 assessment includes the identification of preliminary wetland boundaries, classification of wetlands into geomorphic types and identification of groups of wetlands (such as consanguineous suites).

- Stage 3 assessment involves collection of information on wetland attributes and functions including detailed mapping of wetland boundaries and site specific evaluation.

The mapping and classification done as part of this Study is commensurate with a Stage 2 level. In this Study an evaluation of each wetland will not be undertaken. The framework also describes relevant datasets to allow the classification and mapping of wetlands including information regarding landform, water permanence, sediments, approximate boundary, water quality, extent and condition of all wetland vegetation, use by aquatic and terrestrial fauna, degree of naturalness, and proximity to other wetlands.

The framework also identifies the system for wetland classification as being the geomorphic classification system described by Semeniuk & Semeniuk (1995), as described above in Section 3.1.

4 METHODOLOGY

The wetland mapping and classification process for this project was developed based on the capacity of geographic information systems for displaying, managing, analysing and creating geographic information. The methodology undertaken as part of this study represents a shift in the State's approach to mapping of wetland boundaries in WA as it moves into a digital approach rather than focusing on the manual use of hard copy information.

ENV adopted the following general approach to mapping wetland boundaries:

1. Analysis of remotely sensed satellite imagery for preliminary wetland boundaries over Area D.

2. Analysis of associated spatial datasets including digital aerial orthophotos, topography, soil types, remnant vegetation, and hydrography to map preliminary wetland boundaries for approximately 10% of Area D.

3. Verification of mapped wetland boundaries with the use of stereoscopic aerials.

4. Preliminary field survey to assess wetland-mapping methodology.

5. Revision of desktop mapping methodology based on findings of the field survey.

6. Desktop mapping of remaining wetlands using digital imagery and datasets outlined in steps 1 and 2.

7. Final field survey to assess the methodology undertaken for the desktop mapping, and to visit approximately 10% of identified wetlands in the field.

8. Minor adjustments based on outcomes of field survey.

4.1 DIGITAL MAPPING

4.1.1 Principles of Geographic Data

The mapping and classification of wetlands in Area D marks a shift in the methodology for wetland mapping that has been previously undertaken in WA commensurate with a Stage 2 as it involves the use of digital geographic data as part of the wetland mapping methodology.

Geographic information systems (GIS) are a class of information system that keep track of not only events, activities, and descriptions but also consider **where** these occur. Discrete data stored in a GIS has two main components: the vector

data and the attributes. The vector data holds the spatial location of the feature including its extent, boundaries, and geometry whilst the attribute information is stored in tabular format and relates to each shape or spatial feature mapped.

For this mapping project ESRI ArcGIS Desktop software was used and all results are presented in Map Grid of Australia (MGA) 1994 Zone 50 coordinates, referenced to the Geocentric Datum of Australia.

Representative Fraction/Scale

The representative fraction, also often known as the scale, is defined for a paper map as the ratio between distance on the map and the corresponding distance on the ground.

Representative fractions associated with standard map series, such as the 1:25,000 topography in Western Australia have become standard bases for description of maps and map users have become accustomed to the link between representative fraction and the types of features and level of detail shown in maps.

Previous wetland mapping effort in south-west Western Australia have been focused on the digitising of map boundaries at a scale of 1:25,000.

Spatial Resolution

In digital mapping, there is no comparable distance on the ground and instead we look to a degree of generalization that is valid for digital datasets to estimate accuracy such as spatial resolution.

The spatial resolution of a dataset is defined as the minimum distance over which change is recorded (Longley et al, 2001). Spatial resolution is often used to define the accuracy of a dataset, providing a margin of error. This term is often used to describe the accuracy in continuous datasets such as satellite imagery or digital aerial photography.

4.1.2 Remote Sensing

An analysis of remote sensing imagery was used to identify wetland areas and to provide baseline wetland boundaries to a spatial resolution of 30 m.

Remote sensing refers to "*the science of obtaining information about an object, area or phenomenon through the analysis of data acquired by a device that is not in contact with the object, area or phenomenon under investigation*" (Lillesand & Keifer, 1994). Spaceborne satellite platforms use a series of sensors to record variations in the way the earth's surface reflects energy as different surfaces reflect a signature energy wavelength. This data can then be used to make assumptions regarding the composition of the earth's surface.

Remotely sensed satellite imagery is commonly used to determine land cover and land use over the earth's surface. The DEC currently monitors land clearing and salinity over the State through analysis of remotely sensed satellite imagery. Landsat 7 is a sensor onboard a spaceborne satellite that captures 7 bands of data across the electromagnetic range. Landsat 7 satellite imagery for the Study Area was analysed to determine preliminary wetland boundaries. Imagery from summer 1996 was used in the indices described below.

The use of indices in remote sensing compares the difference between two spectral bands to isolate the variation within a given phenomena. Two indices were applied to the remote sensing imagery to determine wetland areas.

The Normalised Difference Water Index (NDWI) was applied to the dataset to determine areas where open water was present. This index enhances water features in the imagery by comparing the green and infrared bands in the electromagnetic spectrum to maximise the reflectance of water bodies. This index is commonly used in baseline wetland mapping in Queensland (Queensland Government, 2007).

The Normalised Difference Vegetation Index (NDVI) was utilised to determine areas where vegetation health or "greenness" was determined. This index compares the red and infrared bands to enhance areas of high vegetation health. It was assumed that areas with a high level of greenness would be wetland areas. NDVI is commonly used to detect changes in wetland boundaries over time (Lillesand and Kiefer, 1994). ENV determined the NDVI for the project area but found that it was of limited use for identifying wetland boundaries.

The use of remote sensing imagery allowed ENV to identify wetlands that were of a significant size and had open water bodies such as lakes and rivers but waterlogged wetland types were underrepresented. Also, wetlands mapped using remote sensing techniques had to be greater than 90m^2 to be detected, therefore small wetlands were not captured.

4.1.3 Analysis of Spatial Datasets

Spatial datasets were used to verify wetland areas identified using remote sensing and to identify potential omissions, and to verify and refine wetland boundaries.

In a GIS, the ability to overlay spatial datasets allows the user to compare the boundaries of separately occurring phenomena to determine their relationship and influence on wetland areas. Spatial datasets formed a background of detail that can be manipulated, analysed and adjusted to determine wetland boundaries. These datasets could be used to identify wetlands and define their boundaries. Datasets compared include topography, surface water catchments, soils, vegetation and digital aerial orthophotos (herein referred to as

orthophotos). A complete list of the spatial datasets is provided in Table 2 (information and metadata supplied by DEC).

Table 2: Spatial Datasets

File Name	File Type	Year of Capture	Accuracy (m)	Resolution (m)	Source
Digital Aerial Orthophotos					
Darkan_2231_Apr_May _June_2003_Mosaic	ecw	2003	5	50	Landgate
Dinninup_2230_Nov_2004	ecw	2004	10	50	Landgate
Darkan_2231_Jan_2005	ecw	2005	5	50	Landgate
Darkan_2231_Mar_2006	ecw	2006	5	50	Landgate
Dinninup_2230_Feb_2007	ecw	2007	-	-	Landgate
Darkan_2231_Feb_2008	ecw	2008	-	-	Landgate
Miscellaneous Shapefiles					
Soil_subsystems	shp	2001	250	-	DAg
Veg_complexes	shp	1996	-	-	CALM[1]
Drainage_lines	shp	2003	140	-	Geoscience Australia
Waterbodies	shp	-	-	-	-
Catchments	shp	2007	-	-	DoW[2]
Sub_catchments	shp	2007	-	-	DoW
Groundwater_bores	xls	-	-	-	DoW
2m Derived Topography					
2230_14	shp	-	-	-	DAg[3]
2230_23	shp	-	-	-	DAg
2231_14	shp	-	-	-	DAg
2231_23	shp	-	-	-	DAg

1. Conservation and Land Management (CALM)
2. Department of Water (DoW)
3. Department of Agriculture (DAg)

4.1.4 Stereoscopic Aerial Pair Photographs

Stereoscopic aerials were used to potentially uncover any wetland areas that may have been omitted, to modify the boundaries to account for any differences and/or to assess the geomorphic classification given.

Stereoscopic aerials analysed for this study were from the Darkan (2231) and Dinninup (2230) map sheets and were represented as 11 flight runs across Area D in an east-west direction consisting of approximately 18 photos within each flight run. Only 1 set of stereoscopic aerials was used for this study with the flight runs being undertaken during October-November of 1996.

Previous comparable wetland mapping projects in the SW have used,stereoscopic pairs as the primary reference tool to delineate boundaries, with these boundaries then being transcribed to overlay paper before being manually digitised to form the GIS dataset.

In this study, the use of stereoscopic pairs has been used as an additional data source to assess the data. After the boundaries have been determined using the remote sensing and spatial datasets the area has been reviewed with stereoscopic aerials to potentially uncover any other areas that may have been omitted, to modify the boundaries to account for any differences and/or to assess the geomorphic classification given. The ability to view the land surface in three dimensions has been identified as helpful in previous work to assess the landform shape and wetland boundaries. This step has been included in the methodology to provide consistency with previous wetland mapping exercises undertaken.

Using the stereoscopic aerials was not found to improve the quality of the mapping and few changes were made while reviewing stereoscopic aerials.

4.1.5 Identification of Wetland Boundaries

Identification of wetland boundaries was performed in an iterative process involving the use of remote sensing data, spatial datasets and stereoscopic aerials.

The remote sensing imagery was initially able to provide baseline mapping at approximately 30 m spatial resolution (or pixel size) which indicated areas that had open water and/or had wetland vegetation. The minimum detectable area of change was 90m^2 for wetland boundaries, which was not considered suitable accuracy for this study. Satellite imagery provides a accuracy at a 1:100,000 scale mapping which would commensurate with a Stage 1 delineation according to the *Framework for mapping, classification and evaluation of Wetlands in Western Australia* (DEC, in publication)

The remote sensing derived baseline wetland boundaries were then overlaid with digital orthophotos, topography, soil mapping, hydrography, catchment mapping and vegetation complex mapping to compare areas that were likely to be wetlands and derive boundaries at a 1:25,000 scale.

Wetland boundaries were delineated by using the following three generalised criteria:

- Landform: Are the proposed wetland boundaries coincident with the topography and topographic changes in the area? Where is the proposed wetland within the catchment?
- Soil: Do the orthophotos and/or soil mapping indicate that hydric soils or waterlogged soils are present?
- Vegetation: Do the orthophotos and vegetation complex mapping provide an indication of the extent of wetland vegetation present within the wetland?

The boundary of each wetland was then mapped in the GIS as a polygon feature referenced off digital orthophotos. The use of digital orthophotos in this process provides a georeferenced link to the ground surface where the boundaries of the wetland may occur.

The boundaries of the wetlands were also compared over a number of years as multiple orthophotos taken in different years improved the temporal resolution of the wetland boundaries.

For each individual wetland the criteria of landform, soils and vegetation were considered and ranked in the attribute table associated with the shapefile in terms of which criteria provided the basis for the extent of the boundaries. This provided clarity in the mapping process for future dataset users.

Once the boundaries were digitally mapped, the operator checked for consistency with stereoscopic aerial pairs. Use of stereoscopic aerial pairs was included in this project to provide some consistency with previous mapping undertaken in WA as it was the primary data source used. The advantage of using stereoscopic aerial pairs for this study was that they were all taken during October and clearly showed the seasonal extent of waterlogging and inundation.

In this study, a conservative approach to wetland delineation was adopted consistent with Semeniuk & Semeniuk (1995) where *"the boundary of (a) wetland is drawn at the outside of the area that has the characteristics of dampness, or hydric soils, or vegetation indicative of wetland conditions*".

4.1.6 Classification of Wetlands

Once wetland boundaries were mapped a wetland type was then assigned to the area. The classification of wetlands into types using the geomorphic classification system is dependent on two main factors; landform and water permanence.

To determine the landform of each wetland the topography of the area and how that surrounding topography related to the shape of the wetland was considered. Figure 4 shows in diagrammatic form along with topographic contour line examples, the different landform types that are associated with wetland classification.

Water permanence was inferred through the use of orthophotos and stereoscopic aerials. The majority of the digital orthophotos used were taken during the summer months which is when seasonally inundated/waterlogged areas can be distinguished from permanently inundated areas as their drying regime is revealed. The stereoscopic pairs used for the site were all taken during winter months, which more clearly showed patterns of seasonal inundation and seasonal waterlogging.

In wetlands, the extent of seasonal inundation/waterlogging is often not consistent across the entire wetland area. Therefore classification of wetlands requires an assumption about the extent to which the water permanence can vary. Generally, wetland mapping in this study adopted the 10% cut-off rule proposed by Semeniuk & Semeniuk (1995) to distinguish between water permanences for a particular landform type. That is, the areas' extent of either permanent inundation or seasonal inundation cannot exceed either seasonal inundation or seasonal waterlogging respectively by greater than 10% and still maintain its original classification. The example given in Semeniuk & Semeniuk (1995) is as follows:

> *"If a basin that has a seasonally fluctuating water level dries out such that there is still more than 10% of water by area in the basin at the driest stage, then it is a lake, but if there is less than 10% of water by area in the basin at the driest stage, then it is a sumpland" (p.111).*

Additionally, for distinction of channel wetland boundaries some generalisations are made between classification types. Channels can be very narrow in their extent and therefore difficult to recognise at a scale of 1:25,000. The following approach was undertaken:

1. A system of small 'braided' channels was grouped together into a single channel system.

2. An extensive floodplain or palusplain with a small channel within its area may be mapped as a single 'floodplain' entity as the channel is too small to be recognized at the scale of mapping.

3. A channel may have an additional flat area of riparian vegetation mapped as part of the channel as the flat area is too narrow to be identified as a floodplain or palusplain.

4.2 FIELD SURVEY

Field survey was used in this study to provide an assessment of the applicability of the methodology in the early stages in the mapping process and to provide a measure of accuracy to associate with the finalised mapping dataset.

4.2.1 Site Visits

This study undertook two separate field surveys to assess the desktop mapping methodology.

A preliminary field survey was undertaken by an Environmental Scientist and a Botanist from ENV on 5-6 May 2009 to examine selected wetlands in the northern part of Area D.

A variety of wetlands were chosen for this visit to ground truth the mapping methodology and to gain a practical understanding of the physical environment and the characteristics of the catchment. During this first field visit approximately 10% of Area D had been mapped using the desktop methods.

The wetlands visited during this first field survey represented the range of types and varied in their composition including whether their surrounding area had been cleared or consisted of remnant vegetation. ENV staff examined the soil types, vegetation, hydrological conditions, and landform for wetland characteristics. Wetland boundaries and classifications were assessed to provide feedback into the desktop mapping methodology and are not considered as part of the final accuracy statement. How wetland boundaries were determined and classification methodology is described below.

During the first field visit, sites were selected where either the existence of a wetland was questionable or the boundaries of a wetland were not clearly distinguished in the desktop mapping. This ground truthing was undertaken to gain some confidence in the desktop mapping methodology.

The second field survey was performed between 8 –15 June 2009 and examined a wider extent of Area D focusing on visiting a minimum of 10 wetlands within each 1:25,000 map grid area (Figure 1).

The field survey areas selected were based on accessibility and based on diversity of wetland types within the area. Wetlands were predominantly located on private property and as a result, 30 proprietors were contacted for permission to survey wetlands. In some cases, access was denied to the property or proprietors could not be contacted. Field maps showing the wetlands visited are contained in Appendix A and the photos are provided as the digital Attachment 1 to this study.

For each wetland visited a field sheet was compiled with observations regarding the vegetation, hydrology, soils and landform in the area and how it related to the mapped boundaries of the wetland and its classification. The field sheets associated with each wetland visited are found in Appendix B. In addition a number of photographs were taken at each wetland, an index of the photographs is included as Appendix C.

4.2.2 Identification of Wetland Boundaries

Identification of wetland boundaries in the field focused on determining the extent of waterlogged or seasonally inundated areas based on the hydrology, landform, hydric soils, waterlogged soils and wetland vegetation.

To capture the position of the wetland boundary as determined in the field ENV staff were equipped with a handheld global positioning system (GPS) to record coordinate locations. These coordinate locations could then be loaded into the GIS on returning to the office and directly compared to the derived desktop boundary.

When ENV staff were on site they determined where to record coordinates using two methods; a transect and/or a “boundary walk”.

Transects were used to determine the boundary of wetland vegetation and hydric soils. One or two transects were walked in a consistent direction beginning in a clearly dryland area towards an anticipated wetland boundary taking note of changes within the composition of vegetation and collecting soil samples.

In areas where wetland vegetation was present, a GPS coordinate was recorded at the transition point to dryland species to delineate the wetland boundary. Facultative vegetation alone, however, are not significant in terms of delineating boundaries of wetlands. In situations like these supplementary information on the hydrology, landform and hydric soils was required.

In this study, a boundary walk refers to walking along the edge of the boundary to a wetland. During a boundary walk up to five GPS coordinates were recorded at approximately 10-20m intervals depending on access. A boundary walk was used in this study where there was a clear and distinct transition between wetland and dryland areas.

For each wetland it was endeavoured to perform one boundary walk, if distinct boundaries were observed. When wetland boundaries were not easily distinguishable 1 or 2 transects were undertaken. Boundaries were determined by either a boundary walked or up to 2 transects per wetland.

Described below is how the boundaries were determined based on vegetation, soils, hydrology and landform.

Vegetation

The majority of Area D has been cleared for agricultural purposes and wetlands have been grazed by stock, therefore the use of vegetation as a boundary identifier is limited.

During the first field visit where vegetation was present and field identification of plant taxa was not possible, specimens were collected systematically for later identification by a specialised taxonomist. Literature research was then undertaken using the West Australian Herbarium's *Flora Base* (Western Australian Herbarium, 2009) to confirm species habitat preference.

Based on the literature review using *Flora Base*, species that prefer winter-wet areas, swamp areas, creek lines, waterlogged soils, etc. were considered wetland obligate species (i.e. those plants generally restricted to wetland habitats, DEC 2007a). Facultative species can be common, notably in a variety of habitats such as hills, slopes as well as beside drainage lines, fringing salt marshes, etc. (i.e. those species that can occur in wetland and dryland habitats, DEC 2007a).

After ENV botanist researched species habitat preference and identified specimens, field staff became familiar with the area's flora, further facilitating positive wetland boundary delineation. Any new flora species not found in the first survey were identified at the Shire's herbarium as required to aid in up-to-date field identification. Please note as this was not a comprehensive survey not all species present within the wetland community were recorded.

Species that were considered to be acting as obligate wetland species in the project area and that were recorded during the field surveys are listed in Table 3. A complete vegetation species list and their habitat preferences have been compiled in Appendix D.

Table 3: Study Area Wetland Obligate Flora Species List

FAMILY		TAXA		COMMON NAME
TYPHACEAE	*	*Typha*	*orientalis*	Bulrush
CYPERACEAE		*Baumea*	*juncea*	Bare Twig Rush
		Ficinia	*nodosa*	Knotted Club Rush
		Gahnia	*trifida*	Coastal Saw Sedge
RESTIONACEAE		*Lepidosperma*	sp.	
JUNCACEAE		*Juncus*	*pallidus*	Pale Rush
CHENOPODIACEAE		*Tecticornia*	*lepidosperma*	
MYRTACEAE		*Melaleuca*	*cuticularis*	Saltwater Paperbark
		Melaleuca	*lateritia*	Robin Redbreast Bush
		Melaleuca	*preissiana*	Moonah
		Melaleuca	*rhaphiophylla*	Swamp Paperbark
		Melaleuca	ssp.	
		Melaleuca	*viminea*	
		Verticordia	*densiflora*	Compacted
SOLANACEAE	*	*Solanum*	*nigrum*	Black Berry Nightshade
ASTERACEAE	*	*Conyza*	sp.	-
	*	*Sonchus*	*asper*	Rough Sowthistle

Abbreviations:
sp.: species (singular)
var.: variety
spp.: species (plural) subsp.: subspecies
* denotes foreign introduced species
ms: manuscript name (unpublished)

Soils

Field observations were made regarding the presence of hydric soils and/or evidence of waterlogged or inundated soils.

Hydric soils are defined as *"soil that has formed under conditions of saturation, flooding or ponding long enough to develop anaerobic conditions in the upper part. The concept of hydric soils includes soils developed under sufficiently wet*

condition to support the growth and regeneration of hydrophytic vegetation" (DEC, in publication).

At each site the soil conditions at surface and subsurface were noted. Analysis of subsurface soils was done by hand augering to approximately 0.5m depth. This depth was considered adequate as groundwater rise to this level would cause waterlogging at surface due to the capillary fringe. Hand augered and surface samples were observed in the field for properties of hydric soils and/or waterlogging to determine wetland boundaries. Soil samples were returned to ENV offices and visually analysed by an ENV Senior Geochemist. Indicators of hydric soils examined include texture, colour, organic content, structure, mottling, and moisture content.

Groundwater was not encountered at any location by hand auger however, groundwater was observed in nearby table drains and surface water drains. Additionally, in areas that had been affected by salinity from groundwater rise there are separately noted soil conditions and a pattern of dead or dying vegetation. Salt affected areas are generally characterised in Area D by a limited amount of vegetation.

Observations are noted in the "soil assessment" section of the field notes.

Where appropriate, wetland boundaries were determined and boundary walks were undertaken at the extent of the hydric soil area as noted in the field notes.

Hydrology

Hydrological observations made in the field related primarily to either surface water or groundwater hydrological characteristics. This includes evidence of groundwater rise, surface water inundation or surface water flow across the wetland.

Although a snapshot of the hydrology of a wetland cannot be used to define a wetland boundary it does contribute to either the landform type or the soils present therefore supporting the observations made. More importantly, understanding the hydrology of the wetland is imperative to its geomorphic classification.

Topography

Landform type is largely dependent on the local topography. Field observations of topography can provide a refinement of the information collected as part of the desktop works. Minor changes in relief and landform can be determined based on field observations.

For basin and channel type wetlands the boundary is largely determined by changes in landform and a clear shift between wetland soils and wetland vegetation is often due to changes in landform. When a boundary walk was undertaken the altitude from the GPS was also recorded (typical accuracy +/- 5m).

Landform change was often identified as a boundary for a wetland as it often coincided with a change in soils, vegetation and/or hydrology.

4.2.3 Classification of Wetlands

The classification of wetlands in the field was based on two key observations relating to the landform and water permanence.

Observations of landform type in the field were classified according to the landform types presented in Figure 4. A section in the field notes was dedicated to the observation of the landform type and how it related to the desktop mapping. For example, typical observations included identifying low lying or flat areas, basin formations in the landscape, a degree of erosion forming creek or river banks.

The water permanence in the field was identified through observations regarding the local hydrology and soils of the wetland. Since the site visit occurred in June, and not during a period of peak groundwater and surface water levels, a number of observations were recorded to estimate the extent of waterlogging or inundation that would characterise the wetland. Where waterlogging and surface water flow was observed it was noted in the field notes.

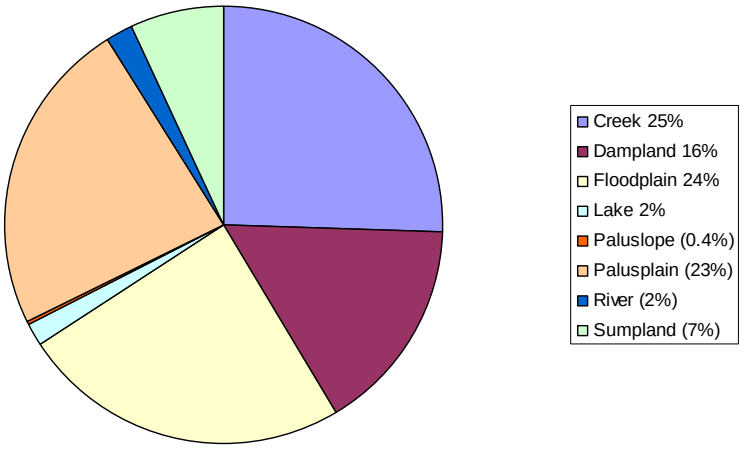
In seasonally dry wetlands, observations regarding soils and hydrology were recorded to make an estimate as to the “wetness” of the area. Observations regarding erosion or surface water scour in many wetlands were recorded to indicate seasonal inundation.

5 RESULTS

In Area D approximately 919 wetlands were mapped and classified including rivers, creeks, lakes, sumplands, damplands, floodplains, palusplains, and paluslopes using the methods described above.

Area D is comprised of approximately 27,000 ha of mapped wetlands which is approximately 19% of total project area. The majority of wetlands mapped were creeks, floodplains or palusplains. The breakdown of wetland classification types as a percent of total mapped wetland area is shown in Figure 5 below:

Figure 5: Wetland Type as Percent of Total Wetland Area



The field survey undertaken as part of this study visited 118 wetlands in total making up approximately 13% of the mapped wetlands. The boundaries of 73 wetlands were assessed in the field and boundary coordinate locations were captured and used to compile the accuracy statement. Typical accuracy on a handheld GPS is +/- 5m.

Based on field observations typical accuracy for the Area D wetlands spatial dataset was determined as approximately 21 m.

Based on the field observations, classification of the wetlands undertaken at a desktop level was confirmed and few wetlands required a change in classification.

All mapped wetlands have been provided as an ArcGIS shapefile in polygon format. Listed in the attribute table are a unique feature identifier, the geomorphic classification of each wetland, the criteria that defined the boundary, whether a site visit was conducted and the date of the site visit.

Metadata (data about data) has been compiled to describe the content, structure and general features of the Area D wetlands spatial dataset. The metadata for this dataset is contained in Appendix E. The spatial dataset is the digital Attachment 2 to this report.

It is envisaged that this report is to be read in conjunction with use of the wetland spatial dataset and related to field descriptions that are contained in Appendix B.

6 DISCUSSION

6.1 DESKTOP MAPPING

This study employed a new methodology for desktop mapping and classification of wetland areas in Area D. This methodology was undertaken to take advantage of GIS and other spatial information collected in Area D by either the DEC or other State government agencies. The new methodology yielded a robust dataset that was ground truthed through field observations. Accuracy of 21m is considered to be an improvement on that recorded for previous wetland mapping and spatial data.

Channel wetlands were included as part of this study whereas they were not included in previous wetland mapping studies. This was an important inclusion for this dataset as the general hydrology of the area is dominated by surface water flow and it is the main driver for the water permanence of most wetlands encountered.

6.1.1 Limitations

Generally in spatial analysis, datasets created are limited by the spatial datasets from which they are derived. In this study, the extent to which remotely sensed data could be utilised was limited by the coarse spatial resolution of the satellite imagery (30m resolution) and therefore requiring greater input based on the remaining spatial datasets. Spatial datasets including the topography, soils and vegetation complexes were at a coarser spatial resolution than the required output of this study. In other words, a GIS cannot derive a 1:25,000 dataset from input datasets that are derived at 1:100,000 as is generally the case from remote sensing data. In turn, the resultant boundaries are largely based on the finer resolution of the digital orthophotos.

The implication of this is that there is a greater emphasis and need for manual processes and operator adjustment and less focus on the information derived from spatial datasets introducing an element of subjectivity.

A further limitation was imposed by the orthophotos available for the area. The majority of the orthophotos provided were captured in the summer months and corresponding to dry conditions. Boundaries based on summer months may not correspond to those reached in the winter months or when water levels are at their peak (generally in September or October) and in turn, impacting on the accuracy of the boundaries.

As stated above, channel wetlands were an important inclusion in this dataset, however, as channels are formed by surface water flow and catchment characteristics, their boundaries are largely determined by topography and the

availability of refined topographic data for desktop mapping is therefore imperative. Field observations indicated that channel depths were generally less than 2m, therefore bank heights would be undefinable in 2m topography. As stated in the methodology, channel areas have been generalised to reflect the coarse 1:25,000 scale of the mapping but could have been generated at a much finer scale had better topographic information been available.

6.1.2 Outcomes

Desktop mapping for this project was undertaken between April to June of 2009 and was submitted to the DEC as a digital file for review in a compatible GIS format. In this study, all mapping was undertaken by a single operator thus reducing the possibility of handling errors being introduced into the dataset.

Previously, wetland boundaries had been provided to the DEC as a series of hand drawn transparencies corresponding to wetland boundaries and DEC GIS operators were required to digitise these boundaries. Handling errors may be introduced as the boundaries are defined by one individual who is familiar with wetlands then transcribed by an operator without such familiarity. The methodology for this project recognised potential handling errors that could occur and endeavoured to minimise them.

A major advantage to computer based mapping is the ability to process a dataset in its entirety to identify areas that have specific characteristics. In this study, field observations could be translated to mapping rules that can be applied across the dataset. For example, if intergradations of landform types needed to be adjusted the operator could identify all wetlands in Area D where an intergradation occurred in less than 1 minute.

The operator could create rules in the dataset that had to be followed across the entire dataset. The advantage of this is it provides consistency across the dataset and a single change could be replicated throughout the entire dataset without any major time commitment.

Additionally, clarity was a key component of this project. Clarity in the process and methodology of wetland mapping has been provided to increase the repeatability in the project and improve the understanding of wetlands to potential users of this dataset. In each mapped wetland, criteria were provided in ascending order to indicate what phenomena (either vegetation, soils or landform) were considered to identify the boundary of the wetland. These criteria are listed in the attribute table for the shapefile and are given for each individual wetland.

6.1.3 Recommendations

The use of GIS and spatial datasets in wetland mapping is recommended for future wetland mapping projects undertaken by the DEC. Using the GIS provides increased accuracy in determining the wetland boundaries and can incorporate a a number of different datasets to assist in identifying the other factors associated with wetland boundaries.

As mentioned above, this study was limited by the amount of fine scale spatial datasets available. It is recommended that future areas chosen for wetland mapping have refined topographic mapping available as almost 70% of wetland boundaries were defined in this study based on their landform characteristics. Topographic contour intervals of 0.5m would greatly improve the results. Alternatively, a collection of accurate and recent spatial data for areas to be mapped is recommended, similar to that listed in Table 2 above.

The use of stereoscopic aerials in this study was done to provide consistency between wetland mapping studies. However, using the stereoscopic aerials was not found to improve the quality of the mapping and few changes were made while reviewing stereoscopic aerials. The use of aerial orthophotographs provided the georeferencing for wetland locations and topographic mapping is then overlaid providing an impression of the landform. The ability to read topographic mapping is considered to be equivalent to viewing images through the stereoscope.

Also, the use of aerial orthophotos captured during the wetter months (September, October) should occur if they are available to determine the extent of potential wetland areas, particularly to capture seasonal inundation/waterlogging. Approximately 95% of wetlands in Area D are subject to a seasonal hydroperiod and having wet period aerial photography would help to refine those boundaries.

6.2 FIELD SURVEY

The main goal for the field survey was to visit 10% of the mapped wetlands within Area D. In total, ENV visited approximately 13% of wetlands in Area D over 10 days. The field survey provided familiarisation with the catchment which then improved the outcomes in the mapping and provided an estimation of the accuracy in the dataset.

The field survey was an important part of the study as it confirmed that the methodology undertaken to identify, delineate and classify wetlands was appropriate.

6.2.1 Limitations

Two main limitations were encountered in the field survey. Firstly, the field survey was done in June during early winter when groundwater levels are low and surface water levels are beginning to rise. The water permanence of approximately 95% the wetlands mapped are seasonally inundated or seasonally waterlogged. In this case, conclusions made regarding the hydrological regime of the wetland had to be determined based on vegetation, soil and local hydrology.

Secondly, Area D is predominantly freehold property, ENV had limited access on some blocks as the landholder was either unable to be contacted or refused entry. This affected the number of wetlands whose boundary conditions could be examined.

6.2.2 Outcomes

The field survey exceeded the target for the number of wetlands to be visited in the field. This provides additional confidence in the accuracy statement provided.

The use of a transect and/or a boundary walk to identify wetland boundaries provided adequate detail to assess the accuracy of boundaries in the GIS. It is not documented in the literature what field procedures were used in previous wetland mapping studies. Understanding how previous field survey was undertaken would be valuable for comparing accuracy statements if this is the objective of the DEC.

For the field survey, detailed notes were compiled and have been submitted as Appendix A to this report. All notes refer to the unique feature identifier (UFI) that is contained within the Area D wetlands spatial dataset to link the spatial component of the project to the field component. GPS capture points and key elements of the boundary definition are noted to improve the repeatability of this study. Additionally, over 250 photos were taken in the field that identify boundary areas and support the observations documented in the notes.

6.2.3 Recommendations

A field survey to ground truth results from desktop mapping is an important part of the study and should be included in future projects. In future projects, the vegetation, soils, hydrology, and landforms associated with wetland boundaries that are observed in the field should be identified and described.

It is recommended that field survey methods are consistent and replicable across DEC wetland mapping projects. These should be formally outlined and subject to change based on temporal or environmental conditions based on the different areas that are assessed. Because the accuracy statement is based on the

outcomes of the field survey there should be a level of consistency across projects.

Furthermore, timing of the field survey should be coincident with peak water levels in the catchment. This would make the estimation of wetland boundaries far more accurate. It is understood that these boundaries are still variable year to year but it would at least capture the conditions during a seasonally wet period.

6.3 TEMPORAL RESOLUTION

Generally, mapping of wetland boundaries is not just limited to a spatial scale but also to a temporal scale. Environmental and climatic changes may occur that in turn cause alterations of wetland boundaries. Temporal resolution refers to the precision of measurement with respect to time (Lillesand & Kiefer, 1994)

The conditions on site are assumed to represent the last 10-15 years. Aerial photography used for wetland mapping also showed changes throughout the landscape over the last 12 years providing a benchmark for major environmental changes. In the aerial photography there were no significant shifts in wetland boundaries.

7 CONCLUSIONS

- ENV Australia Pty Ltd (ENV) was commissioned by DEC to undertake mapping and classification of wetlands for “Area D” within the Shire of West Arthur.

- This study is consistent with principles and guidelines in the *Framework for mapping, classification, and evaluation of wetlands in Western Australia* (DEC, in publication).

- In a desktop GIS, remote sensing data and the spatial datasets were overlayed and compared to determine what spatial locations were likely to be considered as wetland areas. A total of 919 wetlands were identified.

- Desktop identification of wetland boundaries was performed in an iterative process involving the use of remote sensing data, spatial datasets and stereoscopic aerials.

- Once wetland boundaries were mapped a geomorphic classification was then assigned to each identified wetland. The classification of a wetland is dependent on two main factors; landform and water permanence. The wetland types identified were rivers, creeks, lakes, sumplands, damplands, floodplains, palusplains and paluslopes.

- Field survey was used in this study to provide a measure of accuracy of the resultant mapping. Two field surveys were undertaken in this study over the course of 2 separate field trips with a total of 10 days in the field visiting approximately 118 wetland of which 73 had their boundaries scrutinized.

- The accuracy of wetland boundaries determined from the field survey visiting 73 wetlands is +/- 21m.

- The new methodology yielded a robust dataset that was ground truthed through field observations.

8 REFERENCES

Bureau of Meteorology, 2009. http://www.bom.gov.au/climate/averages/

Department of Agriculture and Food. 2003, Soil-landscape map unit descriptive information, land quality and capability data. Department of Agriculture and Food,

Department of Environment and Conservation, 2007, *Framework for mapping, classification and evaluation of wetlands in Western Australia*, Department of Environment and Conservation (in publication).

Department of Environment and Conservation, 2007a, *Protocol for proposing modifications to the Geomorphic Wetlands of the Swan Coastal Plain dataset February 2007,* Department of Environment and Conservation, Perth.

Gibson, N, Keighery, B, Keighery, G, Burbidge, A & Lyons, M ,1994, *A Floristic Survey of the Southern Swan Coastal Plain*. Prepared by Department of Conservation and Land Management and the Western Australian Conservation Council for the Australian Heritage Commission, Perth.

Government of Western Australia, 1997, *Wetlands Conservation Policy for Western Australia*, Government of Western Australia, Perth.

Hill, A.L., Semeniuk, C.A., Semeniuk, V., Del Marco, A. 1996. Wetlands of the Swan Coastal Plain Volume 2a: Wetland Mapping, Classification and Evaluation, Main Report. Waters and Rivers Commission, 1996.

Hill, A.L., Semeniuk, C.A., Semeniuk, V., Del Marco, A. 1996. *Wetlands of the Swan Coastal Plain Volume 2b: Wetland Atlas*. Waters and Rivers Commission, 1996.

Lillesand, T.M, Kiefer, R.W. 1994. *Remote Sensing and Image Interpretation.* John Wiley & Sons, Brisbane.

Longley, P, Goodchild, M, Maguire, D, Rhind, D. 2001 *Geographic Information Systems and Science.* John Wiley & Sons, Brisbane

Semeniuk, C A & Semeniuk, V. 1995, "A Geomorphic Approach to Global Classification for Inland Wetlands", *Vegetatio* 118:103-124

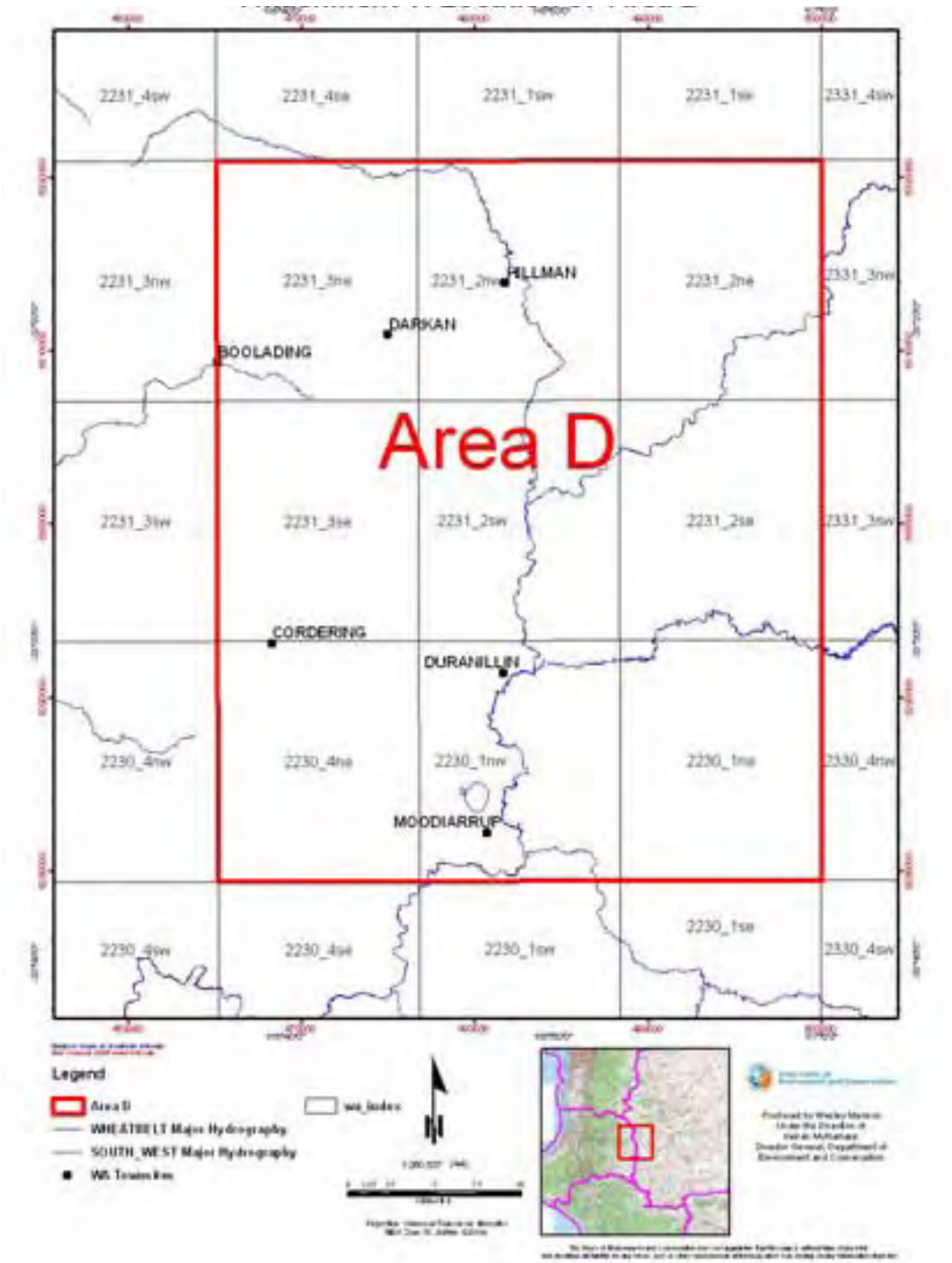
Shire of West Arthur. 2004. http://www.westarthur.wa.gov.au/about_the_shire. Updated: 19/10/2004

Queensland Government. 2007, *Wetland Mapping and Classification Methodology.* Queensland Environmental Protection Agency 2007

UNESCO, 1971, Article 1, part 1, *Convention on wetlands of international significance*. Published in Australia, 1976, for Department of Foreign Affairs, Australian Government Publishing Service, Treaty Series 1975, No 48.

Western Australian Herbarium (2009. *Florabase - Information on the Western Australian Flora*. Department of Environment and Conservation, Perth. *http://florabase.calm.wa.gov.au/*.

FIGURES



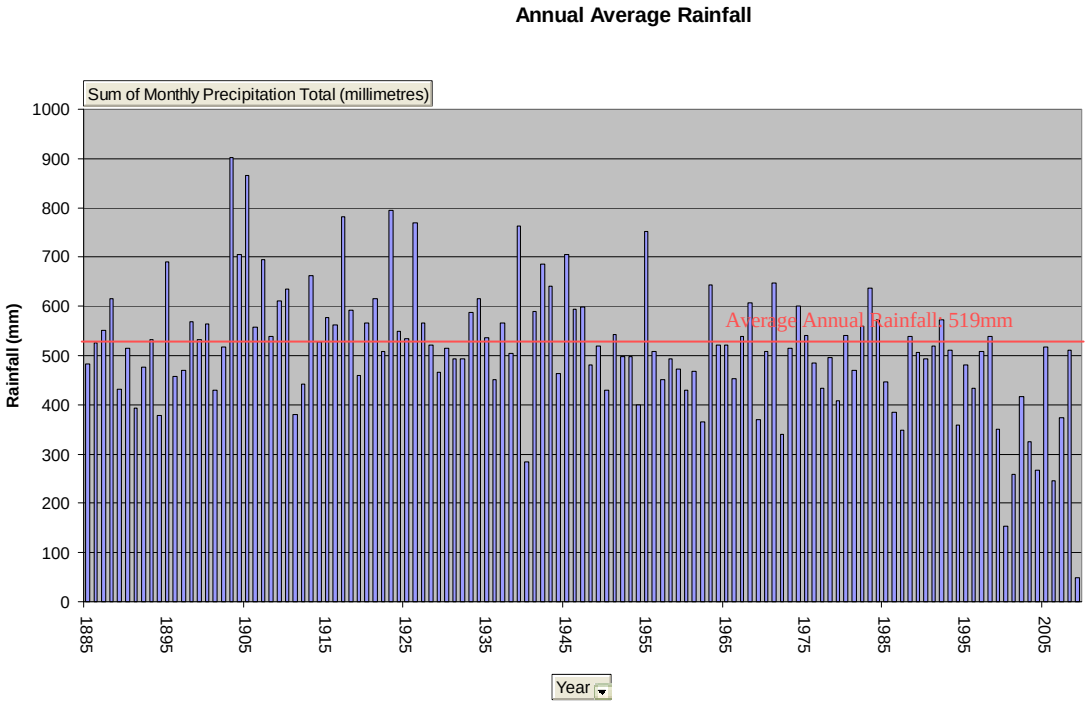
Data Source: DEC (2009)

FIGURE 1: Location Plan

CLIENT: Department of Environment and Conservation

JOB NUMBER:09.062 | SCALE: NTS

DRAWN BY: SS | CHECKED BY:TG | DATE: 19/6/09



(BOM, 2009)

FIGURE 2: Climate

CLIENT:Department of Environment and Conservation		
JOB NUMBER:09.062	SCALE: NTS	
DRAWN BY: SS	CHECKED BY:TG	DATE: 19/6/09

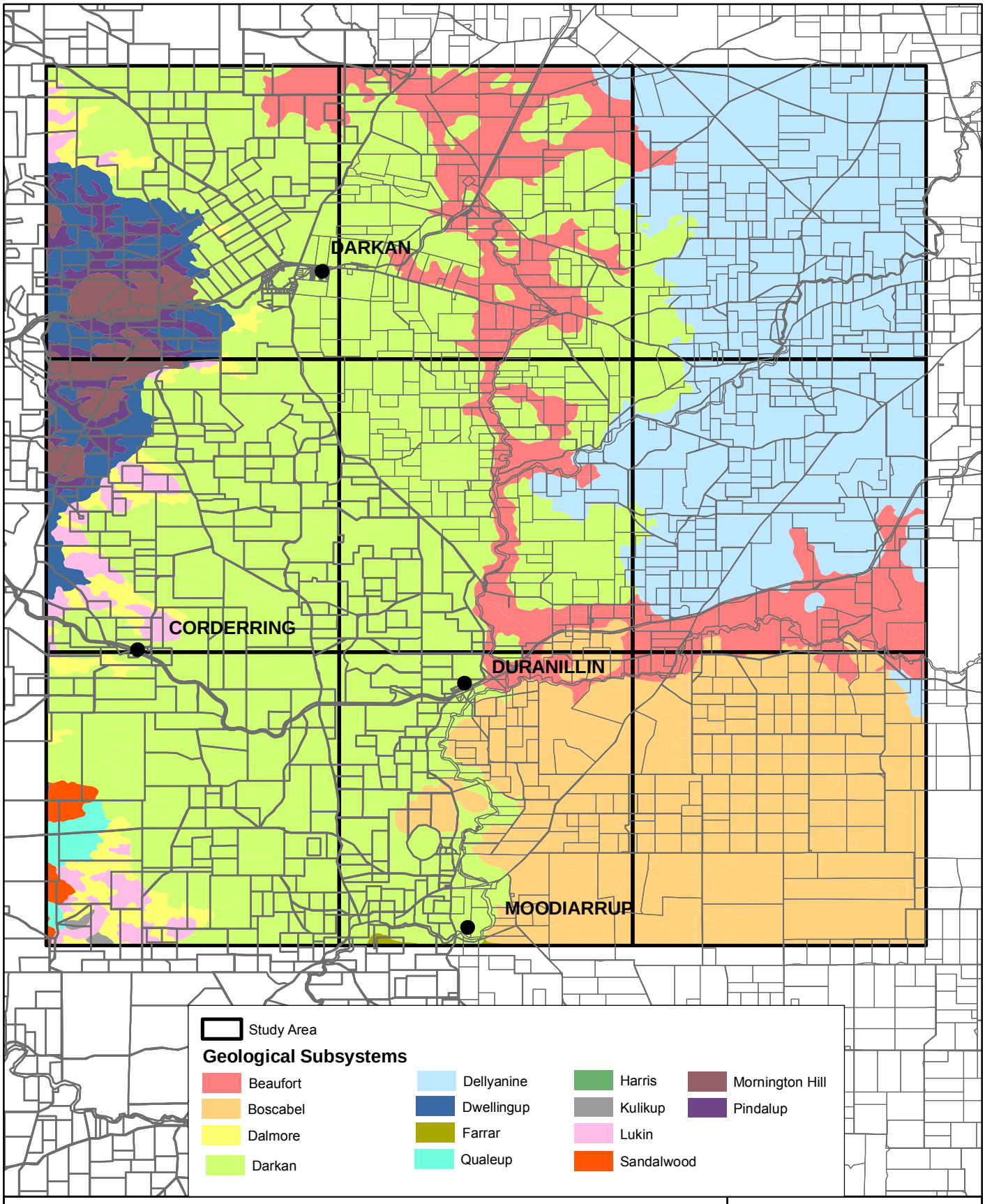


FIGURE 3: Geological Subsystems

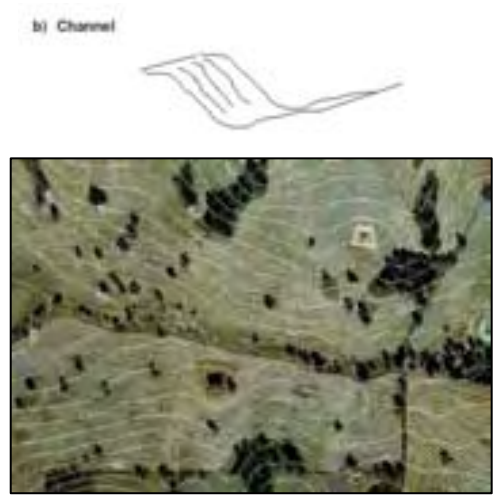
CLIENT: Department of Environment and Conservation

JOB NUMBER: 09.062	SCALE: 1:250,000	
DRAWN BY:SS	CHECKED BY: TG	DATE: 25/6/09

env Australia

a) Basin

b) Channel



c) Flat

d) Slope

e) Highlands/Hills

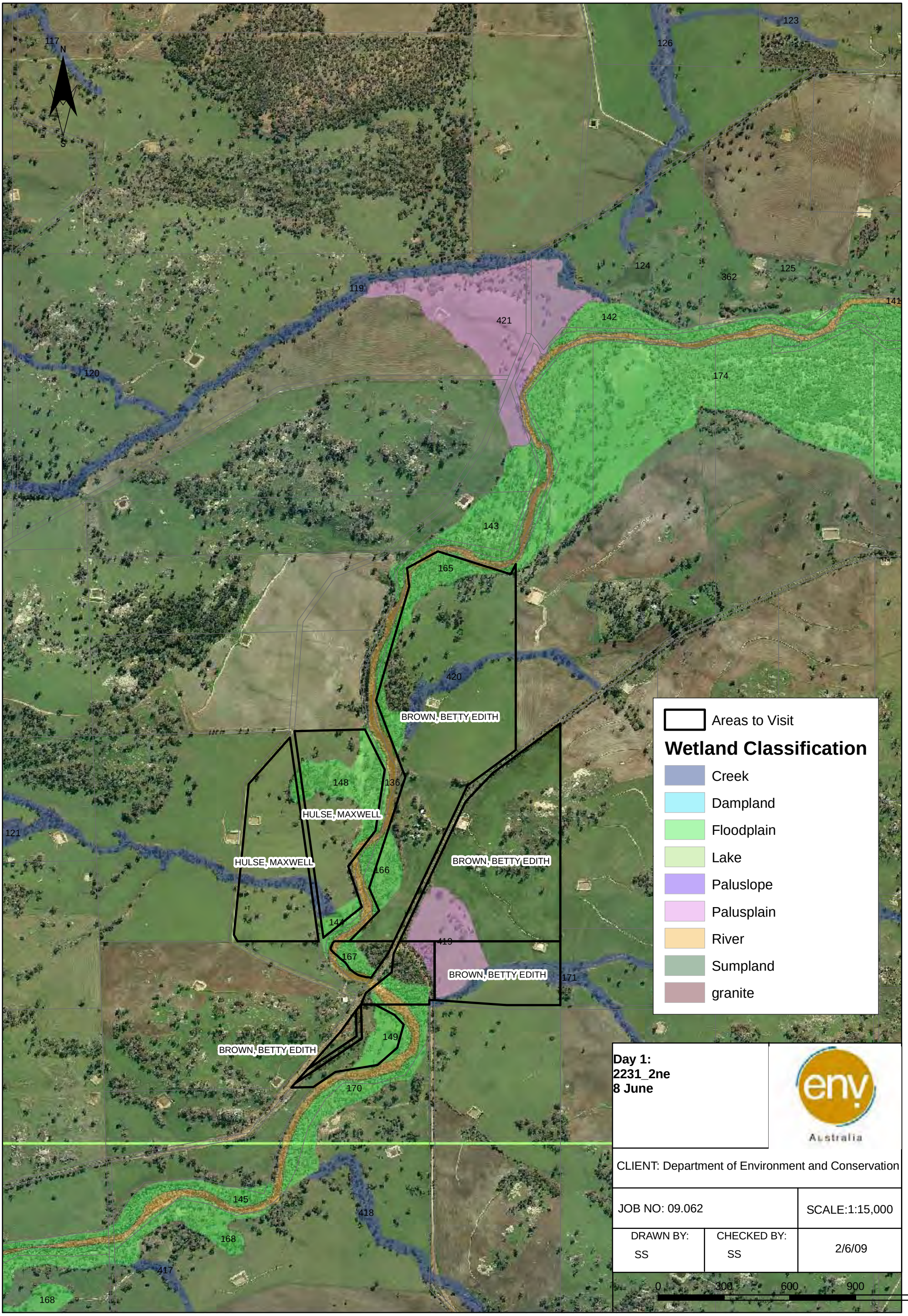
Data Source: Semeniuk & Semeniuk 1995

FIGURE 4: Landform Types

CLIENT:Department of Environment and Conservation

JOB NUMBER:09.062	SCALE: NTS	
DRAWN BY: SS	CHECKED BY:TG	DATE: 19/6/09

APPENDIX A
FIELD MAPS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174
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165
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BROWN, BETTY EDITH
148
136
HULSE, MAXWELL
121
HULSE, MAXWELL
166
BROWN, BETTY EDITH
144
419
167
BROWN, BETTY EDITH
171
149
BROWN, BETTY EDITH
170
145
418
168
417
168
Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 1:
2231_2ne
8 June
env
Australia
CLIENT: Department of Environment and Conservation
JOB NO: 09.062
SCALE:1:15,000
DRAWN BY:
SS
CHECKED BY:
SS
2/6/09
0
300
600
900
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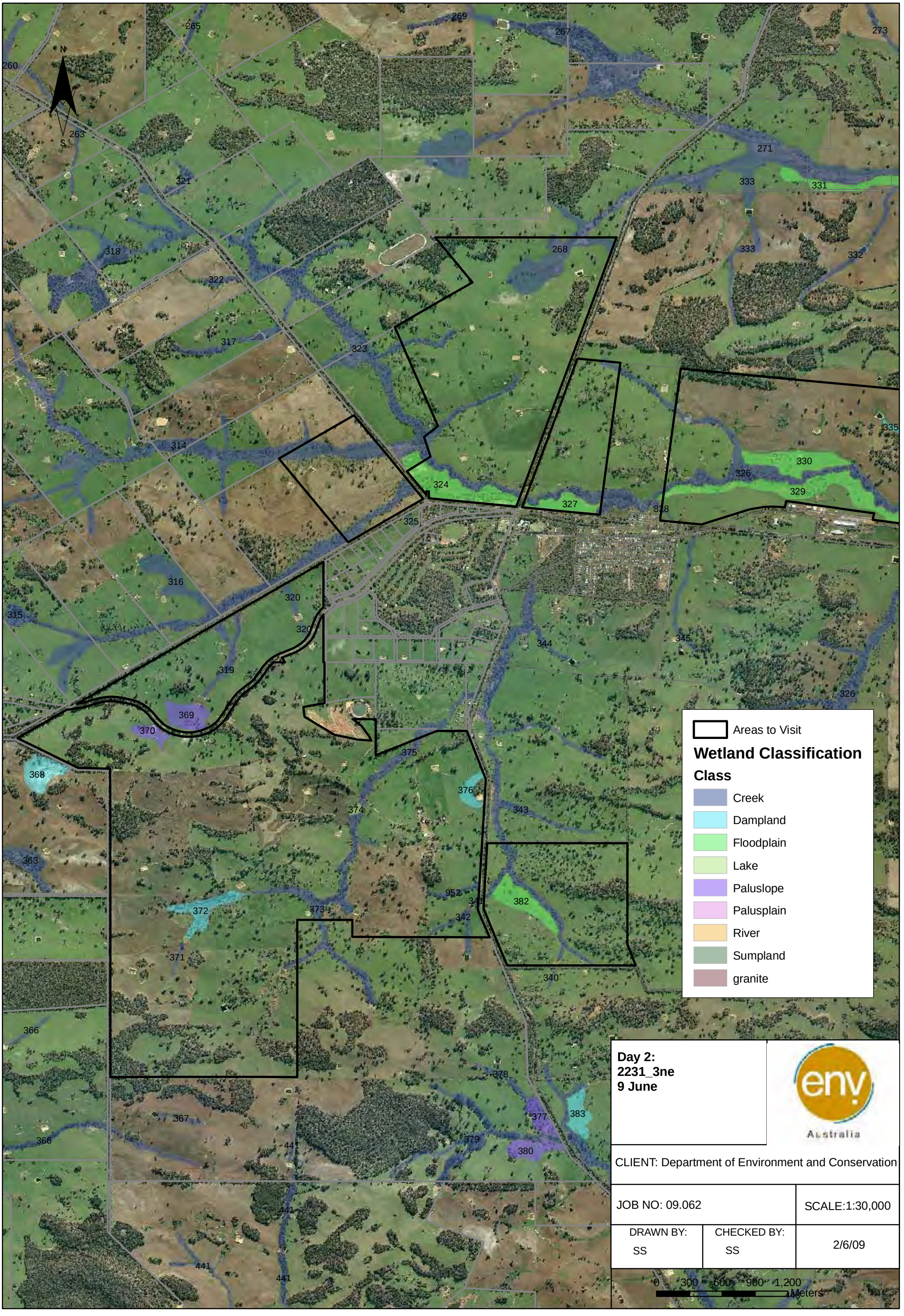
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Areas to Visit
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Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 2:
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9 June
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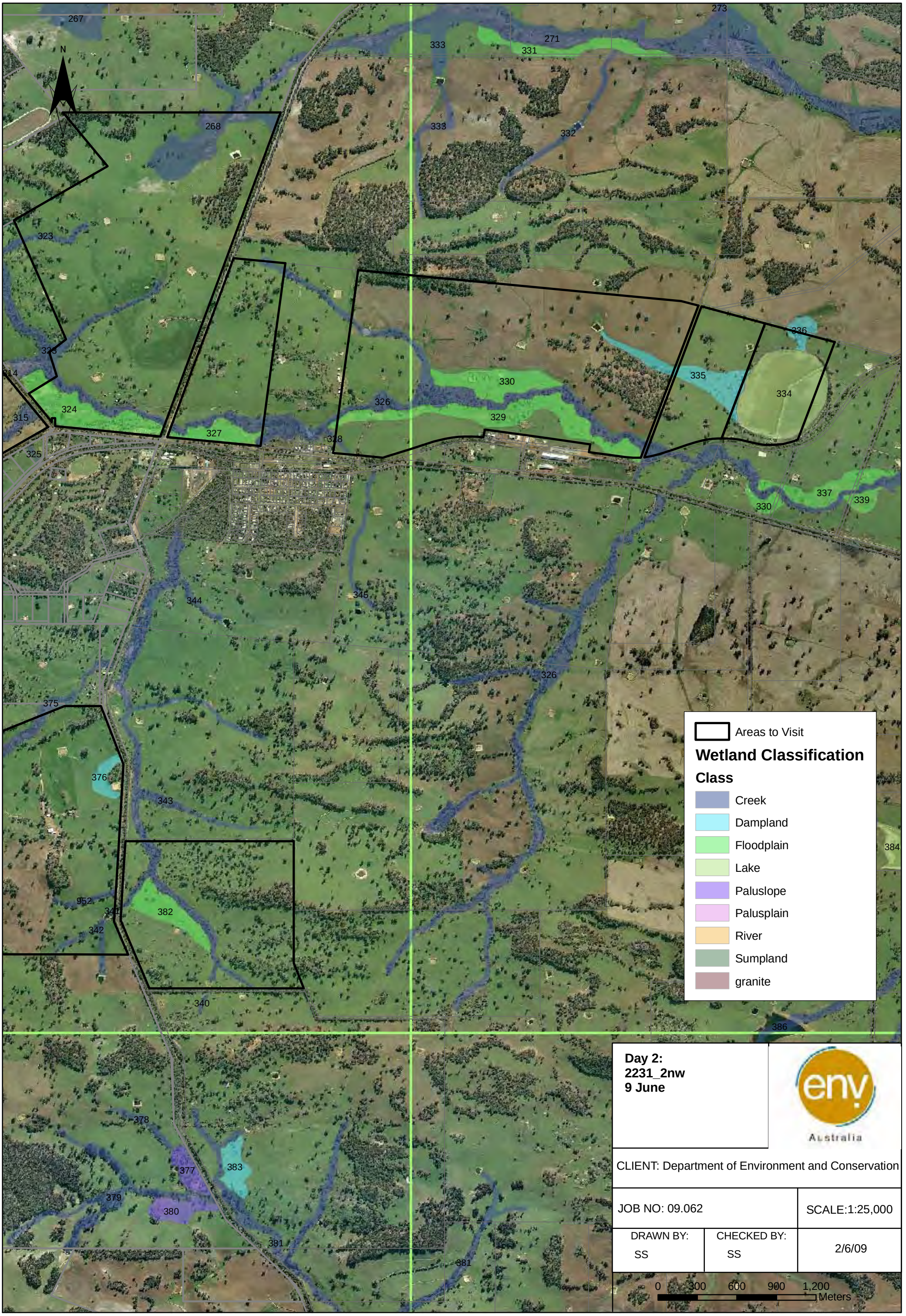
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Areas to Visit
Wetland Classification
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Dampland
Floodplain
Lake
Paluslope
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River
Sumpland
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Day 2:
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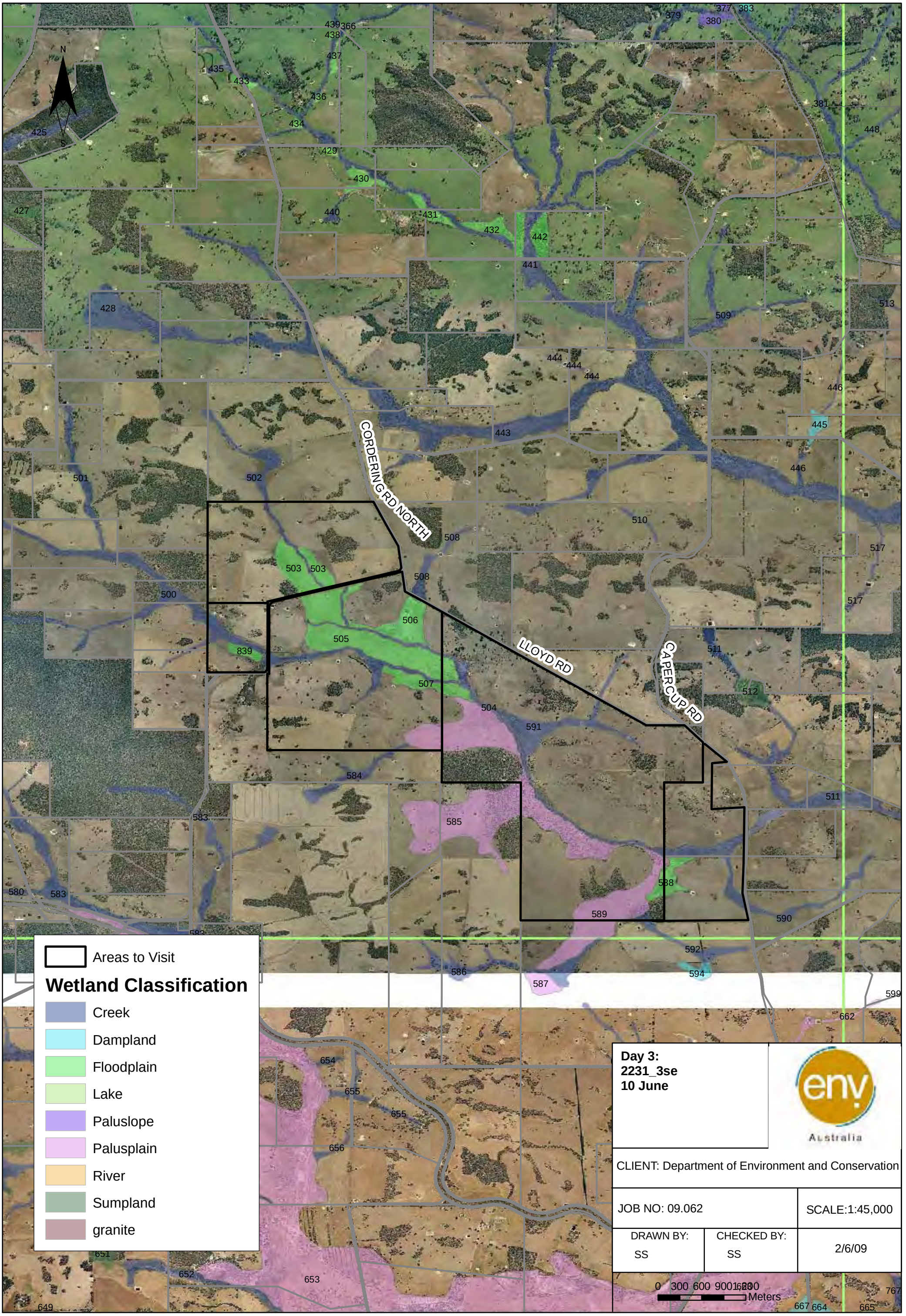
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Areas to Visit
Wetland Classification
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Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 3:
2231_3se
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env
Australia
CLIENT: Department of Environment and Conservation
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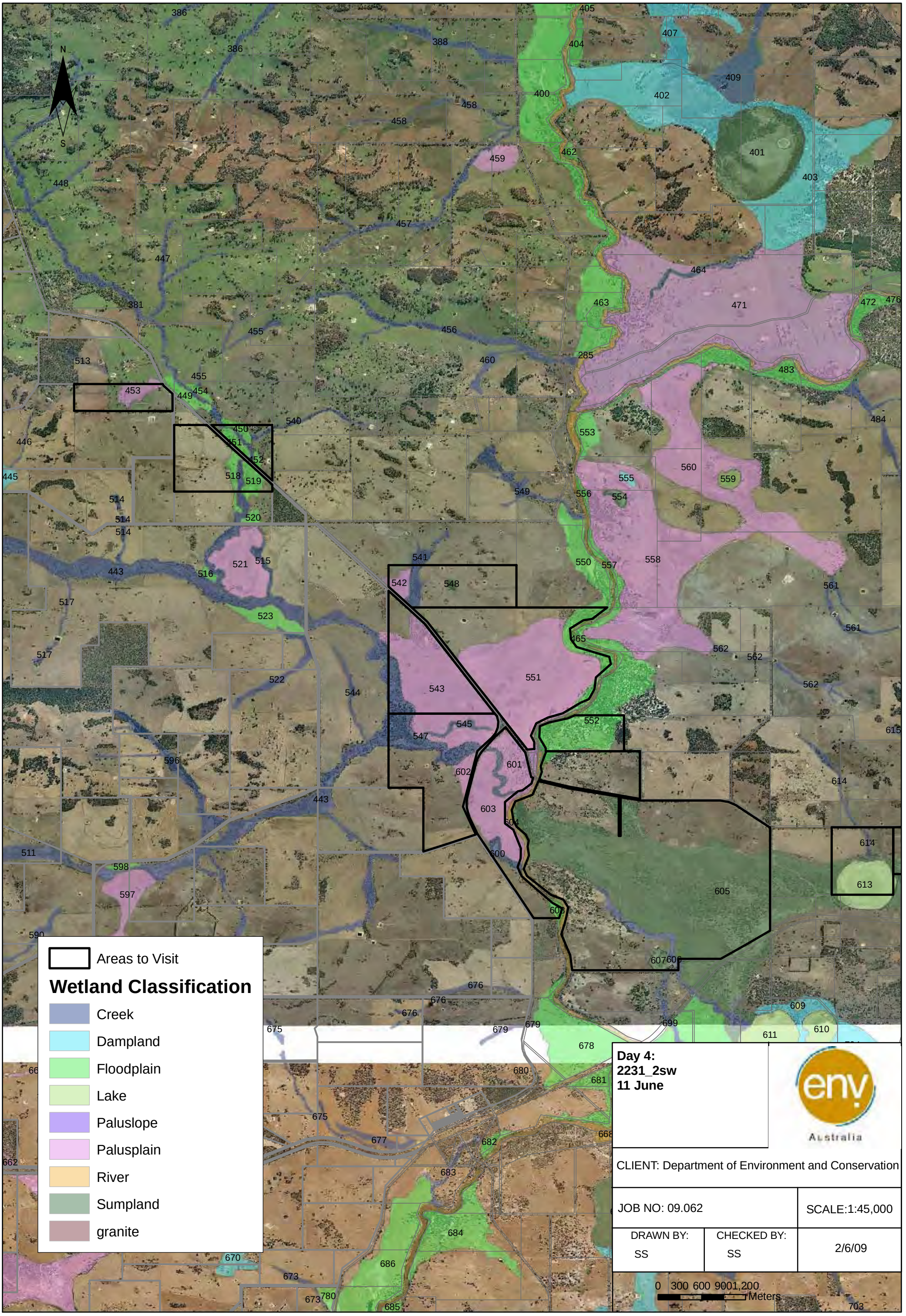
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Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 4:
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env
Australia
CLIENT: Department of Environment and Conservation
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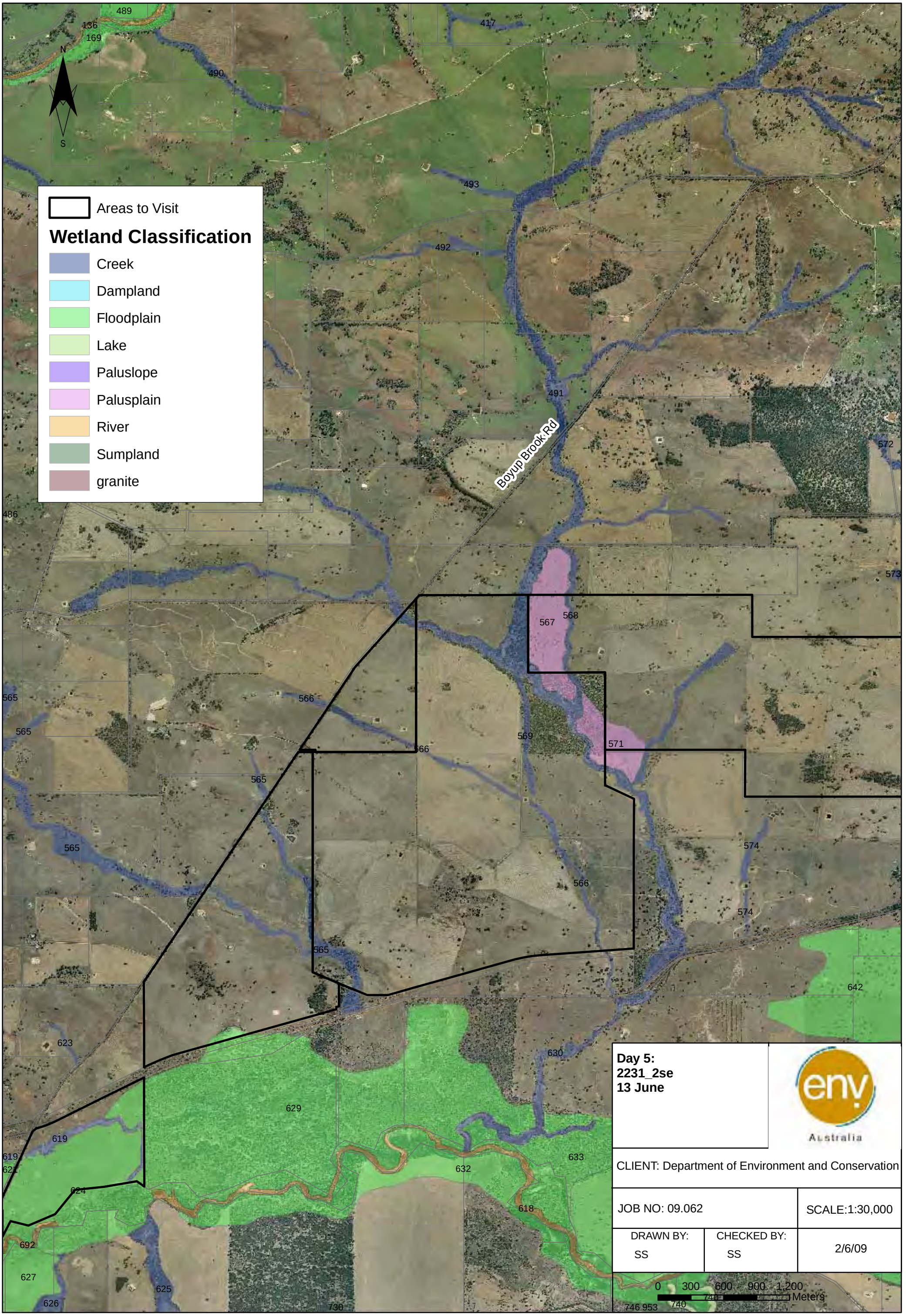
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Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
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granite
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Day 5:
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13 June
env
Australia
CLIENT: Department of Environment and Conservation
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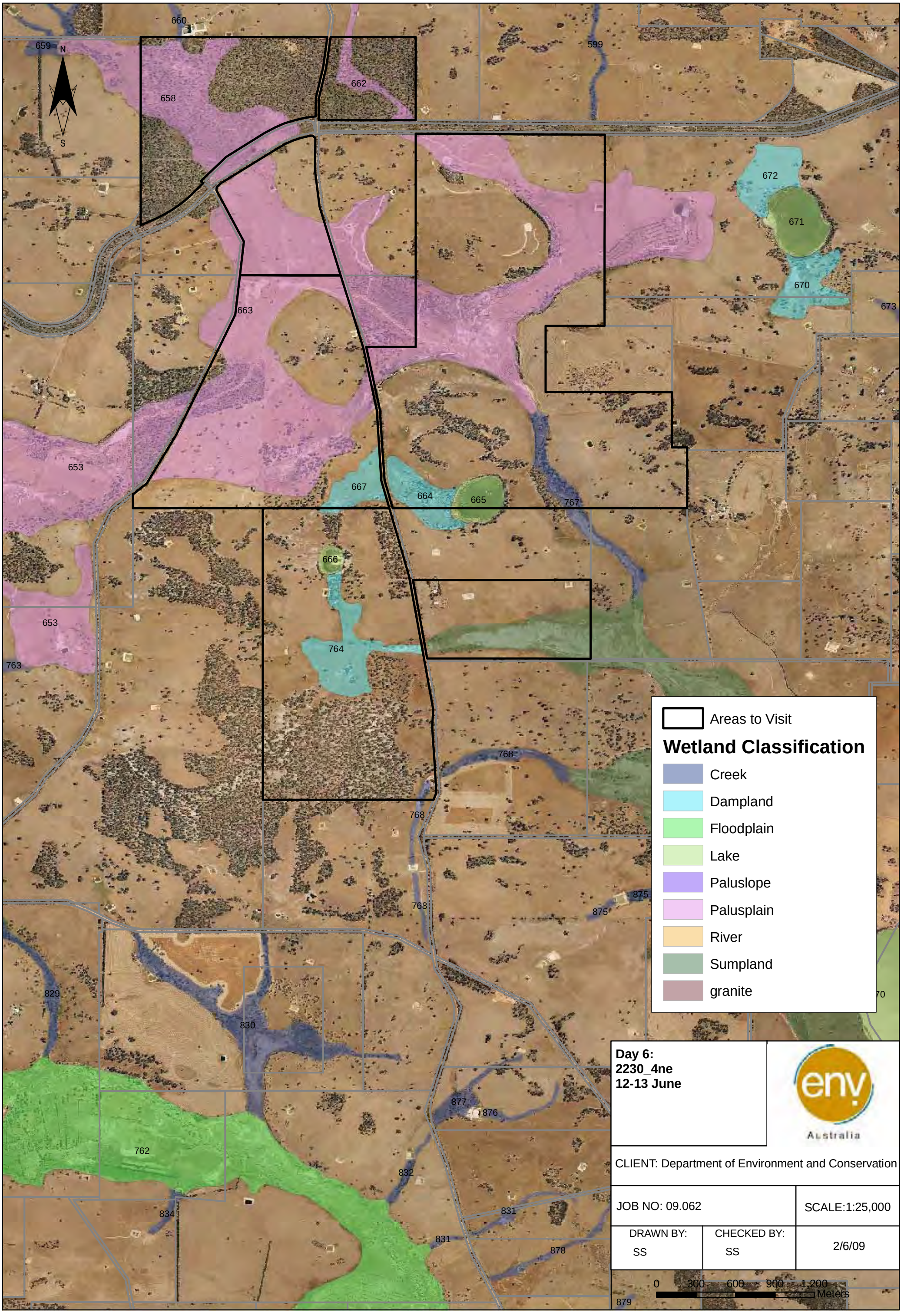
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Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 6:
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env
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CLIENT: Department of Environment and Conservation
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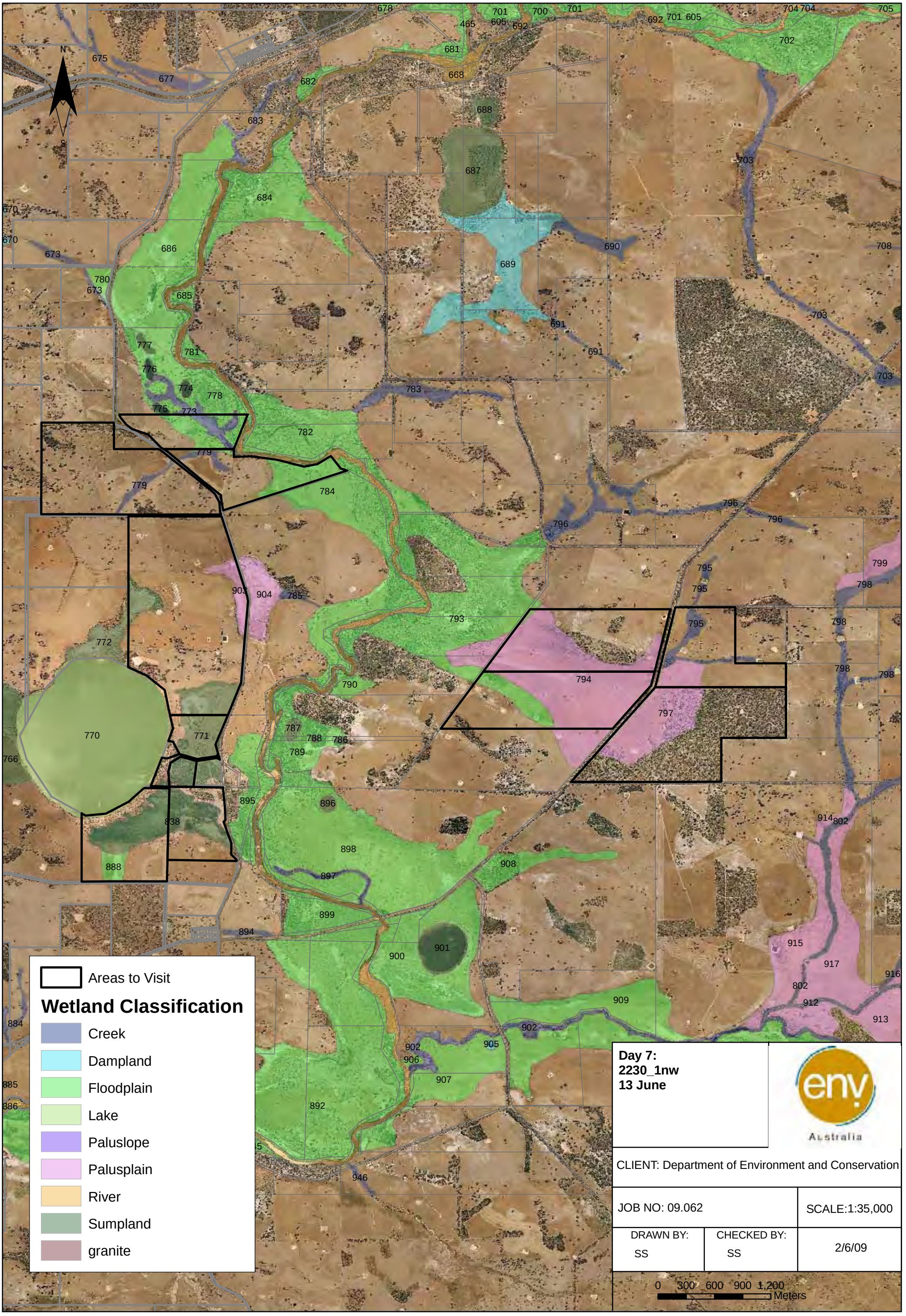
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Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 7:
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CLIENT: Department of Environment and Conservation
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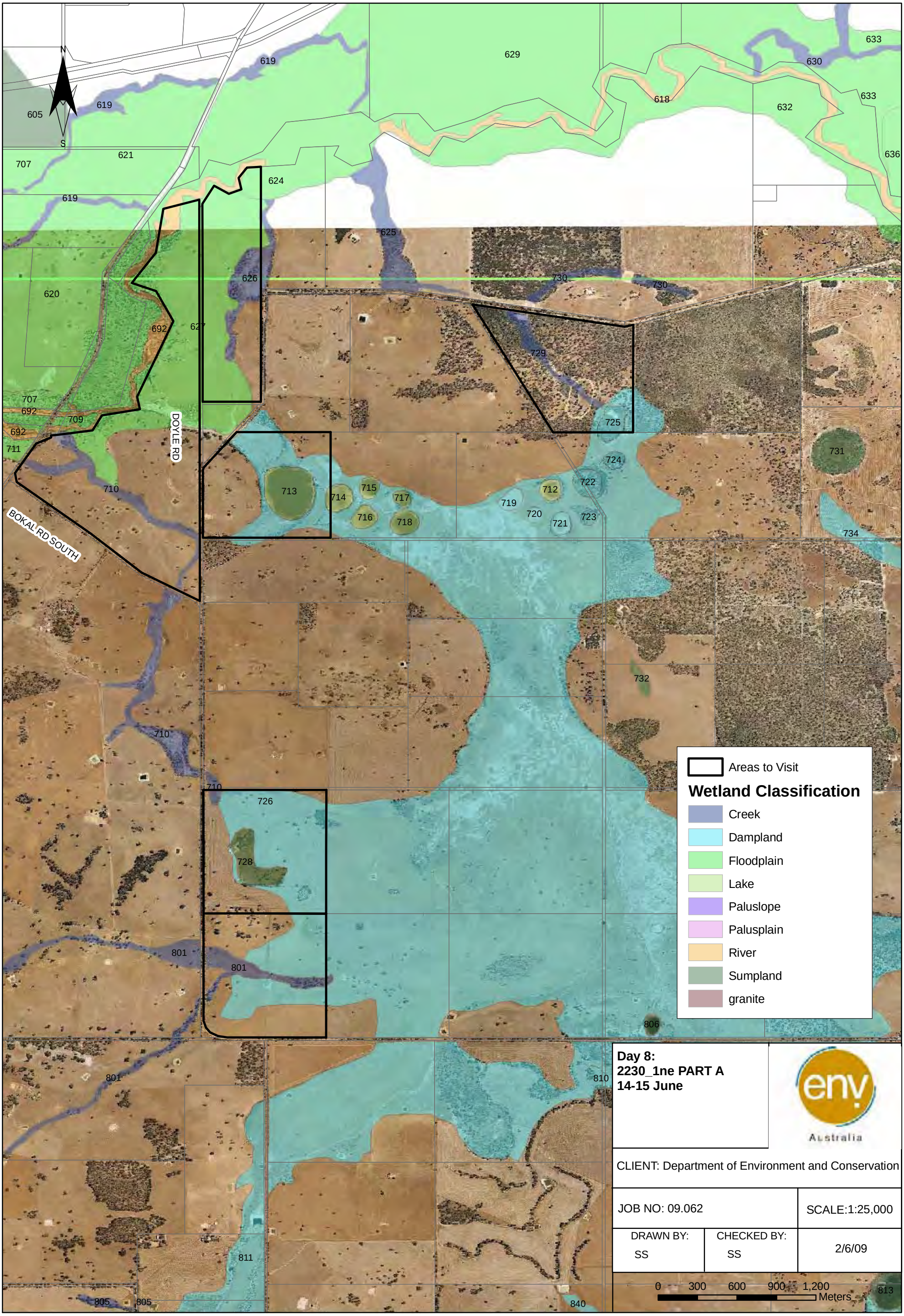
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Areas to Visit
Wetland Classification
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Dampland
Floodplain
Lake
Paluslope
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River
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Day 8:
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CLIENT: Department of Environment and Conservation
JOB NO: 09.062
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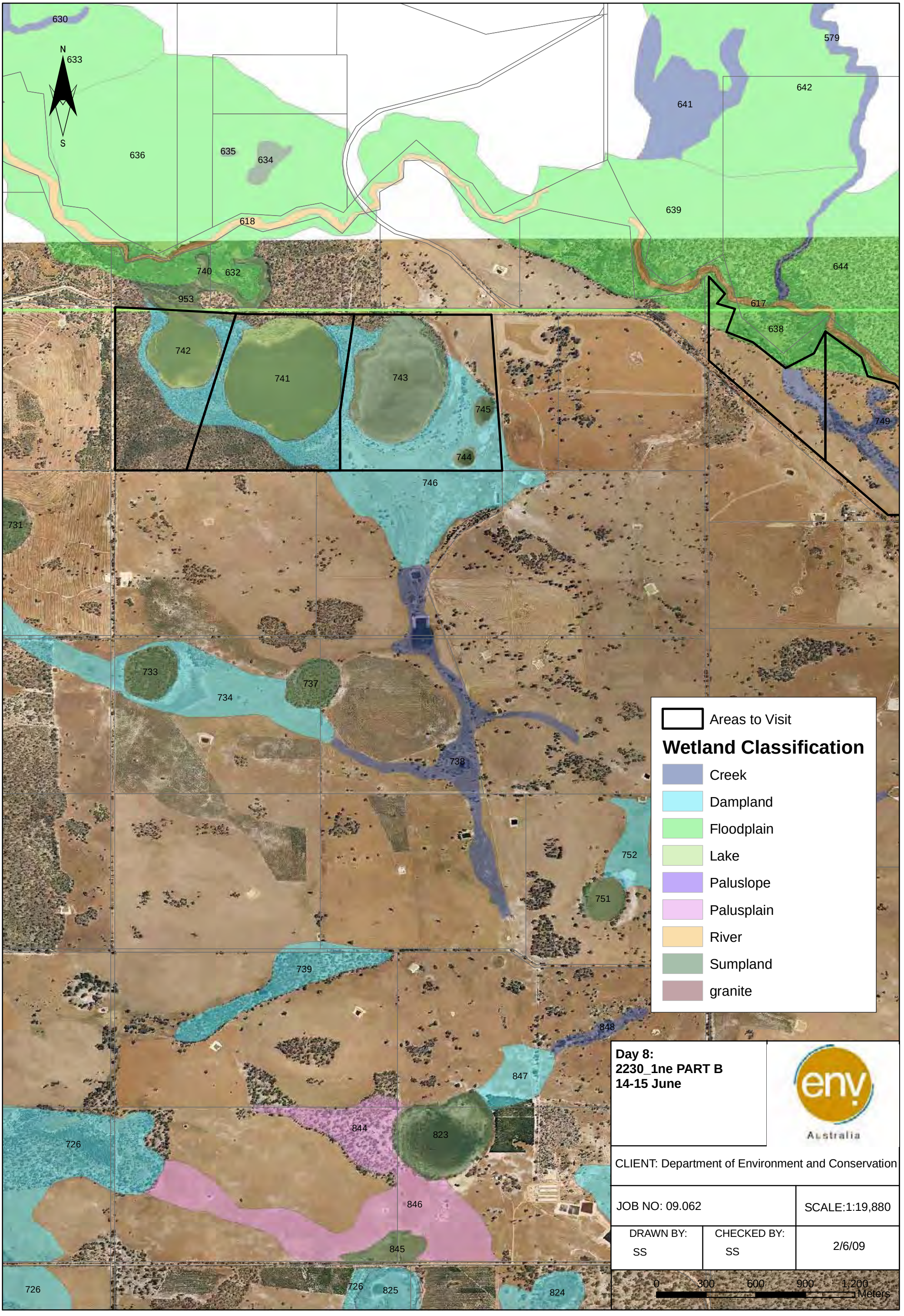
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Areas to Visit
Wetland Classification
Creek
Dampland
Floodplain
Lake
Paluslope
Palusplain
River
Sumpland
granite
Day 8:
2230_1ne PART B
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env
Australia
CLIENT: Department of Environment and Conservation
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APPENDIX B
FIELD NOTES

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 6/5/09
Time: 10:00
Wetland UFI: 174

Easting: _____ Northing: _____

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	498284	6310431	252	498101	6310456	252
Finish	498396	6310481				
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:

No significant vegetation species.

Soil Assessment

Hydrology

Evidence of water scouring

Topography

Site Elevation: 248

Landform Notes:

- Steep catchment, above road floodway.
- channel of moderate definition likely to have high flows being high

Notes:

photo 2362 - edge;
2361

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 5/5/09
Time: 7.30am
Wetland UFI: 3

Easting: _____ Northing: _____

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	498956	6320396		499099	6320987	
Finish	498983	6320219	260	499165	6320981	
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Typha orientalis Some wetland species present

Soil Assessment
Soil sample shows moisture presence

Hydrology
Evidence of groundwater

Topography
Site Elevation: _____
Landform Notes:
very flat area, heavily modified by humans

Notes:
Boundary based on extent of inundation
photo 2357 - channel
2358 - soil photo

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 5/9/09
Time:
Wetland UFI: 194

Easting: Northing:

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
482749	6318595	
482766	6318604	
482773	6318609	
482780	6318613	
482796	6318619	

Vegetation Notes:
No significant vegetation.

Soil Assessment
Evidence of waterlogged soils.

Hydrology

Topography
Site Elevation:
Landform Notes:
distinct incised channel
Boundary defined by landform

Notes:
Probes - 2363 - adjacent paddock.
Area classified as creek.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 5/3/09
Time: 2:30pm
Wetland UFI: 192

Easting: _____ Northing: _____

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
482015	6319295	
482032	6319278	
482020	6319827	
482019	6319391	
481988	6319416	

Vegetation Notes:

Soil Assessment

Soils indicative of hydric

Hydrology

Evidence that area is likely to be seasonally inundated. At the time of visit the area was dry

Topography

Site Elevation: 251

Landform Notes:

Notes:

FIELD SHEET
00.002 Wetland Mapping of Area D

Date: 3/5/07
Time: 1330
Wetland ID: 196 - near Meeting Pool
Easting: 479931 Northing: 6320450

Vegetation Assessment
No Transects

	Easting	Transect 1 Northing	Alt	Transect 2 Easting	Northing	Alt
Start	479931	6320431	253			
Finish	479941	6320437	256			
Veg Change	479935	6320437	253			

Boundary Walk (GPS)

Easting	Northing	Alt
479850	6320794	256
479841	6320805	257
479831	6320813	257

Vegetation Notes:
Vegetation consists of mature cedar, eucalypt, acacia. Clear boundary between wetland and upland species

Soil Assessment
Evidence of hydric soils

Hydrology
Evidence of inundation within wetland. Staining from water evident

Topography
Site Elevation: 253 - 257
Landform Notes:
Clear swampland formation

Notes:
Wetland boundary based on soil, vegetation and landform.

Photos: 23334 inside wetland 2336 - euc edge
23335 boundary

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 5/5/09
Time: 1230
Wetland ID: 246 near Meeting Pool, Ringing veg.
Easting: 479931 Northing: 6332652

Vegetation Assessment
No. Transects: 1

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	479931	6332664				
Finish	480142	6332581				
Veg Change	480123	6332583				
Boundary Walks (Y/N)	Easting	Northing	Alt			

Vegetation Notes:
Consists of fringing wetland vegetation, primarily of red osier considered at edge of wetland fringe.

Soil Assessment
Hydric soils not evident.

Hydrology
Non-visible saline areas appear as if brought water logged to surface.

Topography
Site Elevation:
Landform Notes:
End of transect. Clearly on high ground, sandy soils

Notes:
Photo: 2534 start of transect
2535 end of transect.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 5/7/09
Time: 1:00
Wetland ID: 244 Mewing Pool - LAKE
Easting: Northing:

Vegetation Assessment
No. Transects: 1

	Easting	Transect 1 Northing	Alt	Transect 2 Easting	Northing	Alt
Start	479943	6320931	254	479782	6320870	254
Mid	479956	6320834	253	479768	6320861	255
Veg Change	479943	6320825	251	479768	6320861	253

Boundary Walked (Y/N)

Easting	Northing	Alt
479835	6320822	254
479781	6320824	255

Vegetation Notes:
Not much vegetation present. Some
str. shoreline near edges
Acacia bordering

Soil Assessment
Evidence of hydric soil at surface, dark colour, anaerobic activity

Hydrology
No surface water at present but all aerial photos show water. Water clearly over surface

Topography
Site Elevation: 255
Landform Notes:
Close basin landform

Notes:
Wetland boundary based on soils evidence of water logging and landform.
Not much veg. present.

Photos: 2341 - lake centre. 2342 - view west.
2343 - veg. form change. 2344 - upland access.

env

08-0002 Wetland Mapping of Area D

Date: 5/8/08
Time: 2:30
Wetland ID#: 202 Channel Taylor Rd.
Easting: 478687 Northing: 6322827

Vegetation Assessment

No. Transects: _____

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	478686	6321815				
Finish	478041	6322602				
Veg Changes	478046	6322604				
Boundary Walks (Y/N)						

Easting	Northing	Alt
478051	6322759	
478067	6322734	
478083	6322732	
478175	6322686	
478247	6322665	
478213	6322670	

Vegetation Notes:
wetland veg predom. in boundary. Elec wetlands. Edge vegetation across bike path

Soil Assessment

Creek soils waterlogged

Hydrology

No deep surface water above likely evident in winter

Topography

Site Elevation:
Landform Notes:
Defined channel, meanderings, natural

Notes:
- Creek flowing during visit.
- boundaries defined as edge of wetland vegetation.

Photo 2347 - over road
2348 - shows trees + hydric soils
2349 - 2350 shows channel.
↳ shows constructed channel

FIELD SHEET
09.063 Wetland Mapping of Area D

Date: 5/5/04
Time: 930
Wetland UFI: 342

Easting: Northing:

Vegetation Assessment

No. Transects:

	Easting	Transect 1 Northing	Alt	Transect 2 Easting	Northing	Alt
Start	478021	6317871	257			
Finish						
Veg Change	478022	6317950	257			

Boundary Walks (Y/N)

Easting	Northing	Alt
477974	6319724	
477943	6319700	
477908	6319690	
477868	6319671	
477813	6319658	

Vegetation Notes:
Veg change at dense herbaceous upland edge/ambient on high side.

Soil Assessment

Soil sample taken to a depth of 30cm, mostly sandy silts at dark brown sandy, slightly moist taken at veg change point.

Hydrology

Some evidence of waterlogging, not inundation. Dampened.

Topography

Site Elevation: 256

Landform Notes:
Berm in the landscape

Notes:
Boundary determined by veg extent.

FIELD SHEET
00.002 Wetland Mapping of Area D

Date: 5/5/09
Time: 5 pm
Wetland UFI: 2413

Easting: Northing:

Vegetation Assessment
No. Transects: - Clear boundary

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk: (Y/N)

Easting	Northing	Alt
472666	6319842	
472624	6319863	
472612	6319919	
472268	6319358	
471748	6320027	

Vegetation Notes:
Swampy vegetation of low lying area. Eucalyptus rubra.

Soil Assessment
Clear evidence of waterlogged soils

Hydrology
Evidence of ponding in centre of wetland

Topography
Site Elevation:
Landform Notes:
Clear landform type of basin, draining vegetation.

Notes:
2.354 - picture of wetland

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 1045
Time: 9/6/09
Wetland UFI: 952

Easting: 474846 Northing: 6308151

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474846	6308151	307
474821	6308145	307
474801	6308136	307
474774	6308128	307
474753	6308114	307

Vegetation Notes:
Not indicative of wetland vegetation
Corymbia calophylla found + Eucalyptus marginata.
Does not form boundary although has similar extent to landform

Soil Assessment
High organic content in soil. Very moist at surface

Hydrology
Debris patterns along edges indicate flowing water although dry at time of visit. Current under land suggests flowing water

Topography
Site Elevation: 307
Landform Notes:
Local depression, channel like form very shallow. Very sloped, within high ground.

Notes:
Photo 61 shows wetland

- Extent of wetland based on topography + damp soils.
- Wetland found in field not mapped, classification is a creek.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 4/6
Time: 9/6/09
Wetland UFI: 335 Dampland

Easting: _____ Northing: _____

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
478815	6312138	258
478796	6312136	257
478782	6312133	257
478744	6312118	255
478714	6312114	257

Vegetation Notes:

No significant wetland species. Mainly Eucalyptus remnant but predominantly cleared with stock grazing

Soil Assessment

Soils ~~none~~ show evidence of water logging through the presence of moss and appear peaty.

Hydrology

Evidence of waterlogging and construction of drains to move water

Topography

Site Elevation: _____

Landform Notes:

Low basin formation in between undulating hills Consistent with Dampland basin

Notes:

Photo 102 looking across Dampland
Photo 103 looking north across dampland, shows basin form

Boundary defined by waterlogged soils ~~and~~ with landform being the second criteria, reverse to that noted as criteria in desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 9:55am
Wetland UFI: 396 Dampland.

Easting: 474924 Northing: 6308930

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
No significant vegetation

Soil Assessment
No evidence of hydric soils.

Hydrology
No evidence of waterlogging.

Topography
Site Elevation:
Landform Notes:
~~Small low area~~ middle ground area.

Notes:
Area not a wetland

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/07
Time: 2:15pm
Wetland UFI: Artificial drain.

Easting: 475618 Northing: 6311525

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Vegetation not wetland species.

Soil Assessment
No clear hydric soils.

Hydrology
Surface water flow.

Topography
Site Elevation:
Landform Notes:
Steep sided constructed drain near Daukan Downs rip.

Notes: Artificial drain, constructed bunded weirs
Not mapped as a wetland and confirmed not a wetland

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/07
Time: 1245
Wetland UFI: 314

Easting: 474142 Northing: 6312083

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474132	6312095	277
474115	6312099	273
474090	6312095	273
474068	6312092	272
474050	6312097	272

Vegetation Notes:
No significant vegetation present

Soil Assessment
Clayey soils along banks - does not determine boundary as not much evidence of water presence outside creek path

Hydrology
Flowing water at time of visit, less than 10cm depth.

Topography
Site Elevation: 277
Landform Notes:
Clear channel formation.

Notes: Photo 64 & 65 of creek
66 boundary.
67 channel form

Boundary determined by landform.
Desktop mapping determined by landform and soils.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/09
Time: 1:00
Wetland UFI: 316

Easting: 474198 Northing: 6311628

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474198	6311628	275
474216	6311650	273
474222	6311647	273
474226	6311665	272
474237	6311626	273

Vegetation Notes:
No significant wetland veg present. Euc, sedges, grazing evident. Veg does not indicate boundary

Soil Assessment
Clayey, sandy, gravelly - soils do not form banding

Hydrology
Creek flowing when visited.

Topography
Site Elevation: 275
Landform Notes:
Clear incised channel, limited riparian area

Notes:
Photos 68, 69, show channel
70 shows soil layers

Landform delineated wetland boundary
Same as desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 11:07
Wetland UFI: 342

Easting: 474773 Northing: 6307967

Vegetation Assessment
No. Transects: Creek

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474773	6307967	
474765	6307948	
474762	6307937	
474746	6307918	
474732	6307896	

} GPS malfunction

Vegetation Notes:
No significant vegetation. Only Eucalyptus wandoo sp. Wandoo and Corymbia calophylla.

Soil Assessment
High organic content in soil.

Hydrology
Nearby Dam has water in it.
Channel form very shallow, evidence of flowing water

Topography
Site Elevation: —
Landform Notes:
boundary of wetland based on topography.

Notes:
photos – 62 - creek
63 - dam

Mapped boundary based on landform same as desktop mapping

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 10:20am
Wetland UFI: 382

Easting: 475069 Northing: 6208249

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
No significant vegetation

Soil Assessment
No evidence.

Hydrology
No evidence.

Topography
Site Elevation: 295
Landform Notes:
topography extent of depression, not as pronounced.

Notes:
Not a wetland.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 845
Wetland UFI: 369

Easting: 472765 Northing: 6309073

Vegetation Assessment
No. Transects: No significant veg

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
472768	6309674	301
472780	6309690	300
472799	6309708	300
472804	6309717	300
472810	6309735	300

Vegetation Notes:
Juncus sp (~~[illegible]~~) + Juncus ~~[illegible]~~ palludus. (found within area, Shrub growing area not much vegetation present

Soil Assessment
Waterlogged soils evident. Some areas waterlogged at time of visit. No evidence of flowing water

Hydrology
Headwater area to creek and dam.

Topography
Site Elevation: 300
Landform Notes:
Gentle slope into dam, no clear channel.

Notes:
Photos 48 looking to dam
49 boundary between upland/wetland
50/51 shows slope
52 - Juncus palludus.
53 - pooling water near dam

Boundaries based largely on landform but also on soils to a lesser degree. Same as desktop mapping

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 10:00am
Wetland UFI: 315

Easting: 474856 Northing: 6309929.

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
limited boundary due to restricted access.

Easting	Northing	Alt
474850	6309927	277
474859	6309931	276

Vegetation Notes:
No significant vegetation. Only sedge species (Juncus sp.) Scattered Eucalyptus sp. and Acacia sp.

Boundary cannot be determined based on vegetation

Soil Assessment
Boundary cannot be determined based on soils.

Hydrology
evidence of flowing water at time of visit.
approx depth = 30cm.

Topography
Site Elevation: 277
Landform Notes:
distinct channel (steeply sided).

Notes:
photos: 57 - creek, 58 - creek (showing water)
boundary determined based on landform.

Desktop considers vegetation and soils as well.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/09
Time: 10:30am.
Wetland UFI: ~~703~~ 341

Easting: 474234 Northing: 6308104

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474910	6308104	299
474933	6308118	298
474945	6308134	298
474956	6308146	299
474969	6308171	296

Vegetation Notes:
No significant vegetation. Only eucalyptus sp. and Eucalyptus robusta.)

Soil Assessment
evidence of inundation at surface and of water scour.

Soil change @ 475097mE, 6308265mN.

Hydrology
No visible water at time of visit but water flowing evident.
Other extention of river has water ponding

Topography
Site Elevation: 300
Landform Notes:
Boundary determined based on landform.
distinct channel

Notes:
photos 59- creek.
60- creek. (water ponding)

Boundary determined based on landform same as for desktop mapping

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 1045
Time: 9/6/09
Wetland UFI:

Easting: 474846 Northing: 6308151

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474846	6308151	307
474821	6308145	307
474801	6308136	307
474774	6308128	307
474753	6308114	307

Vegetation Notes:
Not indicative of wetland vegetation
Carimbia calophyllum found + Eucalyptus marginata.
Does not form boundary although has similar extent to landform

Soil Assessment
High organic content in soil. Very moist at surface

Hydrology
Debris patterns along edges indicate flowing water although dry at time of visit. Culvert under road suggests flowing water

Topography
Site Elevation: 307
Landform Notes:
Local depression, channel does form very similar. Very sloped, within high ground.

Notes:
Photo 61 shows wetland

- Extent of wetland based on topography + damp soils.
- Wetland found in field not mapped, classification is a creek.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/07
Time: 1200
Wetland UFI: 327

Easting: 475238 Northing: 6311604

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Access restricted due to electrified fences.

Easting	Northing	Alt

Boundary considered as Coalfields Rd on Southern Edge.

Vegetation Notes:
No vegetation, predominantly cleared with weeds. (Conyza sp.)

Soil Assessment
Evidence of waterlogging and wet soils. No surface water features. Hydric soils evident from surface

Hydrology
Water at surface

Topography
Site Elevation: 263
Landform Notes:
Flat area, lowlying area

Notes:
Photo 78, 79, 80, 81 - Shows area
Cannot access site due to electrified fences.
- Probably not a floodplain, likely to be palusplain. due to lack of inundation.
Boundary considered as road.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/07
Time: 230
Wetland UFI: 329 (Floodplain)

Easting: 4763 Northing:

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt	
476363	6311735	258	13
476374	6311735	259	14
476390	6311738	262	17
476407	6311736	262	15
476427	6311737	262	16

Vegetation Notes:
Cleared area, stock grazing. nil vegetation to determine boundaries

Weeds present (Oryza sp.)

Soil Assessment
Soils seem hydric, highly compacted due to grazing. High moisture content in soils, dark in colour at surface

Hydrology
Evidence of surface water scouring and inundation seasonally confirming Floodplain

Topography
Site Elevation:
Landform Notes:
Gently sloping towards creek bed

Notes:
Photos 86-91 - show floodplain area

Boundary largely based on landform and soils same as desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/09
Time: 230
Wetland UFI: 326 (Creek)
Easting: _____ Northing: _____

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt	
476415	6311829	262.	10
476 406	6311817	262	
476 393	6311819	261	
476 382	6311 817	260	
476 368	6311 821	260.	14

Vegetation Notes:
Mixed wetland vegetation within creek banks including Melaleuca chaphiophylla

Soil Assessment
Peaty soils adjacent to creek. Determine extent of seasonal flow

Hydrology
Defined channel with flowing water at visit.
Approximate depth of flow 20cm.

Topography
Site Elevation: _____
Landform Notes:
Clear channel formed.

Notes:
Photos 92, Map1
92 - creek.
93 - boundary L&V.

Soils, veg and landform determine boundaries, same criteria as desktop assessment

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 910
Wetland UFI: 370

Easting: _____ Northing: _____

Vegetation Assessment
No. Transects: No veg.

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
Railway bed forms boundary of wetland

Easting	Northing	Alt

Vegetation Notes:
Dianella revoluta, Eucalyptus radiata present. Not indicative of wetland

Soil Assessment
Hydric soils present at surface, proximity to dam shows water logging

Hydrology
No surface water features

Topography
Site Elevation: 313
Landform Notes:
Wetland divided by railway, causing some ponding and waterlogging. Land predominantly flat but slightly sloping, could be palusplain

Notes:
Photos - 54 - hydric soils
Poor access to site - no boundaries recorded by GPS
Wetland boundaries formed from landform with some indication from hydric soils, same as desktop.
Palustope based on presence of slope.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 745
Wetland UFI: 319

Easting: 472893 Northing: 6310501

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
473207	6310561	281
472912	6310582	279
472993	6310562	279
472914	6314539	280
473202	6310502	282

Vegetation Notes:
~~[illegible]~~ Juncus sp.
Not much vegetation Stock grazing area

Soil Assessment
Soils waterlogged at time of visit

Hydrology
Ponded water at time of visit, some water flowing

Topography
Site Elevation: 279-282
Landform Notes:
Low depression in landscape - possible not enough grade for water to flow in all places.

Notes:
Highly modified creek line.
Photos: 43, 44, 45
46
47 ponded water
Spoke with landowner, advised that the area is very boggy during winter.
Boundary defined by landform and ex tent of waterlogged soils (same as desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/05
Time: 930
Wetland UFI: 320

Easting: 473285 Northing: 6310862

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)	Easting	Northing	Alt
Road creates boundary on S side.			

Vegetation Notes:
Juncus sp. and Typha sp. present. No other wetland veg. Cleared

Soil Assessment
Clearly inundated during winter, waterlogged at time of visit

Hydrology
Road divides floodplain.

Topography
Site Elevation: 279
Landform Notes:
Floodplain associated with UFI 315.
Flat low area. No channel formation.

Notes: Probes 55 & 56 show wetland UFI 320
No coordinates due to poor access
Landform determines boundaries, same as desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/07
Time: 115
Wetland UFI: 323

Easting: 474504 Northing: 6312001

Vegetation Assessment
No. Transects: No Vegetation

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474504	6312001	269
[illegible]	[illegible]	[illegible]
474486	6312012	269
474472	6312014	269
474460	6312019	269

Vegetation Notes:
No significant wetland vegetation, does not define boundary. Euc present OK riparian

Soil Assessment
No significant hydric soils in riparian area

Hydrology
Creek flowing at the time of visit.

Topography
Site Elevation:
Landform Notes:
Clearly incised channel. Not much valley formation, is generally flat terrain

Notes:
Photos 71-73 show creek
74 shows boundary

Landform defines boundary

In desktop mapping landform was the primary criteria but desk considers soil and veg. Difficult to determine non wetland plants from aerial photos.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: ~2:00 pm
Wetland UFI: 324

Easting: 474472 Northing: 6311629.

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Boundary is road on southern edge.

Easting	Northing	Alt

Vegetation Notes:
No significant vegetation. Some Eucalyptus tree species surrounding remnant vegetation in road verge indicative of upland species (East)
Callistemon pinifolius, Myrtaceae sp (~~Melaleuca~~)

Soil Assessment
Auger sample collected. 0→10cm - Fine, brown sand with high organic contents. 10→30cm - moist, medium brown sand. 50cm → hard, impenetrable layer. ~~High moisture~~, taken west facing photo: 75, Wet soils at western edge.

Hydrology
No surface water present at time of visit. Clear signs of seasonal waterlogging.

Topography
Site Elevation: 291 m.
Landform Notes:
Relatively flat / Low lying.

Notes:
Palmoplain: not floodplain as there are little signs of inundation
photo 77 - shows ~~pt~~ eastern side
photos: 76 - shows area along west side
75 - soils
high moisture soil content indicated the area would be seasonally waterlogged.

Soils define boundary, drainage confirms landform as well

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/08
Time: 820
Wetland UFI: 328

Easting: 476351 Northing: 6311488

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
476351	6311488	268
476344	6311503	266
476358	6311519	266
476332	6311531	265
476324	6311545	265

Vegetation Notes:
No vegetation present, stock grazing area. Cannot determine boundary based on veg.

Soil Assessment
Waterlogged soils with depression

Hydrology
Culverts under road indicate potential for surface water. Confirms classification as a creek.

Topography
Site Elevation: 265-268
Landform Notes:
Low lying shallow channel depression within flat landscape

Notes:
Photos 82-85 show landform

Landform forms boundary, soil confirms as 2nd criteria, same as desktop.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 3.40pm.
Wetland UFI: 334 Lake

Easting: 478826 Northing: 6311727

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
478826	6311727	256
478842	6311706	256
478859	6311691	257
478870	6311686	257
478878	6311682	255

Vegetation Notes:
Fringing Eucalyptus to Lake. Vegetation does not form boundary

Soil Assessment
Clear evidence of hydric soils and inundation

Hydrology
Some surface water present.

Topography
Site Elevation: 256
Landform Notes:
Clear basin ~~topo~~ landform. Depressed in landscape

Notes:
Man made dyke within lake 99 Photo
Looking North across lake 100 Photo
Lake boundary 101 Photo

Boundary determined on topo and soils same as desktop.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 1:30
Wetland UFI: 149
Easting: 494392 Northing: 6307747

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
494361	6307791	242
494368	6307785	246
494371	6307776	246
494390	6307772	245
494389	6307769	245

Vegetation Notes:
~~6307747~~ Melaleuca / paperbark (Melaleuca rhaphiophylla)
- Melaleuca ericifolia at boundary also
juncus sp.

Soil Assessment
Soil, dark brown, strong organic content, moist at surface. Changes in response to topography

Hydrology
Clear evidence of flooding and scouring

Topography
Site Elevation: 245mA
Landform Notes:
Clear river valley, flat bottomed floodplain.

Notes:
photo 1, 2, 6 - shows river scour.

Boundary defined based on landform, also correlates to extent of melaleuca sp (W119-01)

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/07
Time: 1:00
Wetland UFI: 315

Easting: 474198 Northing: 6311628

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474198	6311629	275
474216	6311630	275
474222	6311647	273
474226	6311665	272
474227	6311686	273

Vegetation Notes:
No significant wetland veg present. Euc, sedges, grazing evident. Veg does not indicate boundary

Soil Assessment
Clayey, sandy, gravelly - soils do not form boundary

Hydrology
Creek flowing when visited.

Topography
Site Elevation: 275
Landform Notes:
Clear incised channel, limited riparian area

Notes:
Photos 68, 69, show channel
70 shows soil layers

Landform dictates wetland boundary
Same as desktop mapping.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 7/6/09
Time: 10:30 am.
Wetland UFI: 343

Easting: 474934 Northing: 6308104

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
474914	6308104	299
474933	6308118	298
474943	6308134	298
474956	6308146	299
474969	6308171	296

Vegetation Notes:
No significant vegetation. Only eucalyptus sp. and Corymbia calophylla.)

Soil Assessment
evidence of inundation at surface. Direction of water scour.

Soil change @ 475097mE, 6308265mN.

Hydrology
No visible water at time of visit but water staining evident.
Other extention of river has water ponding

Topography
Site Elevation: 300
Landform Notes:
Boundary determined based on landform. distinct channel

Notes:
photos 59 - creek.
60 - creek. (water ponding)

Boundary determined based on landform same as for desktop mapping

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 2/6/09
Time: 135
Wetland UFI: 136 Arthur River
Easting: 494398 Northing: 6307782

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change	494398	6307783	242			

Boundary Walks (Y/N)

Easting	Northing	Alt
494394	6307789	242
494392	6307796	242
494387	6307820	245
494381	6307810	244
494373	6307822	243

Vegetation Notes:
Tecticornia leptoclada sparsa along banks of river. Other species of tecticornia present - not much veg within river.

Soil Assessment
Sandy soils, waterlogged where not inundated

Hydrology
Water present at time of visit. Depth of Flow approx 10cms.
River bed approx 1m below bank

Topography
Site Elevation: 242
Landform Notes:
Clear division of river and floodplain based on landforms

Notes: @ Photo 3, bank of river
4, 5 centre of river
7 - slightly further south
Boundary defined by landform and tecticornia sp.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 225
Wetland UFI: [illegible] 48

Easting: 494820 Northing: 6306222

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	[illegible]					
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
494798	6306264	250
494790	6306268	250
494783	6306279	250
494780	6306289	250
494774	6306306	250

Vegetation Notes:
Very little remnant vegetation, cannot be identified. Boundary, Logging and human disturbance evident Mostly Eucalyptus Woodland Sclerophyll woodland

Soil Assessment
Sandy soils, moist at surface, compacted due to stock grazing Granite at surface in some areas

Hydrology
evidence of flowing water and channel bed. Only some pools present at visit

Topography
Site Elevation: 250
Landform Notes:
Clear channel form, gradual channel edges
Approx width 30 - 50m

Notes: 8 - wetland
Photo 9 - shows pooling water
10 - shows landform
11 - shows boundary looking south
12 - " boundary looking north
Landform creates boundary criteria

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 240
Wetland UFI: 171

Easting: 494638 Northing: 6307778

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
494644	6307775	239
494653	6307781	"
494669	6307793	239
494688	6307797	239
494715	6307808	240

Vegetation Notes: Chaphiepiyllo.
- Melaleuca [illegible] present
- Euc. rudis present
- predominantly cleared area, not enough to determine boundary

Soil Assessment
Peaty soils at surface, anaerobic activity evident

Hydrology
Evidence of flowing water

Topography
Site Elevation:
Landform Notes:
Channel form slight, generally flat area.

Notes:
Photos 13 & 14 showing channel and veg
15 & 16 - showing boundary
17
Landform predominantly defines channel
2nd criteria extent of soils

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 240
Wetland UFI: 172
Easting: 494638 Northing: 6307778

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
494644	6307775	239
494653	6307787	
494669	6307793	239
494688	6307797	237
494715	6307808	240

Vegetation Notes: Chaphrophyta.
- Melaleuca [redacted] present
- Euc. rudis present
- predominantly cleared area, not enough to determine boundary

Soil Assessment
Peaty soils at surface, anaerobic activity evident

Hydrology
Evidence of flowing water

Topography
Site Elevation:
Landform Notes:
Channel form slight, generally flat area.

Notes:
NB Photos 13 & 14 showing channel and veg
15 & 16 - showing boundary
17
Landform predominantly defines channel
2nd criteria extent of soils

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 300
Wetland UFI: 170

Easting: _____ Northing: _____

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start				~		
Finish				494533	6307711	240
Veg Change	494562	6307748	242	494545	6307713	242

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Evidence of inundation on melaleuca spp (broad leaf) Tea tree
Biodiversity limited but good condition melaleuca

Soil Assessment
Waterlogging Mottling
Peaty soils at surface, moist underfoot

Hydrology
Inundation evident, some very shallow channels, 10cm, present

Topography
Site Elevation: 242
Landform Notes:
Low area, grades towards river. generally flat

Notes:
Photo 18 - hydric soils
20,21 19 - shows mounding of soils

Vegetation dominates boundary Identification

Road forms boundary along side

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 330
Wetland UFI: 419 - Palmsplain

Easting: _____ Northing: _____

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Vegetation of euc. wandoo, hakea, acacia sp.
Not wetland species

Soil Assessment
No evidence of hydric soils, or waterlogging.
Sands present

Hydrology
No defining surface water features or groundwater

Topography
Site Elevation: Flat @ 0m
Landform Notes:

Notes:
22, 23, 24
25 - flowers.

Not a wetland.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 340
Wetland UFI: 167

Easting: 494303 Northing: 6305009 N

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	494321	6307981	243			
Finish						
Veg Change	494316	6307972				

Boundary Walks (Y/N)

Along river edge

Easting	Northing	Alt
494787	6309123	242
494286	6301931	242
494277	6307942	239
494270	6307950	239
494269	6307965	240

Melaleuca viminea sp. viminea

Vegetation Notes:
Boundary edge shows fringing vegetation. Melaleuca sp. interspersed by acacias, Juncus sp. present
Vegetation degraded

Soil Assessment
Sandy soils, compacted due to grazing. Likely not inundated but waterlogged

Hydrology
soils don't show evidence of inundation, but waterlogged

Topography
Site Elevation: 239
Landform Notes:
Flat towards river.

Notes:
27, 28, 29 - showing vegetation
30 - boundary between river and paluplain

Boundary based on extent of fringing veg

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time:
Wetland UFI: 166

Easting: 494436 Northing: 6308268

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	494398	6308271	234			
Finish	494427	6308258	242			
Veg Change	494409	6308261	239			

Boundary Walks (Y/N)

Easting	Northing	Alt
494424	6308276	244
494433	6308277	245
494444	6308280	247
494459	6308304	246
494460	6308314	246

Vegetation Notes: Phyllidia. Juncus [illegible] at boundary, Melaleuca [illegible] Cyperus
Some fringing tree eucalyptus

Soil Assessment
Soil sandy at depth.

Hydrology
evidence of surface water flow/pooling and inundation

Topography
Site Elevation:
Landform Notes:
Slight dip in topography where wetland veg higher predominantly flat within

Notes:
photo 33 - gentle rise
34 - evidence of inundation
31 - boundary from fringing veg to paddock
32 - wetland straight on
35 - river boundary
36 - pasture boundary
Wetland boundary based on veg and landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 4:15
Wetland UFI: 165

Easting: _____ Northing: _____

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	494498	6309090				
Finish	"					
Veg Change	494471	6309099	244			

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Melaleuca rhaphiophylla
Lepidosperma sp Round, Juncus
extent of fringing vegetation quite large.
Upland species Banksia menziesii

Soil Assessment
Evidence of waterlogging, moist soil at surface, Hydric soils ~~non-wetland~~ indicators present at or surface, high organics

Hydrology

Topography
Site Elevation: _____
Landform Notes:
Flat area at base of slope leading into river.

Notes:
Photo
Boundary Photo - 37 38 - vegetation
Soils 39
Boundary photo 40

Boundary taken at extent of fringing vegetation and moist soils extent.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 26/05
Time: 430
Wetland UFI: 49265 165

Easting: 494386 Northing: 6309206

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	494397	6307221	245			
Finish						
Veg Change	494410	6307230	244			

Boundary Walks (Y/N)

Easting	Northing	Alt
494449	6309241	251
494423	6309257	249
494421	6309274	249
494416	6309299	246
494408	6309320	245

Vegetation Notes: Morphological
Melaleuca sp. Juncus sp. Juncus sp.
49265 165

Soil Assessment
Hydric soils, water inundation around creek

Hydrology
Surface water flow evident although dry at time of visit, shallow channel

Topography
Site Elevation:
Landform Notes:
Clear channel depression leading towards river

Notes: Photo 42 - boundary
41 - creek bed

Extent mapped as landform depression and extent of wetland veg

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 21/6/09.
Time: 4:45pm
Wetland UFI: 420
Easting: 494857 Northing: 6309332

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	494857	~~6309332~~	~~248~~			
Finish						
Veg Change						

Boundary Walks (Y/N)
locked gate, couldn't proceed.

Easting	Northing	Alt
494807	6309332	246
494841	6309336	249
494863	6309342	247

Vegetation Notes:
No significant vegetation present, only Eucalyptus sp. Desktop mapped as vegetation extent, although not wetland sp.

Soil Assessment
No obvious hydric soils except in creek bed

Hydrology
Clear evidence of surface water flow

Topography
Site Elevation:
Landform Notes:
clear incised creek line, channel

Notes: - No photo, poor access

Boundary based on landform

env

FIELD SHEET
08.007 Wetland Mapping of Area D

Date: 11/6/07
Time: 3:50
Wetland UFI: 6150

Location: Easting: 475822 Northing: 6621112

Vegetation Assessment

No. Transects: Not done

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk: (Y/N)

Easting	Northing	Alt
475822	6621112	231
475844	6621134	232
475781	6621160	233
475823	6621185	231
475845	6621227	230

Vegetation Notes: not done

Soil Assessment

Soil [illegible] of wetland, soil [illegible] of Gleyed, 2g wetland.

Hydrology

Clear evidence of water logging. Confirmed by Kirsty who lived in the area for quite some time.

Topography

Site Elevation: 230

Landform Notes:

Flat area bounding channel which has water on. Just outside of area of slightly topography - good for access survey

Notes:

W6 wetland

W7 - boundary

W8 small depression wetland area

[illegible] and vegetation.

Small area north. 475603 6620973 should be mapped. Smaller than 10m x 10m resolution.

FIELD SHEET
09.002 Wetland Mapping of Area D

Date: 11/6/09
Time: 1130
Wetland UFI: 0005

Easting: 4823687 Northing: 6215345

Vegetation Assessment

No Transects

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (GPS)

Easting	Northing	Alt
4823687	6215341	203.7
4823723	6215332	204.6
4823681	6215317	205
4824002	6215305	203.7
4824041	6215251	202.7

Vegetation Notes:
Vegetation species clearly varied throughout wetland area. Area with most dense diverse vegetation found on eastern edge, (Tangata Road side) where wetland widest.
Veg Area most diverse + boundary.

Soil Assessment

Soil water appears wet, but surface, moderately dry. Area known for high groundwater. Trench collected groundwater, probably because has wet.

Hydrology

Evidence of waterlogging.

Topography

Site Elevation: 203

Landform Notes:
low lying, flat area, wide expanse but clear boundary location with lower visibility to north and south.

Notes:
Photo 152 - previous wetlands
153 -
154 - hillside + more typical veg.
Boundary defined based on landform.
Waterlogging confirms ~~the~~ dampened status

FIELD SHEET
08.0862 Wetland Mapping of Area 11

Date: 16/6/22
Time: 10 am
Wetland UFI: 543

Easting: 482611 Northing: 6216414

Vegetation Assessment

No. Transects: _____

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Changes						

Boundary Walk: (Y/N)

Easting	Northing	Alt

No access. Identified over cleared.

Vegetation Notes:
Cleared area, grazing stock

Soil Assessment

Soils sandy at surface. Drains appear well at base of valley

Hydrology

Local drains have water in base. Near surface. Springs in valley. Water created by vegetation/sewer valley

Topography

Site Elevation: 240

Landform Notes:
Undulating and flat. Very little relief

Notes:
This wetlands boundary is defined by the road on the edge and water one west. Same as desktop mapping

Photo 146

FIELD SHEET
DELDOT Wetland Mapping of Area D

Date: 11/6/23
Time: 12:22
Wetland UPI: W6

Easting: 483560 Northing: 627[illegible]

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2	
	Easting	Northing	Alt	Easting	Northing	Alt
Start					
Finish					
Veg Changes					

Boundary Walks (Y)N)

Easting	Northing	Alt
483560	627[illegible]	22.5
483574	627[illegible]	22.5
483582	627[illegible]	23.5
483600	627[illegible]	22.4
483616	627[illegible]	23.4

Vegetation Notes:
Predominant Phragmites phyllostachys in area. Greatest in most disturbed condition. Appearance that area is succeeding to Phragmites with varying planted trees and shrubs. Sparse very dense not native understory

Soil Assessment

Wet soils. Clayey at surface with high organic content. Smell of sulfides.

Hydrology

Some ponded water at present. Clear evidence of surface water flow. Upstream flow through culvert under [illegible]

Topography

Site Elevation: 23'
Landform Notes:
Clear channel formation at the edge of a tributary area. Flat in nature

Notes:
Photo 1560 north
151 - boundary

Boundary adjustment on account of soils and topography.

FIELD SHEET 1
09-0192 Wetland Mapping of Area D

Date: 11.6.09
Time: 2:00
Wetland UID: TW7

Easting: 477450 Northing: 6226163

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt
477450	6226163	228
477466	6226156	226
477461	6226167	226
477467	6226184	226
477436	6226187	227

Vegetation Notes:
Low vegetation present, mainly grasses, not included in mapping, non wetland. Primary species is grass

Soil Assessment

Higher soils on drumlins

Hydrology

Creek runs south, flows south

Topography

Site Elevation: 228

Landform Notes:
Gently inclined grassland

Notes:
104: 105 creek

Boundary based on extent of vegetation / landform

FIELD SHEET
08.062 Wetland Mapping of Area D

Date: 11/6/07
Time: 1:30
Wetland ID: 60454
Easting: 476 [illegible] Northing: 6267792

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk: (Y/N)
Restricted access to accord

Easting	Northing	Alt
476254	6267792	336
476280	6267833	336

Vegetation Notes:
Dominant species on boundary [illegible] Deciduous trees present.
Deer [illegible] boundary

Soil Assessment

Hydric soils at surface corresponding with landform

Hydrology

Constructed ditches provide the majority of the observed
No evidence of inundation

Topography

Site Elevation: 335
Landform Notes:
Low lying wetland, topography [illegible] with slight
depression

Notes:
Boundary determined by landform
Photo 136 - wetland downgradient

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/09
Time: 940
Wetland UFI: 1506 e
Easting: 471253 Northing: 6298059

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
Restricted access therefore only 2 pts.

Easting	Northing	Alt
471258	6298079	249
470863	6299789	250

Vegetation Notes:
Parr inside paddock. Along rd verge Melaleuca (WS03-1) present
found. Due to modified road drainage. Extent of veg not considered as extent of wetland

Soil Assessment
Clearly wet, hydric soils devoid of vegetation. Clearly defined wetland boundaries

Hydrology
Some inundation at time of visit

Topography
Site Elevation: 245
Landform Notes:
Very flat.

Notes:
Photo 113 shows wetland + soils

Boundary determined based on extent of soils.

Wetland within M. Wunnenberg Farm along Cadering North Rd.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/09
Time: 950
Wetland UFI: 502

Easting: 470810 Northing: 6298092

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
470796	6298060	250
470782	6298080	251
470763	6298083	251
470752	6298108	251
470730	6298139	250

Vegetation Notes:
No vegetation, stock cleared

Soil Assessment
Clayey soils, does not indicate boundary

Hydrology
Creek flowing at time of visit, approx 10cm deep

Topography
Site Elevation: 250
Landform Notes:
Clearly incised channel, 20cm depth, 2m wide in parts

Notes:
Photo 114, shows creek
Creek does not continue to other side.

Landform clearly dictates boundary, to a lesser degree the colour of mechanical

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/09
Time: 1030
Wetland UFI: 500 (Creek + Floodplain)

Easting: _____ Northing: _____

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Floodplain

Easting	Northing	Alt
470092	6297234	243
470065	6297259	252
470023	6297253	251
469978	6297276	249
469922	6297297	250

Vegetation Notes:

Isolated Eucalypts over cleared area with weeds. No significant vegetation.

Soil Assessment

Hydrology

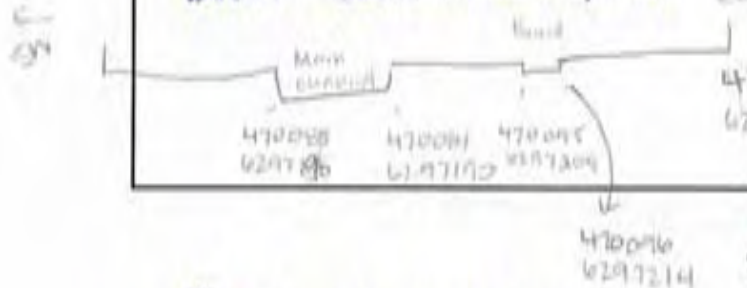
Topography

Site Elevation: 249

Landform Notes:

Notes:

Wetland divided into channel/creek and floodplain shown below. Coordinates depicted



Photos: 115 Floodplain
116 Creekline
117 Boundary

	(E)	(N)	(A)
Boundary Walk ①	469866	6297283	253
Creek ②	469919	6297219	253
③	469998	6297188	253 – [illegible]
④	470062	6297193	245

env

FIELD SHEET

08 0602 Wetland Mapping of Area D

Date: 10/6/09
Time: 1130
Wetland UFI: 504

Easting: 477414 Northing: 6214565

Vegetation Assessment

No. Transects: ____

	Easting	Northing	Alt	Easting	Northing	Alt
		Transect 1			Transect 2	
Start						
Finish						
Veg Change						

Boundary Walked (Y/N)

Easting	Northing	Alt
477414	6214565	228
475365	6215542	232
475328	6215527	232
475285	6215511	264
475231	6215500	259

Vegetation Notes:

No significant vegetation. Some dead Eucalypts with creek line. Riparian area degraded and cropped for agriculture

Soil Assessment

Wet sandy soils. Creek extent defined by wet soils.

Hydrology

Very shallow flow across creek at time of visit.

Topography

Site Elevation:

Landform Notes:

Very gentle flat bottomed valley, approx 50m across. No separate floodplain as entire bottom shows signs of inundation

Notes:

Photo 118 boundary
Photo 119 - Creek.

Wet soils define creek boundary

Creek running towards Capercup Rd. on Morley property

FIELD SHEET
08-083 Wetland Mapping of Area 11

Date: 10/6/09
Time: 1206
Wetland UFI: 588

Easting: 474462 Northing: 6294626

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Lowest						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt
474462	6294027	240
474368	6294041	235
474373	6294062	231
474373	6294084	231
474352	6294112	231

- GPS altitudes varying considerably - not noted in field.

Vegetation Notes:
No significant wetland vegetation. Some eucalypts.

Soil Assessment

Clear evidence of hydric soils, shows extent of inundation

Hydrology

water ponded at time of visit

Topography

Site Elevation: 240

Landform Notes:
Clear basin landform adjacent to flat area (cleared) for cleared and a hardstand, but area very small next to floodplain and built up dam likely.

Notes: Culvert water to dry still (flow)

Boundary based on soils and extent of inundation.

120 [illegible] / [illegible] viewing

Photos 121 of ponded water

122 boundary

FIELD SHEET

09-0057 Wetland Mapping of Area D

Date: 10/6/09
Time: 11.5
Wetland UII: 455

Easting: 477954 Northing: 6301562

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Marks (Y/N)						

Easting	Northing	Alt
477712	6301549	257
477820	6301554	256
477954	6301561	253
478043	6301563	252
478167	6301581	250

Vegetation Notes:

No significant vegetation - some remnant Euc. Wandoo.
Boundary not determined by veg.
Shrub grazing

Soil Assessment

Waterlogged and hydric soils at surface detailed extent of boundary.

Hydrology

Very moist soils at surface at time of visit. No evidence of significant surface water inundation.

Topography

Site Elevation:

Landform Notes:

Flat area, slightly sloping towards road. Curved to a palusslope but slope not agg

Notes:

Picture 123 shows sloping towards road
124 - remnant

Palusplain assessment

Boundary determined on hydric soils but second criteria of landscape

FIELD SHEET
00.082 Wetland Mapping of Area D

Date: 10/6/07
Time: 135
Wetland UFI: 519

Easting: 479480 Northing: 6300233

Vegetation Assessment

No Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
479480	6300233	247
479437	6300204	244
479397	6300176	245
479381	6300148	245
479363	6300125	245

Vegetation Notes:

No significant wetland vegetation, Leucadendron, Acacia and Eucalypts.

Boundary not determinable by vegetation.

Soil Assessment

Soil very moist at surface. Consists of dark brown sand.
Soil moisture identified boundaries

Hydrology

Evidence of surface water present, consistent with recent rainfall conditions.

Topography

Site Elevation: 247

Landform Notes:

Very flat area with no topography visible nearby

Notes:

Photos 125 - wetland
126 - boundary

Boundary defined by transition to dry flat, soil moisture

white, soil moisture

FIELD SHEET

09-0857 Wetland Mapping of Area D

Date: 06/10/21

Time: 12:34:52

Wetland UFI: 381

Easting: 472174 Northing: 6200966

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	[redacted]	[redacted]	[redacted]			
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
472174	6200966	245
472212	6200963	244
472234	6200960	244
472237	6200955	244
472235	6200950	244

Vegetation Notes

Some of Eucalyptus

Soil Assessment

Clayey soils with some [illegible] organic matter

Hydrology

Water flowing south. Creek depth

Topography

Site Elevation: 245

Landform Notes:

Gently inclined creek.

Notes:

Photo 1

1267 Creek

FIELD SHEET
09.082 Wetland Mapping of Area D

Date: 10/07/09
Time: 2:40
Wetland UFI: Floodplain #WL 452
Easting: 429 867 Northing: 6 [illegible]

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
429 862	6200451	244
429 372	6200472	244
429 3[illegible]	62005[illegible]	245
429 3[illegible]	6200 5[illegible]	2[illegible]

Vegetation Notes:
No clear wetland vegetation. Some [illegible] [illegible] [illegible] [illegible] [illegible]

Soil Assessment
Clear evidence of waterlogged soils. [illegible] [illegible] [illegible] [illegible] soils

Hydrology
Evidence of waterlogging

Topography
Site Elevation: 243
Landform Notes:
Flat area adjacent [illegible]

Notes: Phase 12B area
129 boundary

Boundary determined based on landform.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/09
Time: 1234
Wetland ID #: 340

Easting: 479126 Northing: 5[illegible]

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Changes						

Boundary Walked (Y/N): Y

Easting	Northing	Alt
479252	5[illegible]	[illegible]
479265	5[illegible]	[illegible]
479283	5[illegible]	[illegible]
479299	5[illegible]	[illegible]
479314	5[illegible]	[illegible]

Vegetation Notes:
No transitional vegetation, well defined
boundary.

Soil Assessment

Soil clayey near Creek.

Hydrology

Creek flowing with fairly strong current.

Topography

Data Discrepancy:
Landform Notes:
Generally inclined uniformly.

Notes:
Photos 130, 131

Boundary determined by hydrology.

FIELD SHEET 1
08 082 Wetland Mapping of Area D

Date: 10/11/07
Time: 1:30
Wetland UPI: 4951

Easting: 477187 Northing: 6550478

Vegetation Assessment

No. Transects: no vegetation

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N): Y

	Easting	Northing	Alt
Could not access due to wet conditions.			

Vegetation Notes:
No significant vegetation. Does not define boundary

Soil Assessment

Soils were quite wet at base of visit. Lots of water seeping.
Flood plain classification confirmed

Hydrology

Evidence of surface water noted. Some channelled due to veg.

Topography

Site Elevation: —

Landform Notes:
Low lying area flat. Boundary considered where ground rises gently

Notes:
Photos 132 and 133 show extent of floodplain

Boundary considered as crest.

FIELD SHEET
08.062 Wetland Mapping at Area D

Date:
Time:
Wetland ID#: 518

Easting: Northing:

Vegetation Assessment

No. Transects:

	Easting	Northing	Alt	Easting	Northing	Alt
		Transect 1		Transect 2		
Start						
Finish						
Veg Change						

Boundary Walks(Y/N)

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:
Landform Notes:

Notes:

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/9/09
Time: 905
Wetland UFI: 505

Easting: 472495 Northing: 6259633

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
No access to due to constructed drain

Easting	Northing	Alt

Vegetation Notes:
Acacia, Eucalypts, poor health, stock grazing

Soil Assessment
Clear evidence of waterlogging and hydric soils from distance. Water pooling at time of visit suggests inundation during winter

Hydrology
Altered hydro regime due to modification

Topography
Site Elevation: 245
Landform Notes:
Very flat.

Notes:
Clearly a wetland due to soils, and landform. Boundaries not defined due to poor access

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/09
Time: 330
Wetland UFI: WM 591
Easting: 473243 Northing: 6295333

Vegetation Assessment
No. Transects: No vegetation

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
473243	6295333	227
473254	6295301	237
473247	6295318	233
473270	6295284	237
473273	6295265	238

Vegetation Notes:
Some remnant Eucalypts. Not much wetland related vegetation.
Area has stock grazing

Soil Assessment
Clayey sands within creek

Hydrology
Creek flowing at the time of visit, shallow flow less than 10 cm.

Topography
Site Elevation: 233-237
Landform Notes:
Clearly incised channel approx 50cm deep
No more than 10m across.
Drain constructed further upstream approx. 2m deep

Notes: Photos - 104 & 105 show creek at boundary &
106 & 107 show creek upstream undergone significant modification

Delineating of wetland based on landform.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 10/6/07
Time: 1300
Wetland UFI: "504" 1
Easting: 473243 Northing: 6295333

Vegetation Assessment
No. Transects: No vegetation

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
473243	6295333	227
473254	6295301	237
473247	6295318	233
473270	6295284	237
473273	6295265	238

Vegetation Notes:
Some remnant Eucalypts. Not much wetland related vegetation.
Area has stock grazing

Soil Assessment
Clayey sands within creek

Hydrology
Creek flowing at the time of visit, shallow flow less than 10 cm

Topography
Site Elevation: 233-237
Landform Notes:
Clearly incised channel approx 50cm deep
No more than 10m across.
Drain constructed further upstream approx. 2m deep

Notes: Photos - 104 & 105 show creek at boundary #1
106 & 107 show creek upstream undergone significant modification

Delineation of wetland based on landforms.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date 10/6/04
Time 3:25
Wetland ID 381

Easting _____ Northing _____

Vegetation Assessment

No. Transects

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt

Vegetation Notes:
No. sensitive wetland vegetation, all altered
by mowing.

Soil Assessment

Sandy clay loam soil.

Hydrology

Creek flowing at time of visit. Upgradient from
Depth to water table _____ Depth to saturation _____
wetland.

Topography

Site Elevation
Landform Notes:
Clearly incised creek.

Notes:
Points 130, 131

Boundary determined by hydrology.

FIELD SHEET
00.002 Wetland Mapping of Area D

Date: 11/6/01
Time: 1100
Wetland UPI: 0750 006

Easting: 483560 Northing: 6274328

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt
483560	6274328	2.2.2
483574	6274282	2.2.3
483588	6274236	2.2.3
483602	6274190	2.2.4
483616	6274144	2.2.4

Vegetation Notes:
Hardwood swamp dominated by red maple. Groundlayer predominated by skunk cabbage, with scattered sensitive fern, woolly sedge, and fowl manna grass. Sparse very shallow root base throughout.

Soil Assessment

Dark soils, changing at surface with high organic content. Smell of organics

Hydrology

Some ponded water at present. Clear evidence of surface water flow. Upstream/downstream hydrology altered due to dams.

Topography

Site Elevation: 2.2.2

Landform Notes:
Clear transition formation at the edge of a hardwood swamp and a road.

Notes:
Photo 1560 - 2222 eastward
151 - boundary

Boundary digitized on screen - soils and topography.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 4/6/09
Time: 2:15
Wetland UID: 624
Easting: 340 841 Northing: 6475815

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Changes						
Boundary Walks (Y/N)						

Easting	Northing	Alt
340841	6475875	234
340848	6475849	232
340823	6475783	231
340806	6475766	229
340828	6475733	225

Vegetation Notes: Eucalyptus

Vegetation consists of introduced species. Predominant

Percentage based on average of Wetland area.

Soil Assessment

Notes on samples of undisturbed Sharp Color Investigation
done Soil Moisture

Hydrology

Some pools of water evident at time of visit.

Topography

Site Elevation: 234

Landform Notes:

Flat, floodplain

Notes:

Boundary determined by extent of undisturbed
Vegetation.

Photo 184 boundary
185 Wetland

South of Kokeal Rd

FIELD SHEET
09.002 Wetland Mapping of Area D

Date: [illegible]
Time: [illegible]
Wetland UFI: 629

Easting: 402 802 Northing: [illegible]

Vegetation Assessment
No. Transects: [illegible]

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Finish						
Veg Change	[illegible]	[illegible]	[illegible]	402 [illegible]	[illegible]	[illegible]

Boundary Walks (Y/N)

Easting	Northing	Alt
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Vegetation Notes:
Wetland species including Lepidosperma sp.
[illegible], [illegible]
Wetland defined as extent of fringing vegetation
Saline affected area

Soil Assessment
Soil very moist and ponding in places. Likely inundation seasonally

Hydrology
Highly altered hydrology with construction of road and railway line

Topography
Site Elevation: 231
Landform Notes:
Depression in landscape inundated seasonally.
Sumpland

Notes:
Boundary defined upon edge of wetland dependent vegetation

Photo - 172 - shows east side
173 boundary

North of [illegible] Rd. [illegible]

env

FIELDSHEET

DFO/CCA Wetland Mapping of Area D

Date: 12/2/04

Time: 2:35pm.

Wetland UFI: 565

Easting: 493240 Northing: 6296104

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walked (Y/N) Y

Easting	Northing	Alt
493240	6296104	235
493248	6296143	233
493308	6296178	231
493326	6296177	233
493346	6296232	236

Vegetation Notes:

Metalcut marker stop marker along wetland boundary
Eastern portion cut/recovered 3/5.
some dead/dying tree may be claimed by boundary vegetation
Boundary not based on vegetation.

Soil Assessment

Clear evidence of mineralization in soils
Mix pale of grading brilliant crew from pond

Boundary not based on soils

Hydrology

ponding water present at time of visit - approx 30-40 cm deep
visible flowing entrance (but very slow moving) : not at time of visit. Height Boundary based on extent of mineralization.

Topography

Site Elevation: 233

Landform Notes:

shallow creek bed coming into flat area.
disturbed channel
culvert through railway embankment affecting water 'back up'

Notes:

photos: 126 - creek.
127
Boundary based on extent of mineralization, not veg

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/07
Time: 2:45 pm
Wetland ID: 628 (edge of forested wetland pond)
Easting: 477128 Northing: 6226210

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)	Easting	Northing	Alt
Not necessary to dig, boundary not disputed.			

Vegetation Notes: Facultative wetland species. Submerged

Soil Assessment

Very moist soils - evidence of saturation at surface

Hydrology

Evidence of standing water and saturated/flooded soils

Topography

Site Elevation: 1320m
Landform Notes:
Flat depression

Notes:
Photos 1809 - downward view of wetland vegetation
1810 photo - looking south from northern edge of wetland

FIELD SHEET
Ontario Wetland Mapping at Area D

Date: 12/10/11
Time: 3:10pm
Wetland UFI: 566

Easting: 495377 Northing: 6276500

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk: (Y/N)

Easting	Northing	Alt
495213	6276275	273
495216	6276305	273
495307	6276345	273
495351	6276418	274
495327	6276504	276

Vegetation Notes:

No significant vegetation

Vegetation does not define boundary.

Soil Assessment

Undifferentiated soils and inundated land.

Boundary based on soils

Hydrology

Evidence of ~~inundated~~ surface water, water stains, and mudflats.

Bounded by treed area, edge of inundation.

Topography

Site Elevation: 273

Landform Notes:

distinct incised creeping formation.
Channel 30-40m wide
Boundary based on landform

Notes:

photo 170

Boundary based on extent of inundation, stains, landform.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 15/6/16
Time: 3:50 pm
Wetland ID: L191

Easting: 495600 Northing: 6276770

Vegetation Assessment

No. Transects:

	Treatment 1			Treatment 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (GPS):

Easting	Northing	Alt
495604	6276128	238
495610	6276451	238
495617	6276479	234
495623	6276478	237
495633	6276516	236

Vegetation Notes:

Presence of Typical wetland and Melaleuca species.
Weed dominate boundary of wetland — Presence of weed species present indicate [illegible]
Cover of Dying Eucalyptus species [illegible]
Boundary set based on vegetation

Soil Assessment

Colour change
Boundary at boundary. Presence of black organic [illegible]
Boundary... based on soil moisture [illegible]

Hydrology

... evidence of surface water flow. Likely to be [illegible] standing water on north side of wetland. Boundary based on extent of inundated soils.

Topography

Site Elevation: 238

Landform Notes:

Distinct depression [illegible] Boundary based on topography

Notes:

Photo 194 - north, photo 192 - Channel.
Boundary based on extent of inundated soils and topography.
Boundary assessment included some erosion hydrology to [illegible] and ground [illegible]

env

FIELD SHEET 1
08 062 Wetland Mapping of Area 1

Date: 12/6/07
Time: 4pm
Wetland UFI: -5m.

Easting: 496298 Northing: 6076168

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
Boundary not noted due to restricted access.		

Vegetation Notes:

No vegetation assessment

Boundary not based on vegetation.

Soil Assessment

Soil was assessed using

Boundary not based on soil

Hydrology

Evidence of wetland hydrology at time of visit Saturation within 30cms of surface/flowing water

Boundary not based on hydrology

Topography

Site Elevation: 234m

Landform Notes:

natural channel

Boundary based on landform

Notes:

photo 198 channel

Boundary based on landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date 17/6/09
Time 3:45pm
Wetland ID# 510

Easting: 495374 Northing: 6476502

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt

Vegetation Notes:

Ecological assessment, Mature Species.

Soil Assessment

Hydrology

Topography

Site Elevation: 230

Landform Notes:

Notes:

Not on plantation / woodland.

FIELD SHEET
08.007 Wetland Mapping of Area D

Date: 11/6/07
Time:
Wetland UID: 0603

Easting: 425125 Northing: 6479417

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (GPS)

Easting	Northing	Alt
425725	6479479	0283
425616	6479357	0286
425345	6479144	227
425327	6479251	228
425214	6479157	225

Vegetation Notes:
Cleared area, wide grassy No significant natural vegetation. Some recent Bus Wrecks

Soil Assessment

Generally waterlogged in winter due to high groundwater table with dead grass showing typical of waterlogging.

Hydrology

Based on high levels groundwater appears to be a more below ground level.

Topography

Site Elevation: 224

Landform Notes:
Very flat area.

Notes:

Boundary based on landform

Photos 152, 153

FIELD SHEET
09.007 Wetland Mapping of Area D

Date: 11/10/09
Time: 900
Wetland UID: WD3

Easting: 428822 Northing: 6245313

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Changes						

Linindary Walk: (Y/N)
Start of wetland boundary to west

Easting	Northing	Alt
428822	6245313	228

Vegetation Notes:
Area completely cleared no vegetation.

Soil Assessment

Soil to show signs of water logging, high organics.

Hydrology

Topography

Site Elevation: 228
Landform Notes:
Low lying area that slopes subgradual to river

Notes:
Landowner confirmed that here peatland is completely water logged in winter and dries out in summer. The river was canalised two years.
Boundary digitised on paper aerial based on landform.
Dark up (winter) mapping consideration soils unlikely to be dry.
Based visit twice a day.

FIELD SHEET
00.087 Wetland Mapping of Area D

Date: 11/6/05
Time: 20..
Wetland UFI: 663 - swampland

Easting: Northing:

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
476630	6287451	224
476600	6287640	222
476613	6287802	220
476831	6287053	220
476706	6287444	221

Vegetation Notes:
Wheat + found within swampland and at boundary but does not define boundary. ... found. Swampland ... lecheriana also found.

Soil Assessment
Soils appear sandy except of soil considered extent of boundary for swampland

Hydrology
Dry at time of visit, water levels indicated on fence post at approx 30cm.

Topography
Site Elevation: 222
Landform Notes:
Clear basin formation

Notes:
Photo 161 - wetland
162 - boundary
163 - fern core.

Boundary defined by soils and landform.

FIELD SHEET
09.082 Wetland Mapping of Area D

Date: 11/6/09
Time: 345
Wetland ID #: 261

Easting: 412454 Northing: 6791702

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation: 275

Transform Notes:

Notes:

photo 169, not a wetland.
Dams constructed from excavated creek.

FIELD SHEET
00.062 Wetland Mapping of Area D

Date: 11/6/07
Time: 1200
Wetland ID: W14
Easting: 486314 Northing: 6275116

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt
486314	6275116	224
486318	6275223	223
486322	6275236	222
486325	6275252	222
486327	6275277	224

Vegetation Notes:
No significant wetland vegetation. Does not determine boundary

Soil Assessment

Clayey wet soils within creek. Not used in map boundary

Hydrology

Waterlogged at bottom of creek. Some clear indication of water presence, such as water marks on bridge. Use of water to define wetland.

Topography

Site Elevation: 224
Landform Notes:
Clearly incised channel.

Notes:
Photo:
157 - shows creek

Boundary based on landform. Desktop mapping considers local ecological unit, hence change boundary is more here and immediately adjacent to creek and may conceal landform.

env

08 0612 Wetland Mapping of Area D

Date: 11/6/08
Time: 1150
Wetland UFI: 613 'Elvina Swamp'
Easting: 486361 Northing: 6279366

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	486360	6279180	224			
Finish	486277	6279350	224			
Veg Change	486300	6279362	223			

Boundary Walked (Y/N)

Easting	Northing	Alt
486311	6279360	223
486361	6279362	223
486426	6279365	224
486494	6279377	224
486504	6279396	223

Vegetation Notes:
Melaleuca Raphiophylloides. Rivers boundary

Soil Assessment

Wet soils apparent, inundated. Does not form boundary

Hydrology

Water pooling in areas, looks to have significant depth.

Topography

Site Elevation: 221

Landform Notes:
Creek bounds to landscape. Rivers boundary.

Notes: Swans enjoying the open water

Photo 135 - Shows Elvina Swamp

135b Boundary

Boundary defined by vast vegetation and landform. Landform only assessed to closest likely date to the pronounced marsh shape. Melaleucas indicative of view to lake levels.

FIELD SHEET
09.082 Wetland Mapping of Area D

Date: 11/6/07
Time: 1240
Wetland ID #: 645

Easting: 122661 Northing: 6476053

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
High						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt
122504	6476454	228
122532	6476491	228
122521	6476492	226
122527	6476460	228
122508	6476459	226

Vegetation Notes:
Some remnant Eucalypts and Myrtaceae
Wetland
boundary not based on vegetation as it is patchy.

Soil Assessment

Evidence of water logged soil and high groundwater table

Hydrology

No evidence of surface water/inundation likely
wet in creek, could be characterised as
intermittent/ephemeral due to
catchment size.

Topography
Site Elevation: 228
Landform Notes:
Shallow depression in landscape.

Notes: plastic tag
NE boundary

Wetland boundary based on extent of waterlogging
evidence and extent of depression in landscape.

Classification changed to ephemeral due to
lower slope and location higher.

09.062 Wetland Mapping of Area D

Date: 11/6/09
Time: 1015
Wetland ID#: 601

Easting: 484464 Northing: 5026765

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walked (Y/N): Y

	Easting	Northing	Alt
Boundary WP			
Ed			

Vegetation Notes:
No significant veg. Eucalyptus (introduced) blocks access. Isolated tree cover very low poor wetland. Low vigour. Native vegetation.

Soil Assessment

Significant waterlogging likely on time of visit
Visual evidence of waterlogging

Hydrology

Area adjacent to significant river and creek likely impacted during extreme rainfall but hydrology secondary, no signs of surface water observed.

Topography

Site Elevation: 0.24
Landform Notes:
Flat, low lying.

Notes:

Boundary taken as found as it divides private property / landowners

Photo
147 - wetland

FIELD SHEET
06.002 Wetland Mapping of Area D

Date: 11/6/21
Time: 1240
Wetland UID: 557

Easting: 1783260 Northing: 6216425

Vegetation Assessment

No. Transects:

	Easting	Northing	Alt	Easting	Northing	Alt
		Transect 1		Transect 2		
Start						
Finish						
Veg Change						

Boundary Walk: (Y/N)

Easting	Northing	Alt
1783260	6216425	225
1783254	6216422	225
1783244	6216421	225
1783236	6216417	225
1783235	6216410	225

Vegetation Notes:
Alnus rubra, Rhizophyllum borneti on boundary.
Area recently to pasture. Vegetation in good condition in accordance with Bear Mound Nature

Soil Assessment

Evidence of inundation and hydric soils at surface some mineralization at final pit.

Hydrology

Seeps, pooling water

Topography

Site Elevation: 225
Landform Notes:
Creek flat. Creek adjacent to river

Notes:
Boundary determined based on vegetation, soil and landform.

Vegetation not considered as part of boundary, likely conversion of type.

Photos: 142 boundary

147 - creek not seen in dense veg due to thick vegetation cover and shallow water.

HEADSELL
00.062 Wetland Mapping of Area D

Date: 11/6/02
Party: [illegible]
Wetland ID: 602

Easting: 487112 Northing: 6211625

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt
487631	6211636	226
487 387	6211618	226
487 586	6211615	226
487 [illegible]	6211 [illegible]	225
487 [illegible]	6211 [illegible]	225

Vegetation Notes:

No [illegible] vegetation. Mostly pine plantation.
Understorey of Eucalyptus tree species.
Access via Macedonian Spring Rd Forest Track
Boundary walk based on vegetation. Uneven spacing due to creek

Soil Assessment

Soils clearly investigated along boundary using auger / spade.
Soils are quite peaty in texture at most sites at time of visit. Waterlogged Approximately [illegible] of surface.
Soil pit [illegible] deep waterlogged below [illegible].

Hydrology

No water pooling on the soil surface.

Topography

Site Elevation: 225m
Landform Notes:

Boundary based on topographic change. Flat area using Wetland.

Notes:

Boundary based on topographic change as noted on the edge of the swamp. Dry edge to the south.

Photos 102 - panoramic
103 - boundary

Minor creek line mapping. Likely seasonal wet soils
water [illegible] at time of visit.

FIELD SHEET 1
Oil (Oil) Wetland Mapping of Area D

Date: 11/6/[illegible]
Time: 0940
Wetland UFI: 1000

Easting: 482010 Northing: 6276378

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt
482240	6276543	227
482222	6276540	226
482188	6276536	226
482152	6276503	227
482121	6276501	226

Vegetation Notes:
Some recruitment [illegible] (Typha) evident
Elevated ground Alnus sp. New species with row of
Sampled here dense vegetation may be affected by deer vegetation.
... Thick grassy edge and central
open depression area

Soil Assessment

Soils recently inundated as indicated by presence of vegetation
(grasses and Carex sp.)
Very moist at base with

Hydrology

No standing water at time of visit.
Wet organic soils were evident.

Topography

Site Elevation: 231
Landform Notes:
Clear basin formation in landscape, tending out to
entrance.

Notes:
Classification for this wetland should be split based on landforms into a swamp and channel. The first encounter of the boundary walk marker where split should be.
Desktop mapping based on soils which would define the swamp boundary but not the channel/creek

Photos - 138 - 140 shows wetland

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 4/6/09
Time: 2000
Wetland UID: [illegible] 443
Easting: 482665 Northing: 6279511

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Waypt (Y/N)						

Easting	Northing	Alt
482665	6279511	22.6
482668	6279491	22.5
482683	6279514	22.8
482651	6279512	22.7
482665	6279512	22.6

Vegetation Notes:
Cleared area, Melaleuca cajuputi ssp. cajuputi, Eucalypt sp. and Acacia sp. Remnant. Boundary not clearly defined on vegetation as it is sparse

Soil Assessment
Sandy soils within creek bed. Clear signs of inundation at low tide, devoid of vegetation

Hydrology
Creek flowing at time of visit, one main channel but inundation likely further during higher tide levels, not clear

Topography
Site Elevation: 2.2L
Landform Notes:
Clearly incised creek

Notes:
Photos 136 = Creek
137 - Boundary

Boundary based on landform and extent of inundated soils, similar to clearing but soil likely exposed to low tide not visible on aerial photography.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 9/6/09
Time: 11:00am.
Wetland UFI: Unknown (300m West of Barkan Kojenup road, on Boyanup - Brooke Road)

Easting: 483347 Northing: 6282697

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Restricted Access - Boundary digitised by Boyup-Brook rd to the south.

Vegetation Notes:
Heavily grazed and no significant vegetation present. Dying Eucalypts present.

Boundary not digitised by vegetation.

Soil Assessment
Evidence of soil being waterlogged.

Hydrology
Evidence of water ~~[illegible]~~ scouring: likely to be water logged. No evidence of water ponding at time of visit.

Topography
Site Elevation:
Landform Notes:
Generally flat in the immediate surrounding area - topography rises in distance.
~~Boundary based on topography.~~

Notes:
Boundary seems to be digitised by soils and landform but unable to tell due to restricted access point.

Photo: 13 - Wetland
14 - Boundary

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/6/05
Time: 1030
Wetland UFI: 772 "The Washback"
Easting: 480641 Northing: 6285814

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
480441	6285814	232
480424	6285773	231
480407	6285731	228
480414	6285678	227
480414	6285638	226

Vegetation Notes:
Sparse vegetation, highly planted to manage salinity
Tecticornia lepidosperma present. Dead eucalypts regenerating

Boundary not defined by vegetation

Soil Assessment
Soils moist and mottled orange and brown at depth.

Hydrology
Significant modification to sumpland with constructed drains circling its perimeter.

Topography
Site Elevation: 234
Landform Notes:
Clear basin formation. Slopes gradually towards Lake Towerrinning.

Notes:
Photo 209 - sumpland
210 - boundary

Boundary determined by landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/6/09
Time: 10:00
Wetland UFI: 779

Easting: 480939 Northing: 6287194

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
Restricted access -

Easting	Northing	Alt

Vegetation Notes:
No significant vegetation, weeds

Soil Assessment
Soils moist at time of visit

Hydrology
Ponded water under the road. 2 x 900mm ø culverts under road suggest significant flow.
Flows towards near by Avon River.

Topography
Site Elevation: 224
Landform Notes:
Very shallow creek, may have diffuse overland flow during winter months

Notes:
207 - culverts
208 - Channel

Boundary determined based on landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/6/09
Time: 950
Wetland UFI: 686

Easting: 480263 Northing: 6229026

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
No access to site.

Easting	Northing	Alt

Vegetation Notes:
Lepidosperma sp. in road verge. "Saltbush" planted species, trial plots.

Limited vegetation, boundary not determined on vegetation.

Soil Assessment
Evidence of watertable rise and surface water inundation.

Hydrology
Near Armus River

Topography
Site Elevation: 219
Landform Notes:
Flat

Notes:
Photo 204 - of sign detailing control measures
205 - wetland
206 - scoured area

Boundary determined by extent of inundated soils.

FIELD SHEET
09-087 Wetland Mapping of Area D

Date:
Time:
Wetland ID#:

Easting: Northing:

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N):

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

09.002 Wetland Mapping of Area D

Date:
Team:
Wetland ID#:

Easting: Northing:

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
End						
Veg Change						

Boundary Walk: (Y/N)

	Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

FIELD SHEET
09.002 Wetland Mapping of Area D

Date:
Time:
Wetland ID:
Easting:
Northing:

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Walks (Y/N)						

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

FIELD SHEET
60082 Wetland Mapping at Area D

Date:
Time:
Wetland UFI:

Easting: Northing:

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

FIELD SHEET
09.062 Wetland Mapping of Area D

Date:
Time:
Wetland UID:

Easting: Northing:

Vegetation Assessment

No Transects:

	Easting	Northing
Start		
Finish		
Veg Change		

Boundary Walks (Y/N)

Transect 1

Northing	Alt

Easting	Northing	Alt

Transect 2

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 19/6/09
Time: 7:40am
Wetland UFI: Unknown (water body south-east of L. Toweringi 5)

Easting: 480348 Northing: 6283369

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
480348	6283369	221
480329	6283366	219
480295	6283341	215
480264	6283358	215
480249	6283351	215

Vegetation Notes:
Melaleuca rhaphiophylla and Tecticornia lepidosperma indicators
Area is saline + Obv. but Slight in vegetation
Dead / dying tree where soils are inundated
Melaleuca cuticularis and Lepidosperma s.l.
Boundary based on vegetation

Soil Assessment
evidence of inundated peaty soils. Peaty > mod's and high organics.

boundary based on soils

Hydrology
Evidence of inundated soils and ponding water. Not flowing.

Boundary not defined by hydrology

Topography
Site Elevation: 221
Landform Notes:
clear depression in landscape

boundary based on landform

Notes:
photo 195 - wetland, 196 - [illegible]; 197 - boundary.

boundary based on vegetation, soils, and landform.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/09
Time: 850
Wetland UFI: 662

Easting: 476643 Northing: 6290850

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change	476643	6290850	237			

Boundary Walks (Y/N)

Easting	Northing	Alt
476478	6290895	232
476507	6290930	256
476515	629 0962	233
476462	6291005	239
476430	6291060	235

Vegetation Notes:
Melaleuca preissiana, Ficinia nodosa, Lepidosperma sp
Found onsite, consisting with drainage in landform.

Vegetation taken as boundary

Soil Assessment
Soil was moist at time of visit. likely seasonally waterlogged

Hydrology

Hydrology affected by railway causing groundwater to "back up" and create a wetter area behind embankment. This is included in the mapping

Topography
Site Elevation: 231
Landform Notes:
Clear flat area. ~~waterm~~ consistent with palusplain.

Notes: Photos.
170 - Lepidosperma sp
171

Boundary determined by vegetation.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/09
Time: 1010
Wetland UFI: 667
Easting: 476383 Northing: 6287992

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
476383	6287 992	323
476317	6287 993	324
476268	6287 983	324
476193	6287 931	321

Vegetation Notes:
Cleared area, stock grazing. One tree Melaleuca ericifolia. Eucalypts in poor health.

Boundary not determined by vegetation

Soil Assessment
Clear evidence of waterlogging in soils.

Forms boundary.

Hydrology
Some evidence of surface water in low depression. Groundwater approximately 1m from

Topography
Site Elevation: 321
Landform Notes:
Clearly depressed landform within landscape

Notes: Photo 172 - shows dampland
173 →
Boundary determined by soils and landform.
Desktop examined soils likely to change district on photography

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/09
Time: 1210
Wetland UFI: 766

Easting: 476761 Northing: 6286838

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
476761	6286838	223
476818	6286845	226
476887	6286818	224
476977	6286870	222
477040	6286870	222

Vegetation Notes:
Vegetation sparse. Road verge has lepidosperma sp. Unbeknownst to us it went to grow across a larger extent.

Soil Assessment
Soils moist, show evidence of inundation

Hydrology
Small channel within base of sumpland. Very small less than 0.5m deep.

Topography
Site Elevation: 223
Landform Notes:
Clear rise in topography showing basin.

Notes: Boundary based on soils and landform.

Photo
174 - Boundary
175 - Sumpland
176 - Channel within sumpland

FIELD SHEET
08.062 Wetland Mapping of Area 11

Date: 17/6/08
Time: 1632
Wetland UFI: 6666
Easting: 475 975 Northing: 6287463

Vegetation Assessment
No. Transects: NO Veg

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
475 975	6287463	232

Vegetation Notes:
Layers Separated Mainly on Canopy Presence
Separations also based on Floral and Abundance Location
Vegetation Boundaries Were Mainly Within Edge

Soil Assessment
Hydric soils at surface. Grey soils

Hydrology
Clear evidence of Saturated Conditions

Topography
Site Elevation: 232
Landform Notes:
Clear Lesson in Topography

Notes:
177 - Predominantly Gleys
178 - Predominantly Gleys

Boundary based on extent of Hydrophytic vegetation. Most conservative boundary taken.

FIELD SHEET
00.002 Wetland Mapping at Area D

Date: 12/06/07
Time: 12.45
Wetland UFI: 764

Easting: 476[illegible]3 Northing: 6227[illegible]

Vegetation Assessment

No Transects

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walk (Y/N)

Easting	Northing	Alt
476143	6227151	234
476150	6227[illegible]	234
476153	6227[illegible]	234
476161	6227[illegible]	234
476138	6227121	232

Vegetation Notes:
Mass of disrupted cleared scrub Melaleuca Eucalypts

Soil Assessment

Wet soils ; waterlogged likely No surface water present

Hydrology

Topography

Site Elevation: 234

Landform Notes:
Clear basin formation with rising hills

Notes: Photo 171 looking into depression

Boundary based on landform and soils

FIELD SHEET
00.002 Wetland Mapping of Area D

Date: 19/6/09
Time: 1235?
Wetland ID: 741
Easting: 496477 Northing: 6274322

Vegetation Assessment

No Terminals:

	Easting	Transect 1 Northing	Alt	Easting	Transect 2 Northing	Alt
Start						
Finish						
Veg Changes						

Boundary Walks (Y/N)

Easting	Northing	Alt
496446	6274363	221
496457	6274348	228
496522	6274343	232
496521	6274353	231

Vegetation Notes:
Alnus incana, Picea sitchensis, Betula papyrifera, Salix sp., Alnus rubra, Thuja plicata, Tsuga heterophylla within wetland boundary, Rubus spectabilis

Soil Assessment

Small % peaty, organics, Alnus rubra debris present

Hydrology

Lower elev. out flow, no visible signs of flooding/water. Small channel at lower elev. flows to Pacific Rim

Topography

Site Elevation: 0369
Landform Notes:
Clear path in vegetation, stream in boundary path (3126)

Notes:
SAS - middle of swamp/wetland
SAS2 - boundary of swamp

FIELD SHEET
0000 Wetland Mapping of Area D

Date: 15/6/05
Time: 11:15
Wetland ID: 742. Dead Man Swamp

Easting: 493812 Northing: 6248210

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
493764	6248320	0
493808	6248361	3
493824	6248321	0
493813	6248311	0
493873	6248311	0

Vegetation Notes:
Tree canopy dominated by Eucalyptus camaldulensis.
Melaleuca ericifolia flowering throughout.

Soil Assessment

Soil moist and soft overall

Hydrology

Clear evidence of ponding, deeper than 1m in centre

Topography

Site Elevation: 0-1

Landform Notes:
Clear depression in landscape containing seasonal swamp

Notes:
Boundary determined by vegetation, landform and soil.

Photos:
1023 - swamp
1024 boundary

FIELD SHEET
09-002 Wetland Mapping of Area D

Date: 14/09/09
Time: 1235
Wetland ID: 746 Dead Horse Swamp

Landing: Easting: 496509 Northing: 6277342

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	496427	6277355	243	496562	6277462	242
Finish	496567	6277260	227	496494	6277414	232
Veg Change						226

Boundary Walks (Y/N): Easting Northing Alt

Vegetation Notes:
Eriophorum, Acer rubrum, balsam fir, white birch, Kalmia angustifolia, Gaylussacia baccata, Trientalis borealis, Vaccinium myrtilloides, Sphagnum, Pleurozium, Cladonia, Cornus canadensis, Rhodora canadensis, Vaccinium angustifolium, Aralia nudicaulis, Osmunda cinnamomea, Dryopteris carthusiana, Dryopteris intermedia, Polypodium virginianum, Thelypteris noveboracensis, Onoclea sensibilis, Carex, Juncus, Equisetum, Solidago, Aster, Viola, Rubus, Ilex mucronata, Ilex verticillata, Nemopanthus mucronatus, Lonicera canadensis, Lonicera villosa, Viburnum nudum, Viburnum cassinoides, Alnus incana, Salix, Populus tremuloides, Betula papyrifera, Betula alleghaniensis, Picea rubens, Abies balsamea, Pinus strobus, Larix laricina, Thuja occidentalis, Tsuga canadensis, Fraxinus nigra, Fraxinus pennsylvanica, Acer saccharum, Fagus grandifolia, Quercus rubra, Prunus pensylvanica, Prunus virginiana, Sorbus americana, Amelanchier, Ostrya virginiana, Ulmus americana, Populus grandidentata, Populus balsamifera, Betula populifolia, Betula papyrifera var. cordifolia, Acer spicatum, Acer pensylvanicum, Corylus cornuta, Diervilla lonicera, Rosa, Rubus idaeus, Rubus pubescens, Rubus hispidus, Rubus canadensis, Rubus allegheniensis, Rubus odoratus, Rubus parviflorus, Rubus strigosus, Rubus chamaemorus, Rubus pedatus, Rubus arcticus, Rubus acaulis, Rubus saxatilis, Rubus idaeus var. strigosus, Rubus idaeus var. canadensis, Rubus idaeus var. idaeus, Rubus idaeus var. parvifolius, Rubus idaeus var. pubescens, Rubus idaeus var. hispidus, Rubus idaeus var. canadensis, Rubus idaeus var. allegheniensis, Rubus idaeus var. odoratus, Rubus idaeus var. parviflorus, Rubus idaeus var. strigosus, Rubus idaeus var. chamaemorus, Rubus idaeus var. pedatus, Rubus idaeus var. arcticus, Rubus idaeus var. acaulis, Rubus idaeus var. saxatilis

Soil Assessment

Peaty. Soils wet at surface

Hydrology

Topography

Site Elevation: 237

Landform Notes:
Low area, flat.

Notes: 5223, boundary, WP 743 in bog adjacent (unnamed) stream
5224 - within row of wetland shrubs only.

Boundary formed by vegetation

FIELD SHEET
00.082 Wetland Mapping of Area D

Date: 14/6/22
Time: 1013
Wetland UFI: 72-1
Easting: 492096 Northing: 6276360

Vegetation Assessment

No. Transects: Three at road on Rd verge

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	492096	6276360	241			
Finish	492571	6276181	232			
Veg Changes	4	6276266	234			

Boundary Walks (Y/N)

Easting	Northing	Alt

Restricted access

Vegetation Notes:
Wetland in Kanuka, Gorse, Radiata on adjacent, Sapling kanuka/gorse all road verge although boundary is clear, no evidence of soil scrape over the road.

Soil Assessment

Wet soil at road verge, Clayey soil slight wetness observed

Hydrology

Hydrology inferred by flow drains, drainage Creek flow through culverts.

Topography

Site Elevation: 232

Landform Notes:
Vegetation responsive to changes in landform.

Notes:
Plot 55 21 - boundary
55 22 - Wetland road crossing

Boundary determined by vegetation.

FIELD SHEET
08.0107 Wetland Mapping of Area D

Date: 13/01/07
Time: 1445
Wetland UFI: W25

Easting: 492435 Northing: 6521235

Vegetation Assessment - already vol complete
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	492402	6521263	23.3			
Finish	492435	6521301	23.7			
Veg Change	492435	6521301	23.7			

Boundary Walked (Y/N)	Easting	Northing	Alt
Limited access close to landowner. Steeper boundary on road.			

Vegetation Notes:
Carex rostrata, Typha latifolia in topo closer to the boundary. Salix cinerea, Rubus spp. on boundary

Soil Assessment
Wet soils evident. Some oxidised roots.

Hydrology
Very shallow stream. Formation clear, evidence of seasonal flow. Evidence of surface water flow.

Topography
Site Elevation: 23.5
Landform Notes:
Low flow channel, likely shallow inundation beyond bank.

Notes:
SSG - boundary
SSG - core

Boundary delineated by conservative extent of wetland vegetation

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 14/6/09
Time: 920
Wetland UFI: 626

Easting: 491127 Northing: 6293142

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
491101	6293153	229
491065	6293158	230
491017	6293111	230
491027	6293084	230
490989	6293041	228

Vegetation Notes:
Gahnia trifida, Melaleuca viminea within wet areas
Evidence of planted trees, mostly Eucs.

Soil Assessment
Soil effected area - Area Erosion of bank edges evident.
Very muddy at wet through area at time of visit.

Hydrology
Area inundated seasonally, evidence of surface water. Some standing water in Creek, very small grade across creek.

Topography
Site Elevation: 230
Landform Notes:
Channel + Spillway formation - clear in landscape. Grades towards river

Notes:
Photos: 5519 - spillway
5518 - Creek + boundary

Boundary determined by extent of inundation.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 15/6/09
Time: 912
Wetland UFI: 726

Easting: 491098 Northing: 6292301

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
No contact with landowner. Restricted access

Easting	Northing	Alt	
491102	6292289	225	→ Rvn Road

Vegetation Notes:
Melaleuca sp Viminea? , Gahnia trifida within road verge, within 726 planted species of Eucs. and Acacia sp?

Soil Assessment
Soils quite wet at time of visit. No evidence of surface water scour

Hydrology

Topography
Site Elevation: 226
Landform Notes:
Distinct low basin formation with land rising in to highground NE & SW.

Notes:
Photo 5516 - shows wetland species and planted

Boundary based on landform and soils

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 15/6/09
Time: 900
Wetland UFI: 692 ~~Upstream~~ Beaufort River

Easting: 489937 Northing: 6292232

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
489937	6292232	226
489918	6292226	226
489899	6292228	226
489863	6292229	232
489860	6292282	274

Vegetation Notes:
Tecticornia halocnemoides, Lepidosperma, along river bed Melaleuca Asphiophylla along boundary.

Boundary was determined by vegetation.

Soil Assessment
Sandy soils wetland overlaid

Hydrology
Some ponded water within river channel. No flow

Topography
Site Elevation: 226
Landform Notes:
Clear channel within landscape.
Boundary taken as extent of seasonally inundated area

Notes:
Photos MJ 5315.

Boundary based on level/rise.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 14/9/09
Time: 850
Wetland UFI: 709
Easting: 489899 Northing: 6292174

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
489802	6292149	225
489819	6292158	223
489837	6292161	225
489851	6292150	226
489871	6292143	225

Vegetation Notes:
Ficinia nodosa, Melaleuca thymifolia phyllosa, area characterised by a mix up upland and wetland species. Juncus sp. Rhos Rhomea, Lepidosperma

Does not define boundaries.

Soil Assessment

Hydrology
Evidence of surface water scouring within wetland which contains seasonal inundation

Topography
Site Elevation: 225
Landform Notes:
Clear floodplain characteristics, flat area between two rivers.

Notes: Have SS12, boundary Hillman River (698)
SS13- Floodplain shows mixed vegetation.
SS14-
Boundary based on landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 14/6/09
Time: 805
Wetland UPI: 627

Easting: 490085 Northing: 6292117

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
490142	6291978	226
490169	6291945	227
490173	6291917	226
490196	6291892	226
490196	6291226	226

Vegetation Notes:
Vegetation within fenced area considered as "core" consisting of [redacted], Melaleuca chapmaniana thicket

Vegetation does not cross boundary.

Soil Assessment
Groundwater near surface. Soils wet at surface

Hydrology
Area waterlogged at time of visit. Clayey muddy soils at surface. Likely inundated during winter months.

Topography
Site Elevation: 232
Landform Notes:
Flat area adjacent to river. Gently rise forms boundary

Notes:
Boundary formed by landform and soils. Decision only considered soils. Likely because gentle rise in topography not prominent as extent of inundation

Photos: SS 10 - photo of Hillman river (692) shows hinge.
SS 11 - Boundary in paddock

FIELD SHEET
00.002 Wetland Mapping of Area D

Date: 4/26/07
Time: 745
Wetland UFI: 710

Easting: _____ Northing: _____

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt

Vegetation Notes:

Record of vegetation within plot. Within 2 meter circle

Soil Assessment

Wet soil to ____ cm at ____ cm depth

Hydrology

Shallow Open water at ____ cm depth. Wet soil to ____ cm. Saturated soil to ____ cm depth. Water table at ____ cm depth. Drainage ____

Topography

Site Elevation: _____

Landform Notes:

Open channel. Recently ____

Notes:

Photos: ____

Boundary determined by ____

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/09
Time: 835
Wetland UFI: 801

Easting: 490754 Northing: 6288075

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

No access to site

Vegetation Notes:
One lone melaleuca

Soil Assessment
Soils appear wet

Hydrology

Topography
Site Elevation: 240
Landform Notes:
Flat. slight depression, could be dampland or channel.

Notes:
Photo 234, 235

Boundaries could not be determined from road.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/1/09
Time: 1.30pm
Wetland UFI: 806

Easting: 493632 Northing: 6227510

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Access restricted

Easting	Northing	Alt

Vegetation Notes:
Predominately denude of wetland vegetation except for Melaleuca viminea around edges.

Soil Assessment
Sandy soils

Hydrology
Water ponding present. Likely hydrology related to road construction.

Topography
Site Elevation: 233 (from road)
Landform Notes:
Clear basin formation in landscape. Topography rising in all directions.

Notes: Boundary formed by road. Restricted access unable to access boundary

Photo 233 Swampland

[illegible]
[illegible] Wetland Mapping of Area D

Date: [illegible]
Time: [illegible]
Wetland ID#: [illegible]

Easting: [illegible] Northing: [illegible]

Vegetation Assessment

No. Transects: [illegible]

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Finish	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Veg Change	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:

[illegible]

Soil Assessment

[illegible]

Hydrology

[illegible]

Topography

Site Elevation: [illegible]

Landform Notes:

[illegible]

Notes:

[illegible]

eny

[illegible]
09.002 Wetland Mapping of Area D

Date: [illegible]
Diary: [illegible]
Wetland Unit: [illegible]

Easting: [illegible] Northing: [illegible]

Vegetation Assessment

No Transects

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:

[illegible]

Soil Assessment

[illegible]

Hydrology

[illegible]

Topography

Site Elevation: [illegible]

Landform Notes:

[illegible]

Notes:

[illegible]

eny

[illegible]
09-002 Wetland Mapping of Area D

Date: [illegible]
Time: [illegible]
Wetland UPI: [illegible]

Easting: [illegible] Northing: [illegible]

Vegetation Assessment

No. Transects: [illegible]

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks: (Y/N)

Easting	Northing	All

Vegetation Notes: [illegible]

Soil Assessment

[illegible]

Hydrology

[illegible]

Topography

Site Elevation: [illegible]

Landform Notes: [illegible]

Notes: [illegible]

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 3/6/09
Time: 1220
Wetland UFI: 799 - Palusplain

Easting: 486749 Northing: 6285650

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
No access

Easting	Northing	Alt

Vegetation Notes:
Cleared area, no vegetation. Some *Conyza sp. and Lepidosperma sp. (mainly on road verge) due to degradation of the road.

Soil Assessment
From a distance area appears wet, with bright green grass showing high water table.

Hydrology
No water ponding

Topography
Site Elevation: 245
Landform Notes:
Area flat between 4 very gentle slopes

Notes: ~~Base~~ 224 - Palusplain
Photo - 2285 - lepidosperma

! Boundary could not be determined due to restricted access.

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/6/09
Time: 1145
Wetland UFI: 716
Easting: 484110 Northing: 6486392

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

No access

Easting	Northing	Alt

Vegetation Notes:
Planted Casuarinas. Not indicative of wetland boundary.

Soil Assessment
Soils moist. No evidence of hydric soils.

Hydrology
Culvert under road indicates flow in winter

Topography
Site Elevation: 221
Landform Notes:
Depression in landscape channel formation

Notes:
Photo: 221 creek
222 culvert
223 from Bayup Brook - Arthur Rd
Boundary would be based on landform

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 12/6/08
Time: 1130
Wetland UFI: 793

Easting: 484078 Northing: 6786374

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)
No access edge walking

Easting	Northing	Alt
484084	6786400	223

Vegetation Notes:
Lepidosperma sp present ~~[illegible]~~ and some Melaleuca pvessiana. Very scattered. Upland vegetation mixed Allocasuarina sp. Acacia sp.

Soil Assessment
Wet soils, high organic content evidence of salt.

Hydrology
Area has many scours and braids of creek. Signs the area gets inundated beyond channels on left bank.

Topography
Site Elevation: 223
Landform Notes:
Flat area.

Notes:
Boundary determined based on extent of inundated soils
217 culvert
218 channel
219 Melaleuca + She Oak
~~220~~ lepidosperma sp
~~223~~

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 13/6/09
Time: 11:10 am.
Wetland UFI: 795

Easting: 485468 Northing: 6285661

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Vegetation Notes:
Lepidosperma sp. on road verge that transects wetland.
Paddocks cleared for grazing and cropped

Soil Assessment
Waterlogged soils north of road. South of road paddock cropped

Hydrology
Culvert under rd to convey flow.

Topography
Site Elevation: 232
Landform Notes:
distant depression in landscape.

Notes: Boundary change near rd to not a wetland.
Culvet present under road.

Photo:
215 - picture of wetland
216 - does not show signs of wetland

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 15/6/09
Time: 9.40am
Wetland UFI: 838
Easting: 480348 Northing: 6283369

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt
480348	6283369	221
480329	6283368	219
480293	6283361	215
480268	6283358	215
480249	6283357	215.

Vegetation Notes:
Melaleuca cuticularis and Tecticornia lepidosperma indicates area is saline. Obv. but slight in vegetation. Dead / dying tree where soils are inundated. Melaleuca cuticularis and Lepidosperma sp. Boundary based on vegetation.

Soil Assessment
evidence of inundated peaty soils. Peaty > muck and high organics.

Boundary based on soils

Hydrology
Evidence of inundated soils and ponding water. Not flowing.

Boundary not defined by hydrology

Topography
Site Elevation: 221
Landform Notes:
river depression in landscape

boundary based on landform

Notes:
photo 195 - wetland, 196 - [illegible], 197 - boundary.

boundary based on vegetation, soils, and landform.

FIELD SHEET
09.0852 Wetland Mapping of Area D

Date:
Time:
Wetland UPI: 403

Easting: Northing:

Vegetation Assessment

No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						
Boundary Walk (Y/N)						

Easting	Northing	Alt

Vegetation Notes:

Soil Assessment

Hydrology

Topography

Site Elevation:

Landform Notes:

Notes:

FIELD SHEET
09.062 Wetland Mapping of Area D

Date: 8/6/09
Time: 11:00am
Wetland UFI: 1 w78 (up - Boore Road)
Easting: 483347 Northing: 6282697

Vegetation Assessment
No. Transects:

	Transect 1			Transect 2		
	Easting	Northing	Alt	Easting	Northing	Alt
Start						
Finish						
Veg Change						

Boundary Walks (Y/N)

Easting	Northing	Alt

Restricted Access - Boundary digitised by Boyd-Brooke to the south.

Vegetation Notes:
Heavily grazed and no significant vegetation present by bar Eucalypts present.

Boundary not digitised by vegetation.

Soil Assessment
Evidence of soil being waterlogged.

Hydrology
Evidence of water ~~[illegible]~~ scouring: likely to be water logged. No evidence of water ponding at time of visit.

Topography
Site Elevation:
Landform Notes:
Generally flat to the immediate surrounding area. Topographically rises in distance.
~~Boundary boundaries digitised by topography.~~

Notes:
Boundary seams to be digitised by soils and imagery but unable to tell due to restricted access photo.

Photo: 013 - Wetland
014 - Boundary

APPENDIX C
PHOTO INDEX

PHOTO INDEX

Photo Number	Wetland UFI	Description
1	149	River scour
2	149	River scour
3	136 (Arthur River)	Bank of river
4	136 (Arthur River)	Centre of river
5	136 (Arthur River)	Centre of river
6	149	River scour
7	136 (Arthur River)	Slightly further south
8	418	
9	418	Pooling water
10	418	Landform
11	418	Boundary looking south
12	418	Boundary looking north
13	171	Channel and vegetation
14	171	Channel and vegetation
15	171	Boundary
16	171	Boundary
17	171	
18	170	Hydric soils
19	170	Mounding of soils
20	170	Mounding of soils
21	170	Mounding of soils
22	419	
23	419	
24	419	
27	167	Vegetation
28	167	Vegetation
29	167	Vegetation
30	167	Boundary between river and palusplain
31	166	Boundary between fringing vegetation and paddock
32	166	Wetland
33	166	Gentle rise
34	166	Evidence of inundation
35	166	River boundary
36	166	Pasture boundary
37	165	Boundary photo
38	165	Vegetation
39	165	Soils
40	165	Boundary
41	165	Creek bed
42	165	Boundary
43	319	
44	319	
45	319	
46	319	
47	319	Ponding water
48	369	Dam
49	369	Boundary between upland/ wetland

50	369	Slope
51	369	Slope
52	369	*Juncus pallidus*
53	369	Pooling water near dam
54	370	Hydric soils
55	320	Wetland
56	320	Wetland
57	375	Creek
58	375	Pooling water
59	341	Creek
60	341	Water ponding
61	852	Wetland
62	342	Creek
63	342	Dam
64	314	Creek
65	314	Creek
66	314	Boundary
67	314	Channel form
68	316	Shows channel
69	316	Shows channel
70	316	Shows soils layers
71	323	Creek
72	323	Creek
73	323	Creek
74	323	Boundary
75	324	Soil
76	324	Area along west side
77	324	Shows eastern side
78	327	Wetland
79	327	Wetland
80	327	Wetland
81	327	Wetland
82	328	Landform
83	328	Landform
84	328	Landform
85	328	Landform
86	329	Floodplain area
87	329	Floodplain area
88	329	Floodplain area
89	329	Floodplain area
90	329	Floodplain area
91	329	Floodplain area
92	326	Creek
93	326	Boundary
99	334	Man made dyke within lake
100	334	Looking north across reserve
101	334	Lake boundary
102	335	Wetland
103	335	Wetland showing rising topography in background
104	591	Creek at boundary

105	591	Creek at boundary
106	591	Creek undergoing modifications
107	591	Creek undergoing modifications
108	504	Wetland
109	504	Wetland
110	504	Wetland
111	506	Wetland from a distance
112	506	Wetland
113	506	Shows wetland and soils
114	502	Shows Creek
115	500	Floodplain
116	500	Creekline
117	500	Boundary
118	504	Boundary
119	504	Creek
120	588	Surrounding floodplain
121	588	Ponded water
122	588	Boundary
123	453	Shows sloping
124	453	Wetland
125	519	Wetland
126	519	Boundary
127	381	Creek
128	452	Floodplain
129	452	Boundary
130	540	
131	540	
132	451	Extent of Floodplain
133	451	Extent of Floodplain
134	518	Boundary
135	518	Area
136	443	Creek
137	443	Boundary
138	600	Shows wetland
139	600	Shows wetland
140	600	Shows wetland
142	602	Palusplain
143	602	Boundary
144	545	
145	545	Boundary
146	543	
147	601	Wetlands
148	552	Boundary
149	552	Creek
150	600	Creek extent
151	600	Boundary
152	605	Shows wet soils
153	605	Shows wet soils
154	605	*Melaleuca* sp. Near Quill Road

155	613	Shows Emu Swamp
156	613	Boundary
157	614	Shows creek
158	663	
159	663	
160	664	Within dampland
161	665	Wetland
162	665	Boundary
163	665	From core of wetland
164	767	Creek
165	767	Creek
166	658	Wetland
167	658	Boundary
168	658	*Lepidosperma* sp.
169	661	
170	662	*Lepidosperma* sp.
171	662	
172	667	Shows Dampland
173	667	Shows Dampland
174	766	Boundary
175	766	Sumpland
176	766	Channel within sumpland
177	666	Boundary
178	666	Core
179	764	Core
181	770	UFI 770 in background
182	629	Shows rail and road
183	629	Boundary
184	629	Boundary
185	629	*Melaleuca* species
186	565	Creek
187	565	
188	628	Remnant vegetation (south) and paddock (north) possibly historically connected
189	628	Looking south into remnant vegetation
190	566	
191	491	Creek
192	491	Channel
193	574	Channel
195	838	Wetland
196	838	
197	838	Boundary
198	771	Boundary
199	903	Looking across dampland
202	780	Wetland
203	673	Wetland
204	686	Sign showing control program undertaken for surface water salinity

205	686	Wetland
206	686	Scoured Area
207	779	Culverts under Rd
208	779	Channel
209	772	Sumpland
210	772	Boundary
213	678	Wetland
214	678	Boundary
215	795	Wetland
216	795	Does not show signs of wetland
217	793	Culvert under road
218	793	Channel
219	793	Melaleuca and Sheoak
220	793	*Lepidosperma* sp.
221	796	Creek
222	796	Culvert
223	796	Taken from road
245	799	Palusplain
225	799	*Lepidosperma* sp.
226	805	
227	810	High water table in excavation
228	810	East of Bokal Rd South
229	811	West of Bokal Rd South
230	UNK	Sumpland from a distance
231	UNK	Core of wetland
232	UNK	Owl in nearby tree
233	806	Sumpland
234	801	
235	801	
2334	196	Inside wetland
2335	196	Boundary
2338	246	End of transect
2339	246	Start of transect
2341	244	Lake centre
2342	244	Lake edge
2343	244	Vegetation change
2344	244	Upland *Acacia* sp.
2347	202	Near road
2348	202	Shows trees and hydric soils
2349	202	Shows channel
2350	202	Shows constructed channel
2354	243	Picture of wetland
2357	3	Channel
2358	3	Soil photo
2361	174	
2362	174	Edge of area
2363	194	Adjacent paddock
SS7	710	
SS8	710	

SS9	710	
SS10	627	Hillman River (UFI 692) fringe
SS11	627	Boundary in paddock
SS12	709	River boundary
SS13	709	Floodplain
SS14	709	Mixed vegetation (Upland and Wetlands species)
SS15	692	
SS16	726	Shows wetland species and planted species
SS17	626	Spillway
SS18	626	Creek and boundary
SS19	625	Boundary
SS20	625	Core
SS21	729	Boundary
SS22	729	Dam and Creek
SS23	746	Boundary, UFI 743 in background. Could not Access.
SS24	746	Within core of wetlands, showing fringe
SS25	741	Middle of Sumpland
SS26	741	Boundary
SS27	742	Swamp
SS28	742	Boundary

APPENDIX D
FLORA SPECIES LIST

APPENDIX D

FLORA SPECIES LIST

* denotes foreign introduced species

Abbreviations:

sp.: species (singular) var.: variety
spp.: species (plural) ms: manuscript name (unpublished)
subsp.: subspecies

Source: Western Australian Herbarium (2009)

FAMILY		TAXA		COMMON NAME	HABITAT PREFERENCE		
					Obligate	Facultative	Dryland
TYPHACEAE	*	*Typha*	*orientalis*	Bulrush	√		
POACEAE	*	*Eragrostis*	*curvula*	African Lovegrass		√	
CYPERACEAE		*Baumea*	*juncea*	Bare Twig Rush	√		
		Ficinia	*nodosa*	Knotted Club Rush	√		
		Gahnia	*trifida*	Coastal Saw Sedge	√		
RESTIONACEAE		*Lepidosperma*	*?squamatum/ striatum*		√		
JUNCACEAE		*Juncus*	*pallidus*	Pale Rush	√		
XANTHORRHOEACEAE		*Xanthorrhoea*	*preissii*	Grass Tree		√	
CASUARINACEAE		*Allocasuarina*	*fraseriana*	Sheoak			√
		Casuarina	*obesa*	Swamp Sheoak		√	
CHENOPODIACEAE		*Tecticornia*	*lepidosperma*		√		
HEMEROCALLIDACEAE		*Dianella*	*revoluta*	Blueberry Lily		√	
MIMOSACEAE		*Acacia*	*acuminata*	Jam Wattle		√	
MYRTACEAE		*Callistemon*	*phoeniceus*	Lesser Bottle Brush	√		
		Corymbia	*calophylla*	Marri		√	
		Eucalyptus	*marginata*	Jarrah			√
		Eucalyptus	*rudis*	Flooded Gum		√	
		Eucalyptus	ssp.				
		Eucalyptus	*wandoo* subsp. *wandoo*	Wandoo		√	
		Kunzea	*glabrescens*	Spearwood		√	
		Melaleuca	*cuticularis*	Saltwater Paperbark	√		
		Melaleuca	*lateritia*	Robin Redbreast Bush	√		
		Melaleuca	*preissiana*	Moonah	√		
		Melaleuca	*rhaphiophylla*	Swamp Paperbark	√		
		Melaleuca	ssp.		√		
		Melaleuca	*viminea* subsp. *viminea*		√		
		Verticordia	*densiflora*	Compacted Featherflower	√		
SOLANACEAE	*	*Solanum*	*nigrum*	Black Berry Nightshade	√		
ASTERACEAE	*	*Conyza*	sp.		√		
	*	*Sonchus*	*asper*	Rough Sowthistle	√		

APPENDIX E
METADATA

APPENDIX E

AREA D WETLAND MAPPING METADATA STATEMENT

This metadata statement is prepared to assist in interpreting the GIS layer Area D Wetlands.

1. Dataset

Title: Area_D_Wetlands

Custodian: Department of Environment and Conservation

Jurisdiction: Western Australia

2. Contact

Contact Organisation Name: Department of Environment and Conservation

Contact Organisation Jurisdiction: Western Australia

Contact Position:

Mail Address: Locked Bag 104

Bentley Delivery Centre

Suburb: Bentley

Postcode: 6983

State: WA

Country: Australia

3. Description

The data contained within the *Area D Wetlands* mapping layer covers wetlands within the Wheatbelt region of Western Australia predominantly within the Shire of West Arthur. The area is encompassed by the following 1:25,000 map sheets for the Middle Blackwood (Area D):

- 2231-III NE;
- 2231-III SE;
- 2230-IV NE;
- 2231-II NW;
- 2231-II SW;
- 2230-I NW;
- 2231-II NE;

- 2231-II NE; and
- 2230-I NE.

Each wetland is classified based on its geomorphic properties and is captured at a 1:25000 scale. For further information on geomorphic classification of wetlands refer to *Wetlands of the Swan Coastal Plain Volume 2* (Hill et al, 1996).

Keywords: Wetland, geomorphic wetland, West Arthur

4. Data Currency

Beginning Date: 22/6/09

Ending Date: Current

5. Dataset Status

Progress: Draft

6. Data Quality

Scale: Data captured at a 1:25000 scale

Positional Accuracy: + or – 21m over the dataset

Logistical Consistency: Attributed polygons

Completeness: Map sheet area as listed above

7. Metadata Date: 22/6/09

8. Details of Captured Attributes

a. UFI: unique feature identifier for each wetland polygon

- Field type: Integer
- Key field, no duplicates

b. Class: Geomorphic classification of wetland according to Seminiuk & Seminiuk (1995) were recognised

- Field type: Text
- Possible Attributes: River, Creek, Lake, Sumpland, Dampland, Palusplain, Floodplain, Paluslope

c. **Criteria1:** Boundary criteria are provided in order of importance regarding the delineation of wetland boundaries. This field refers to the dominant criteria for boundary delineation.

   - Field Type: Text
   - Possible Attributes: V, S, L denoting vegetation, soil and landform respectively.

d. **Criteria2:** Boundary criteria are provided in order of importance regarding the delineation of wetland boundaries. This field refers to the secondary criteria used for boundary delineation. May be null.

   - Field Type: Text
   - Possible Attributes: V, S, L denoting vegetation, soil and landform respectively. Can be a null value

e. **Criteria3:** Boundary criteria are provided in order of importance regarding the delineation of wetland boundaries. This field refers to the third rated criteria for boundary delineation.

   - Field Type: Text
   - Possible Attributes: V, S, L denoting vegetation, soil and landform respectively. Can be a null value.

f. **Field Visit:** Denotes whether a field visit was undertaken for the wetland

   - Field Type: Text
   - Possible Attributes: Y or N denoting yes or no.

g. **Date:** Date of which field visit occurred

   - Field Type: Date