GAZCORP INDUSTRIAL ESTATE WESTERN SYDNEY EMPLOYMENT AREA

Ecological Impact Assessment

For:

Gazcorp Pty. Ltd

October 2013

Final

CUMBERLAND ECOLOGY

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Report No. 8051RP3

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Revision	Date Issued	Prepared By	Approved By	Revision Type
A	11/02/2013	C. Phu	D. Robertson	Draft
B	08/10/2013	C. Phu	D. Robertson	Final Draft
C	22/10/2013	C. Phu	D. Robertson	Final Report

Approved by: Dr. David Robertson

Position: Project Director

Signed: David Robertson

Date: *22 October, 2013*

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Glossary of Terms

CBD	Central Business District
CEEC	Critically Endangered Ecological Community
DP&I	NSW Department of Planning and Infrastructure
DPI	NSW Department of Primary Industries
EEC	Endangered Ecological Community
EIA	Ecological Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental Planning Instrument
FM Act	NSW *Fisheries Management Act 1994*
Gazcorp	Gazcorp Pty Ltd, the proponent
GIS	Geographic Information Systems
GPS	Global Positioning System
JBA	JBA Urban Planning Consultants Pty Ltd
LGA	Local Government Area
Locality	The area within a 10 km radius of the subject site
NES	Matters of National Environmental Significance that are protected under the EPBC Act
NW Act	NSW *Noxious Weeds Act 1993*
OEH	NSW Office of Environment and Heritage

Project	Development of 52.2 ha of land at 813-913 Wallgrove Road, Horsley Park (the 'subject site') to an industrial estate
RMS	NSW Government Transport Roads & Maritime Services (formerly the Road and Traffic Authority)
Subject site	813-913 Wallgrove Road, Horsley Park (also Lot 5, DP 24090) where the Project will be located
SCA	Sydney Catchment Authority
SEWPAC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development
TSC Act	NSW *Threatened Species Conservation Act 1995*
WONS	Weeds of National Significance
WSEA	Western Sydney Employment Area
WSEA SEPP	*State Environmental Planning Policy (Western Sydney Employment Lands) 2009*

Executive Summary

S1 Purpose

Gazcorp Pty Ltd (Gazcorp) has commissioned an Ecological Impact Assessment (EIA) to assess a proposal for the development of an industrial estate at 813-913 Wallgrove Road, Horsley Park (Lot 5, DP 24090). The purpose of the EIA is to:

- Describe the flora and fauna values of the land proposed for development;
- Identify threatened species, populations or ecological communities present on the land. Threatened species, populations and ecological communities refer to those listed on the schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act), Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and NSW *Fisheries Management Act 1994* (FM Act);
- Assess the potential occurrence of threatened species, populations or ecological communities on the land; and
- Assess the potential impacts of the proposed industrial development on threatened species, populations or ecological communities and make recommendations for the mitigation of these potential impacts.

This EIA also addresses the need to refer the development to the Commonwealth Minister for the Environment for impacts on matters of National Environmental Significance (NES) as listed under the EPBC Act.

Gazcorp seeks a Concept and Development Approval under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the proposed development, which will be assessed as a State Significant Development (SSD) by the Department of Planning and Infrastructure (DP&I). This EIA is intended to support an Environmental Impact Statement (EIS) that is being prepared by JBA Urban Planning Consultants Pty Ltd (JBA) on behalf of Gazcorp for submission to DP&I.

S2 Background

The proposed development (hereafter referred to as 'the Project') involves the development of 52.2 ha of land at 813-913 Wallgrove Road, Horsley Park (the 'subject site') to an industrial estate. It is located approximately 33 km west of the Sydney Central Business District (CBD) and is approximately 11 km to the north west of Fairfield City Centre. The subject site is part of the Fairfield City Local Government Area (LGA) but falls within the bounds of the Industrial Release Area governed by the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (WSEA SEPP).

S2.1 Land Context

The subject site is positioned near a number of significant industrial areas including Eastern Creek and Minchinbury to the north, Erskine Park to the west, and Wetherill Park to the east. The nearest residential area to the subject site is Bossley Park and surrounding suburbs, which are located approximately 5.5 km to the south east, and Minchinbury approximately 4.5 km to the north west.

The subject site has a 680 m frontage to Wallgrove Road on the east border, which offers both on- and off-ramps from the Westlink M7 Motorway and the M4 Motorway, approximately 1 km and 2.5 km to the north respectively. Reedy Creek riparian corridor forms the western border. To the south of the subject site are fragmented rural-residential lots, which together with the subject site contain a Transgrid transmission line. A Sydney Catchment Authority (SCA) pipeline lies on the northern border of the subject site.

S2.2 Environmental Characteristics

The terrain within the subject site is gently undulating with well structured clay soils derived from Wianamatta Shale. There is one large hill situated within the middle of the subject site, which slopes down towards the Wallgrove Road frontage to the east and towards Reedy Creek to the west. A small number of farm dams are located throughout the subject site. The only significant structures on the subject site are one large metal shed in the central north and a large stock holding yard in the west of the property. The subject site is currently being used as an agistment for cattle and horses. Grassland areas may have been pasture-improved in the past and is regularly slashed.

The subject site is largely cleared of native vegetation and is dominated by pasture grasses. The native vegetation is represented by a mosaic of regenerating patches of open forest and woodland at various stages of canopy regeneration; much of the understorey is dominated by exotic shrubs and groundcovers. A few mature canopy trees can be found scattered throughout the subject site. A narrow riparian corridor that follows Reedy Creek and its tributary arm is present along the western boundary.

S2.3 Project Description

The subject site is zoned IN1 – General Industrial across the majority of the site and zoned E2 – Environmental Conservation along the western boundary. The Project is for the development of industrial land and will provide for a range of distribution and warehousing facilities in the Western Sydney Employment Area (WSEA). This will involve the clearance of most of the existing vegetation and decommissioning of existing farm dams. A riparian buffer corresponding to environmental conservation zoning along Reedy Creek and its tributary (30 m and 20 m respectively will be observed at the western boundary. Vegetation within the south-east corner of the site will also be retained for its amenity values as part of the landscaping of the site.

The Project is proposed to be constructed in three stages. Concept Approval is being sought for the conceptual design of the entire subject site and Development Approval is being sought for Stage 1 of the Project. Future development within the RMS road reserve at the northern boundary and within the Transgrid transmission line easement at the southern boundary of the subject site has been noted but is not assessed within this EIA.

S3 Methods

S3.1 Desktop Study

The WSEA has been investigated in detail in recent years due to the number of development and infrastructure projects that have been put forward under the Sydney Metropolitan Strategy initiatives for employment creation in Western Sydney. As such, baseline ecological data relevant to the subject site and its surrounds exist and have been used to inform the assessment of the Project.

Information on local biodiversity values were obtained by reviewing assessments conducted within the locality (within 10 km) of the subject site. This included, but was not limited to, a review of the ecological studies carried out for the following projects:

- Oakdale Concept Plan;
- Minchinbury Employment Park;
- Bungarribee Industrial Estate;
- Eastern Creek Business Hub;
- Eastern Creek Waste and Recycling Facility;
- Erskine Park Link Road, Ropes Creek Realignment; and
- Ropes Creek Industrial Estate.

The information from these studies were used to gain an understanding of the biodiversity of the subject site in its local context and to develop a list of threatened species and ecological communities that have potential to occur on the subject site.

Threatened species records were accessed from the OEH BioNet database. The number and age of records of threatened species recorded within the locality of the subject site were used to assess the likelihood of occurrence of threatened species.

The SEWPAC Protected Matters Search Tool was also accessed with reference to the locality of the subject site. The Protected Matters Search Tool provides a list of matters of NES that are predicted to occur based on the presence of suitable habitat, which was used to guide threatened species searches during field surveys and to assist in the assessment of impacts to threatened species.

S4 Field Study

Field investigations were carried out as part of the EIA to:

- Identify and evaluate the condition and extent of existing vegetation communities and grassland vegetation;
- Identify any threatened flora and fauna species present on the subject site; and
- Assess the nature and extent of habitat for threatened flora and fauna.

All field surveys were conducted in a manner consistent with current threatened species survey guidelines and the methods prescribed in the BioBanking Assessment Methodology Operational Manual. Field surveys were conducted initially in 2008 and further work carried out in summer 2012-2013.

S4.1 Flora Survey

Flora surveys were conducted to map vegetation communities and assess the presence of threatened species that were considered to have potential to occur. These surveys involved:

- Full floristic survey using ten 20 x 20 m sampling plots (i.e. quadrats) to collect compositional and structural information of the vegetation;
- biometric condition assessment of the vegetation on the subject site using data collected from quadrat samples;
- Random meander transects across the entire subject site to collect data on the condition and distribution extent of vegetation communities;
- Targeted searches for threatened species in areas of suitable habitat.

As the desktop study indicated that the threatened ecological community Cumberland Plain Woodland would be present on the subject site, interpretive guidelines for the identification of Cumberland Plain Woodland were used to help assess the woodland vegetation on the subject site. The EPBC Act Listing Advice prescribes a set of condition thresholds that woodland patches must meet in order to be considered the threatened ecological community Cumberland Plain Woodland. Degraded patches that no longer retain sufficient conservation values to meet these condition thresholds are not considered to be listed under the EPBC Act as Cumberland Plain Woodland. The condition thresholds are intended to focus national legal protection on native vegetation patches that are functional, relatively natural and in relatively good condition.

The TSC Act listing for Cumberland Plain Woodland includes areas of native grassland that are not natural grassland communities but rather were derived from the clearing of canopy trees and/or shrubs of Cumberland Plain Woodland. Whilst there is no formal prescriptive method for identifying native grasslands that are derived from the clearing of Cumberland Plain Woodland canopy and mid-storey, the TSC Act listing states that:

"Native grasslands derived from clearing of the woodland and forest are also part of this community if they contain characteristic non-woody species listed in paragraph 3 [of the listing]."

The above passage indicates that to be included in the TSC Act listing for Cumberland Plain Woodland, the grassland being assessed must be predominantly native, i.e. be dominated by native grasses, and contain at least one of the characteristic native non-woody species.

S4.2 Fauna Survey

S4.2.1 Habitat Assessment

The assemblage of fauna species within the subject site is influenced by habitat availability and other factors such as habitat condition and complexity, patch size, configuration and connectivity to other areas of intact vegetation. These factors affect the quality of the habitat on a broader, landscape scale. The subject site is dominated by grassland and very young regrowth woodland.

Habitat condition was assessed by noting ground, shrub/understorey and canopy cover; number and size of tree hollows present; habitat features such as bush rock, fallen trees, forage trees and wetland areas such as creeks and soaks. Notes on the structural complexity of vegetation, the age structure of the vegetation and the nature and extent of human disturbance in the subject site and surrounds were also recorded and considered.

Indirect indicators of fauna use of the site such as droppings, diggings, footprints, scratches, nests, burrows, paths and runways were noted.

Quantitative measures of habitat quality were collected within 20 x 50 m sampling plots. The variables measured included:

- Cumulative length of fallen logs (m);
- Number of tree hollows;
- Number of trees with hollows; and
- Proportion of canopy species that are regenerating (%).

Logs included in the measure were of 10 cm diameter or more and were at least 0.5 m in length. Hollows were only recorded if they had an entrance size of at least 5 cm diameter and were at least 1 m above the ground.

S4.2.2 Birds

Area searches were carried out at seven survey locations in representative vegetation patches. Searches were carried out at different times of the day and over a 30 minute observation period each. All bird species that were sighted or heard calling within a 30 minute observation block were recorded.

Spotlight searches for nocturnal bird species were carried out over a total of four nights totalling 16 hours. All bird species that were sighted or heard calling were recorded.

Birds that were opportunistically observed or heard calling throughout the survey period were recorded.

S4.2.3 Microchiropteran Bats

Surveys to detect the presence of various microchiropteran bat species were carried out using ultrasonic echolocation detectors (AnaBat SD1, Titley Electronics). Walking transects were conducted on four nights. Each walking transect was carried out for 1 hour after dusk in woodland, riparian forest and around dams.

Ultrasonic echolocation recordings were analysed by Greg Ford from Balance! Environmental.

S4.2.4 Cumberland Land Snail Searches

Active searches for Cumberland Land Snail (*Meridolum corneovirens*) were carried out across the subject site throughout the 2008 survey period. This entailed searches of litter and other debris at the bases of *Eucalyptus tereticornis* (Forest Red Gum) trees.

Snails were identified from photographic records by Dr. Stephanie Clark from Invertebrate Identification Australasia.

S4.2.5 Frog Searches

Active searches for frog species were conducted over two nights and involved visual and aural searches of roads and tracks, and damp areas such as drainage lines, fringing vegetation and areas of standing water (e.g. dams). Any frogs observed or heard calling were recorded.

S4.2.6 Opportunistic Records

Any other fauna species opportunistically seen or heard during the survey period were recorded.

S4.3 Survey Limitations

The biodiversity values in the locality of the subject site are well known as a result of a number of ecological studies that have been completed for various projects. As a result, detailed baseline vegetation and fauna data (including threatened species known and expected to occur within the locality) exists and are well documented. This information was used to guide field surveys and was considered during the assessment of threatened species, populations and ecological communities.

Weather conditions during frog searches, ultrasonic echolocation detection recordings and other nocturnal surveys were ideal because of preceding weeks of rain, warm evening temperatures and high insect activity.

Many plant species present on the subject site, such as grass and shrub species, show signs of grazing stress and occur in suppressed growth forms or are very small. Notwithstanding this, many features used in species identification are present, such as old seed heads, flowers, and leaf characteristics. It is probable that the majority of plant species have been recorded.

The field data acquired through field surveys are intended to be indicative of the types of species that could occur and not an absolute census of all flora and fauna species of the subject site. Although many species were detected during field surveys, additional species are likely to be present that have not been observed. Factors such as inclement weather, seasonality, migration schedules, population density and cryptic life histories can all affect the ability to detect species on ground. As a precautionary approach, the presence of suitable habitat was considered when assessing the potential occurrence of a given threatened species. Where potential habitat was present and the species was known to occur at other locations in the locality, it was assumed that the species had potential to occur and were thus assessed accordingly.

When the baseline information available from the locality is considered with the field data, the resultant information is considered to be sufficiently comprehensive to adequately support the assessment of threatened species, populations and ecological communities.

S5 Results

S5.1 Vegetation of the Subject Site

The subject site is located on the Cumberland Plain, which is in the Western Sydney region of the Sydney Basin. The Cumberland Plain is characterised by gently undulating plains and low hills formed on fertile clay soils derived from Wianamatta Shale and rich Tertiary and Quaternary alluvial soils associated with the Hawkesbury-Nepean River system.

The Cumberland Plain supports a number of different dry woodland and open forest communities. Originally, the woodlands and open forests of the Cumberland Plain would have been extensive across the region and would have been characterised by a species-rich grassy understorey with a sparse or locally dense shrub layer. Due to the agricultural value of the land, the Cumberland Plain was heavily cleared in the early years of settlement for grazing and cropping purposes. The Cumberland Plain continues to support agriculture, urban expansion and industrial development. In 2003, only 12% of the original extent of pre-European native vegetation cover on the Cumberland Plain was reported to remain as intact bushland; this figure is likely to be much less today. As a result of extensive historical and ongoing land clearing, the majority of the vegetation communities on the Cumberland Plain are now formally listed as threatened ecological communities under legislation.

The declining extent of native vegetation on the subject site is consistent with the trends in the region. Vegetation mapping of the Cumberland Plain in 2002 shows that the subject site was dominated by grassland but retained sizable areas of Shale Plains Woodland, Shale Hills Woodland and Alluvial Woodland. Current vegetation mapping in 2012 by Cumberland Ecology shows a further decline in the extent of these communities on the subject site.

The extent of vegetation validated on the subject site by the current field surveys is summarised in **Table S.1**.

Table S.1 Extent and Type of Vegetation on the Subject Site

Vegetation Communities	TSC Act Status	EPBC Act Status	Area (ha)
Shale Hills Woodland	CEEC	not listed	11.1
Shale Plains Woodland	CEEC	not listed	3.9
Alluvial Woodland	EEC	not listed	3.1
Exotic Grassland	not listed	not listed	31.4
TOTAL			**49**

CEEC = Critically Endangered Ecological Community; EEC = Endangered Ecological Community

The subject site has been used as an agistment for cattle and horses for many years and is now largely dominated by exotic grassland that has possibly been pasture-improved in the past. The occurrences of Shale Plains Woodland and Shale Hills Woodland on the subject site are highly degraded from their original condition by ongoing grazing and historical clearing and exist in a highly stressed state. The canopy is largely represented by very young regeneration (i.e. 10 m tall, 10-15 cm diameter at breast height) surrounding one or two parent trees. The regenerating canopy trees in this woodland are in poor health and suffering from widespread crown dieback, possibly due to a recent psyllid outbreak. Much of the native understorey is lost and has been replaced by exotic pasture grasses and weedy shrubs.

Similarly, the Alluvial Woodland on the subject site is also highly degraded and occurs as a narrow band of degraded riparian open forest along Reedy Creek. Much of the native species diversity has been lost and replaced by woody weeds, exotic vines and pasture grasses. The Alluvial Woodland present on the subject site is frequently accessed by cattle and horses and show signs of grazing stress and trampling.

S5.1.1 Threatened Ecological Communities

Notwithstanding the above, the vegetation communities present on the subject site conform to two threatened ecological communities that are protected under the TSC Act:

- Cumberland Plain Woodland (Shale Hills Woodland and Shale Plains Woodland); and
- River-flat Eucalypt Forest (Alluvial Woodland).

These communities are discussed below.

i. Cumberland Plain Woodland

Cumberland Plain Woodland is listed as a Critically Endangered Ecological Community (CEEC) under both the TSC Act and EPBC Act. The TSC Act listing for Cumberland Plain Woodland does not define condition thresholds that exclude stands of poorer quality from the listing. Although highly degraded, a biometric condition assessment indicates that the Shale Hills Woodland and Shale Plains Woodland patches present on the subject site meet moderate to good biometric condition thresholds. The TSC Act listing for Cumberland Plain Woodland also recognises regrowth stands of shorter than 10 m tall with associated ground layers of reduced diversity and cover. Thus, although Shale Hills Woodland and Shale Plains Woodland on the subject site are highly modified from their original condition, they still conform to the TSC Act listing for Cumberland Plain Woodland.

The TSC Act listing for Cumberland Plain Woodland also includes native grasslands derived from clearing of the woodland canopy if characteristic non-woody species (as mentioned in the formal listing) are present. The grassland areas on the subject site are predominantly exotic in composition and cover and are not considered to be native grassland derived from clearing of native woodland and forest. The original grasslands derived from the clearing of Shale Hills Woodland and Shale Plains Woodland would have been predominantly native in composition, and is likely to have included a diversity of grass and herb species such as *Dichondra repens* (Kidney Weed), *Brunoniella australis* (Blue Trumpet), *Aristida ramosa* (Purple Wiregrass), *Aristida vagans* (Threeawn Speargrass), *Desmodium varians* (Slender Tick-trefoil), *Microlaena stipoides var. stipoides* (Weeping Meadow Grass), *Themeda australis* (Kangaroo Grass), *Cheilanthes sieberi subsp. sieberi* (Poison Rock Fern), *Opercularia diphylla*, *Wahlenbergia gracilis* (Sprawling Bluebell) and *Dichelachne micrantha* (Shorthair Plumegrass).

Over many decades of disturbance, and with additional pasture improvement with subtropical grass species, the floristic composition of the grassland on the subject site was permanently altered. The current grassland areas on the subject site are largely dominated by subtropical pasture species, including *Pennisetum clandestinum* (Kikuyu), *Paspalum dilatatum* (Paspalum), *Cynodon dactylon* (Couch Grass) and *Bromus catharticus* (Prairie Grass). A few native grass species are present but occur in very low frequencies (less than 5% of the overall ground cover) and include *Eragrostis leptostachya* (Paddock Lovegrass), *Lachnagrostis filiformis* and *Dichelachne crinita* (Longhair Plumegrass). There is also a general absence of native herbs; the herb species that were recorded frequently are represented by exotic pasture weeds such as *Plantago lanceolata* (Lamb's Tongue), *Senecio madagascariensis* (Fireweed), *Verbena bonariensis* (Verbena), *Cirsium vulgare* (Spear Thistle) and *Conyza bonariensis* (Common Fleabane).

Therefore, no area of grassland on the subject site is considered to be threatened under the TSC Act.

The EPBC Act listing includes condition thresholds that define when a patch of Cumberland Plain Woodland no longer retains sufficient conservation values to be considered as part of the listing. Using the decision flowchart provided in the policy statement for Cumberland Plain Woodland, it is determined that the occurrences of Shale Hills Woodland and Shale Plains Woodland on the subject site no longer conform to the EPBC listed community. This is primarily due to the current condition of the understorey, which is dominated by exotic perennial species and retains less than 30% foliage cover of native species.

Therefore, the EPBC Act listed Cumberland Plain Woodland is no longer present on the subject site.

ii. River-flat Eucalypt Forest

River-flat Eucalypt Forest is listed as an Endangered Ecological Community (EEC) under the TSC Act. It is not listed under the EPBC Act. The TSC Act listing does not define condition thresholds that exclude stands of poorer quality from the listing. Although highly degraded, a biometric condition assessment indicates that the Alluvial Woodland patches present on the subject site meet moderate to good biometric condition thresholds. The TSC Act listing recognises that River-flat Eucalypt Forest is a variable community that, due to partial clearing, can have a reduced canopy comprising scattered trees. The listing also recognises that due to its association with waterways and a high incidence of physical disturbance such as stock access and pollution runoff, there are very few examples of River-flat Eucalypt Forest that is unaffected by weeds.

As such, although the occurrence of Alluvial Woodland on the subject site is highly degraded, it is considered to conform to the TSC Act listed community River-flat Eucalypt Forest.

S5.2 Habitat Assessment

The subject site has a long history of agricultural land use. The native woodland and forest was heavily cleared in the past to provide pasture for livestock. Slashing, grazing and pasture improvement activities have maintained large open areas of grassland dominated by pasture grasses.

The subject site experiences a high level of ongoing disturbance and now provides habitat of limited value for native flora and fauna. There are four main habitat types found on the subject site and these are discussed below.

S5.2.1 Regenerating Woodland

The native woodland vegetation remaining on the subject site is represented by a mosaic of regenerating patches of open forest and woodland at various stages of canopy regeneration. These woodland patches are characterised by the following attributes:

- Small patch size (less than 5 ha);
- Poorly connected to larger, more intact bushland;

- Moderately dense thicket of young trees (the majority of which are approximately 10-15 cm in diameter at breast height) around one or two large parent trees;
- Few hollows; hollows are only present on the large old growth trees;
- A sparse shrub layer;
- A predominantly exotic ground cover of exotic pasture grasses;
- Lack of native tussock grasses;
- Few fallen logs or other timber debris; and
- A very open and structurally simple understorey.

The regenerating canopy trees appear to be experiencing a degree of dieback of the canopy foliage. Due to their age and health, these trees are unlikely to flower reliably or abundantly at the present time and are highly unlikely to supply hollows for arboreal fauna. This makes the site largely unsuitable for blossom feeders and hollow-using species.

The understorey is structurally simplified as there are few shrubs, and any timber debris has largely been removed. This limits the availability of foraging habitat for small fauna such as woodland birds and affords little protection from feral predators that have been recorded on the subject site such as Red Fox (*Vulpes vulpes*). There is also a lack of native tussock grasses that provide a degree of complexity to the ground stratum for small ground foraging fauna. The woodland patches are also accessed by cattle and horses and as a result the understorey vegetation is heavily grazed; and the growth of many grass and shrub species is suppressed and recruitment of native species is limited.

The regenerating woodland patches, due to their small patch sizes, have little interior habitat to support native fauna. These patches are also largely isolated from other significant patches of woodland habitat off site and therefore have limited connectivity value.

S5.2.2 Riparian Woodland

The riparian woodland occurs as a narrow and interrupted band of vegetation along Reedy Creek. The quality of the riparian woodland is relatively poor for the following reasons:

- Historically cleared, limiting width of the woodland along the creek;
- Clearing has also simplified the understorey and removed most of the native vegetation that would have provided sheltering and foraging habitat for native fauna;
- The canopy trees, whilst mature, are relatively young and provide few hollows for native fauna;
- Grazing and trampling due to regular access by cattle has degraded the banks of the creek and kept the understorey relatively open;

- Easily accessed by feral fauna; and
- Isolated from other significant patches of woodland habitat off site and therefore has limited value as a wildlife corridor.

The riparian woodland, due to its narrow width, simplified understorey and configuration, has little interior habitat to support native fauna. The understorey is largely cleared of native vegetation and is somewhat open, which limits the availability of refugia for small native fauna from feral predators. Notwithstanding this, some of the woody exotics such as *Lycium ferocissimum* (African Boxthorn) have potential to provide shelter and food resources for small native fauna.

S5.2.3 Aquatic Habitat

The aquatic habitats on the subject site are represented by Reedy Creek and two large dams. One dam was constructed in the eastern portion of the subject site and collects water flowing from the hill in the middle of the subject site. The western-most dam is the larger of the two dams and was constructed in proximity of Reedy Creek. A large stock-holding yard is located at the edge of this dam where relatively high numbers of stock have access to the dam. A third, smaller dam is located at the southern boundary of the subject site.

The dams and Reedy Creek are used by cattle and horses as watering points and are permanently open to livestock access. As a result, the dams and much of the Reedy Creek frontage on the subject site lack fringing vegetation and stags or other timber debris that provide habitat for aquatic fauna. Around the stock-holding yard, the presence of a high concentration of cattle has removed all of the ground cover around the western-most dam and Reedy Creek. There are some occurrences of *Eleocharis sphaceolata* in one of the dams that may provide some habitat for aquatic fauna but this vegetation is relatively limited.

The aquatic environments are currently likely to have high nutrient loadings, especially from pasture runoff, cattle droppings and cattle carcasses located along the creek. It currently supports visiting waterbird species and most likely provides habitat for native turtles and eels. However, the dams and the creek are unlikely to support populations of native fish.

S5.2.4 Exotic Grassland

The exotic grassland on the subject site provides little habitat for native fauna because of the following reasons:

- Large native tussock grasses, fallen logs and other timber debris that provides habitat for ground dwelling fauna are generally absent;
- Grass seeds for grassland birds and other ground foraging granivores because of heavy grazing by cattle and horses;
- Trees with significant hollows for arboreal fauna are generally absent;
- Shrubs that can provide food and sheltering sites are generally absent;

- It provides little to no connectivity value as a fauna movement corridor; and
- It is regularly slashed and continues to be heavily grazed.

S5.3 Flora of the Subject Site

The flora assemblage of the subject site is typical of pasture properties in Western Sydney and is largely dominated by a number of pasture grass species, such as *Paspalum* spp., *Pennisetum clandestinum* (Kikuyu), *Setaria* spp., *Bromus catharticus* (Prairie Grass) and *Cynodon dactylon* (Couch Grass); and pasture weeds, like *Sida rhombifolia* (Paddy's Lucerne), *Cirsium vulgare* (Spear Thistle) and *Senecio madagascariensis* (Fireweed).

Approximately half of the diversity of flora species recorded on the subject site comprises introduced species. Exotic pasture species are the most frequently encountered species in the grassland areas of the subject site and a diversity of exotic scramblers and shrubs dominate the riparian woodland associated with Reedy Creek.

The native species present on the subject site comprise the remaining half of the species diversity recorded on the subject site. These native species, with the exception of the recovering canopy trees, occur very infrequently. Ground cover herbs and native shrubs are not common on the subject site.

A number of exotic plant species present on the subject site are listed as a noxious weed under the *Noxious Weeds Act 1993* (NW Act) for Fairfield LGA. Landowners must control any noxious weeds on their properties in accordance with control requirements listed for each noxious weed species. The noxious weeds recorded on the subject site are presented in **Table S.2** below.

Some of the species in **Table S.2** are also declared a Weed of National Significance (WONS) by the Australian Government based on their invasiveness, potential for spread and environmental, social and economic impacts. Whilst there are no control requirements specified for each WONS, it is expected that individual landowners and managers are ultimately responsible for managing these species. State and territory governments are responsible for the overall legislation and administration of weed management but must report to the Australian Weeds Committee on progress against any remaining actions under strategic plans where they are available for a specific WONS.

Table S.2 Environmental Weed Species Recorded on the Subject Site

Scientific Name	Common Name	WONS[1] / Declared Noxious (Fairfield LGA)
Asparagus aethiopicus	Asparagus Fern	WONS
Asparagus asparagoides	Bridal Creeper*	WONS / Class 4 weed
Chrysanthemoides monilifera subsp. monilifera	Boneseed*	WONS / Class 2 weed
Senecio madagascariensis	Fireweed	WONS
Opuntia stricta	Prickly Pear	WONS / Class 4 weed
Ligustrum lucidum	Large-leaved Privet	Class 4 weed
Ligustrum sinense	Small-leaved Privet	Class 4 weed
Cestrum parqui	Chilean Cestrum	Class 3 weed
Lycium ferocissimum	African Boxthorn	WONS
Lantana camara	Lantana*	WONS / Class 4 weed

**A strategic plan for this species has been prepared by the Australian Weeds Committee*

[1]Weeds of National Significance

S5.3.1 Threatened Flora Species

No threatened species listed under the TSC Act and EPBC Act were recorded on the subject site.

Atlas records show that a number of threatened plant species have been recorded in the locality of the subject site. Many of these species are found in larger areas of bushland like the Western Sydney Regional Park, Kemps Creek Nature Reserve and bushland immediately south of M4 and the existing quarantine station.

The results of ecological studies conducted for other nearby projects demonstrate that degraded sites with long agricultural histories similar to that of the subject site are no longer likely to support threatened plant species previously recorded in the locality, such as *Grevillea juniperina* (Juniper-leaved Grevillea), *Acacia pubescens* (Downy Wattle), *Dillwynia tenuifolia*, *Persoonia nutans* (Nodding Geebung) *Pultenaea parvifolia* and *Pimelea spicata* (Spiked Rice-flower).

The likelihood that threatened plant species are present on the subject site has been fully assessed and discussed within this EIA. This assessment demonstrates that the subject site is unlikely to provide suitable habitat for threatened plant species known to occur in the wider locality.

S5.4 Fauna of the Subject Site

The faunal assemblage recorded on the subject site is dominated by common urban bird species. These are largely aggressive or territorial native birds that typically thrive in the urban-rural residential landscape and include Noisy Miner (*Manorina melanocephala*), Australian Raven (*Corvus coronoides*), Australian Magpie (*Cracticus tibicen*), Pied Currawong (*Strepera graculina*) and Red Wattlebird (*Anthochaera carunculata*). The subject site also provides habitat for a number of microchiropteran bat species that are common to the locality, such as Gould's Wattled Bat (*Chalinolobus gouldii*) and Eastern Broad-nosed Bat (*Scotorepens orion*). A small number of common frog species were recorded in association with the habitats around the dams and include the Common Froglet (*Crinia signifera*), Striped Marsh Frog (*Limnodynastes peronii*) and Spotted Marsh Frog (*Limnodynastes tasmaniensis*).

Only one small native arboreal mammal, the Common Brushtail Possum (*Trichosurus vulpecula*) was recorded during surveys of the subject site and only one native skink, the Common Garden Skink (*Lampropholis guichenoti*) was recorded. There is very little habitat of good quality available on the subject site for small arboreal mammals, ground mammals and reptiles. Due to the high numbers of the feral Red Fox (*Vulpes vulpes*) observed during field survey, these species would also likely to be subject to high levels of predation if they occurred on the subject site as resident species.

S5.4.1 Threatened Fauna Species

A small number of threatened and migratory fauna species were recorded on the subject site (**Table S.3**).

One individual Square-tailed Kit (*Lophoictinia isura*) was recorded flying over the subject site and was observed perching on a stag. It is possible that this individual was foraging over the subject site and adjacent properties; the subject site would form a part of a much larger foraging range for the species.

Echolocation calls were recorded for a few microchiropteran bat species including Southern Myotis (*Myotis macropus*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*), which are all listed as a Vulnerable species under the TSC Act. The calls were collected around the western dam during a warm night with high insect activity. All three microchiropteran bat species were likely to have been foraging for insects around the dam. However, they are unlikely to roost on the subject site because of the relative lack of roosting hollows. The value of the subject site as foraging habitat is also limited and they are likely to forage occasionally over the subject site as part of a much larger foraging range.

Table S.3 Threatened Fauna Recorded on the Subject Site

Scientific Name	Common Name	EPBC Act	TSC Act
Ardea modesta	Eastern Great Egret	Mi; Ma	
Ardea ibis	Cattle Egret	Mi; Ma	
Lophoictinia isura	Square-tailed Kite		V
Falsistrellus tasmaniensis	Eastern False Pipistrelle		V
Myotis macropus	Large-footed Myotis		V
Scoteanax rueppellii	Greater Broad-nosed Bat		V

V = Vulnerable; Mi = Migratory; Ma = Marine

Atlas records show that a number of threatened fauna species have been recorded in the locality of the subject site. Many of these species are found in larger areas of bushland like the Western Sydney Regional Park, Kemps Creek Nature Reserve and bushland immediately south of M4 and the existing quarantine station.

The results of ecological studies conducted for other nearby projects demonstrate that degraded sites with long agricultural histories similar to that of the subject site are most likely to provide sub-optimal foraging habitat for wide-foraging species like raptors, migratory birds and bats but are unlikely to provide important roosting or breeding habitat for these species. Small native fauna like ground mammals, reptiles and woodland birds are unlikely to occur on these types of properties.

S6 Impact Assessment

S6.1 Clearance of Threatened Ecological Communities

The Project proposes to develop the subject site to accommodate a range of distribution and warehousing facilities. This will involve clearing the majority of the existing vegetation on the subject site (**Table S.4**), which includes two different threatened ecological communities listed under the TSC Act:

- Cumberland Plain Woodland CEEC (Shale Hills and Shale Plains Woodland); and
- River-flat Eucalypt Forest EEC (Alluvial Woodland).

As part of the Project, a riparian setback from Reedy Creek and its tributary (30 m and 20 m respectively 30 m) has been excluded from the development envelope. This area corresponds to the E2 zoning along the western boundary of the subject site and will not be cleared of vegetation for the Project. Other areas of existing remnant vegetation will also be retained, namely in the south-east corner of the subject site.

Table S.4 Areas of Direct Vegetation Clearance Required by the Project

Vegetation Communities	TSC Act Status	EPBC Act Status	Area to be retained (ha)	*Areas excluded from assessment (ha)	Disturbance Area (ha)	TOTAL within Subject Site (ha)
Shale Hills Woodland	Cumberland Plain Woodland CEEC	not listed	0.00	1.28	9.85	11.1
Shale Plains Woodland	Cumberland Plain Woodland CEEC	not listed	0.26	0.37	3.27	3.9
Alluvial Woodland	River-flat Eucalypt Forest EEC	not listed	1.02	0.61	1.43	3.1
Exotic Grassland	not listed	not listed	0.47	2.35	28.57	31.4
TOTAL (nearest ha)			**2**	**5**	**43**	**49**

CEEC = Critically Endangered Ecological Community; EEC = Endangered Ecological Community

**RMS road reserve and Transgrid transmission line easement*

Cumberland Plain Woodland and River-flat Eucalypt Forest, like many communities on the Cumberland Plain, have been listed as threatened because they have undergone a very large reduction in their geographic distribution in a relatively short timeframe and are likely to become extinct if considerable effort is not made to conserve remaining occurrences. The Project proposes to clear approximately 13.1 ha of Cumberland Plain Woodland and approximately 1.4 ha of River-flat Eucalypt Forest and is therefore likely to have a significant impact on these communities.

Notwithstanding the above, the occurrences of Cumberland Plain Woodland and River-flat Eucalypt Forest on the subject site represent highly degraded examples of these communities, as evidenced by the alterations in community structure and composition, establishment of exotic species and degradation and fragmentation of habitat observed during field survey. The occurrences on the subject site are also very isolated from other areas of bushland by the M7 and M4 motorways and surrounding rural residential and industrial development.

The subject site has a long history of native vegetation clearing and is currently being used as a cattle and horse agistment. In the absence of the Project, continuing use of the subject site as an agricultural property will continue to degrade the on-site occurrences of Cumberland Plain Woodland and River-flat Eucalypt Forest. Since the subject site is located in the WSEA, which is an area targeted specifically for industrial development, it is reasonable to expect that future development of WSEA lands will further isolate the on-site occurrences from surrounding bushland in the long term.

Due to these reasons, the threatened ecological communities occurring on the subject site have poor capabilities and little opportunity for long term recovery. These occurrences are therefore unlikely to have high conservation significance in the long term.

In the locality of the subject site, significant areas of Cumberland Plain Woodland and River-flat Eucalypt Forest are being retained and conserved. These include the Western Sydney Regional Park, Kemps Creek Nature Reserve and woodland vegetation around Prospect Reservoir. Additional areas of sizable bushland supporting Cumberland Plain Woodland and River-flat Eucalypt Forest within adjacent precincts of the WSEA are also protected under E2 zone restrictions.

The Project, whilst having a significant impact on Cumberland Plain Woodland and River-flat Eucalypt Forest, is unlikely to have a significant impact on the overall persistence of these communities in the locality in the long term.

S6.2 Impacts on Threatened Species and Threatened Species Habitat

The subject site provides very low quality habitat for many native threatened species. No threatened plant species were recorded on the subject site. Due to the degradation of the subject site and ongoing grazing and slashing practices, the occurrence of threatened plant species is highly unlikely. The Project is unlikely to have a significant impact on threatened plant species or their habitat.

The subject site also provides very poor habitat for native threatened fauna species, particularly ground mammals, arboreal mammals, reptiles and small woodland birds. Notwithstanding this, more mobile threatened species that typically forage over a large area, such as threatened raptors and microchiropteran bats, are expected to forage within the subject from time to time as they move around the locality. However, due to the degradation of the subject site and the general lack of important habitat features such as tree hollows, these species are unlikely to roost or nest on the subject site.

The Project will remove a relatively small area of low quality foraging habitat for the Southern Myotis (*Myotis macropus*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Square-tailed Kite (*Lophoictinia isura*). The Project will also remove low quality potential foraging habitat for a number of other microchiropteran bat and raptor species recorded in the locality, such as Eastern Bentwing-bat (*Miniopterus shreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Little Eagle (*Hieraaetus morphnoides*). The Project will not remove any known or important roosting or nesting habitat for any of these species.

Better quality foraging, roosting and nesting habitat will remain for these species in the locality of the subject site in bushland around Prospect Reservoir, in Kemps Creek Nature Reserve and in the Western Sydney Regional Park.

Considering all of the above, the Project is unlikely to have a significant impact on threatened fauna species or their habitat.

S6.3 Indirect Impact on Waterways and Riparian Habitat

Areas of vegetation within the subject site, including within the riparian setback along Reedy Creek and its tributary, and in the south-east corner of the subject site will be retained as part of the Project. These areas are not proposed to be cleared under the proposed Project; however, the Project has potential to indirectly impact on the vegetation and aquatic environments within the riparian zone if no mitigation or management measures are implemented.

The riparian area was historically cleared of much of its original vegetation and currently exists in a highly degraded state. Ongoing stock grazing and trampling, weed infestation, cumulative loss of interior habitat, high nutrient loadings and other such impacts will continue to degrade the woodland and associated aquatic environments for the foreseeable future. Nevertheless, the Project has potential further impact the riparian area along Reedy Creek in a number of ways, including:

- Increased sedimentation and erosion during construction phase of the Project;
- Increased edge effects. Although the Project is unlikely to significantly increase edge effects currently affecting the existing riparian vegetation, the Project has potential to inhibit any future restoration efforts in the riparian zone if not managed adequately; and
- Downstream impacts. Beyond construction, there is potential for pollutants carried in dirty stormwater to be discharged into Reedy Creek, which would pollute waterways and adversely affect flora and fauna occurring within those waterways in the long term

If mitigation works are carried out in the riparian zone and ongoing management of this area takes place, then the biodiversity values of the riparian vegetation and the associated aquatic environments are likely to improve above its current condition.

S6.4 Impacts on Matters of NES

The Project is not expected to have significant impacts on matters of NES listed under the EPBC Act. No World Heritage properties or National Heritage places are relevant to the subject site. No areas of internationally significant wetland as listed under the Ramsar Convention are relevant to the subject site.

No threatened flora or fauna species listed under the EPBC Act were recorded on the subject site and none are likely to rely significantly on the subject site such that the Project would have an adverse impact on the long-term survival, area of occupation or recovery of the species.

Two bird species recorded on the subject site are listed as migratory and marine species under the EPBC Act. These species are Eastern Great Egret (*Ardea modesta*) and Cattle Egret (*Ardea ibis*). These species are expected to forage within the subject from time to time as they move around the locality. However, the subject site does not comprise important foraging or breeding habitat for these migratory species and therefore the Project is unlikely to have a significant detrimental impact on these species.

The native woodland on the subject site that conforms to Cumberland Plain Woodland under the TSC Act is too degraded to meet the EPBC Act listing for Cumberland Plain Woodland. No other vegetation communities on the subject site conform to any EPBC Act listed threatened ecological community. Therefore, the Project is unlikely to have a significant impact on threatened ecological communities listed under the EPBC Act.

S7 Impact Mitigation

S7.1 Avoid Impacts

The Project has few opportunities to avoid impacts to threatened species habitat and threatened ecological communities. Although different design options were considered during the design phase of the Project, the current Concept Plan is considered to be the most feasible option.

Under a "do nothing" scenario that assumes that the current land uses continue, the biodiversity values of the remnant vegetation on the subject site are likely to continue to decline. The Project, although likely to remove 13.1 ha of Cumberland Plain Woodland and 1.4 ha of River-flat Eucalypt Forest, presents opportunities to improve the condition and value of the vegetation that will be retained along Reedy Creek and its tributary. This is discussed further below.

The current Concept Plan will retain vegetation within several areas of the subject site, including within the riparian setback along Reedy Creek and its tributary, and in the south-east corner of the subject site. No development works will take place in the riparian setback excepting those activities permitted with consent within E2 zoning areas.

S7.2 Mitigate Unavoidable Impacts

Although the Project will retain the vegetation within several areas of the subject site, including within the riparian setback along Reedy Creek and its tributary, and in the south-east corner of the subject site, the Project will still have potential to indirectly impact on the vegetation and aquatic environments within these areas. Considering this, a number of mitigation measures are recommended for the Project to minimise potential impacts to native flora and fauna during both the construction and operational phases of the Project.

Construction protocols and controls are recommended during the construction phase of the Project that includes pre-clearance and dam decommissioning protocols to limit inadvertent impacts to native flora and fauna that may currently be residing on the subject site.

Ongoing management and improvement activities are recommended for the riparian area of the subject site under a coordinated riparian management plan to ensure that the biodiversity values of this area are not adversely impacted by the Project in the long term. This will also ensure that the objectives of the E2 zone "*to protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values*" are achieved.

The landscape design and planting species for the subject site should consider incorporating elements of Cumberland Plain Woodland to ameliorate as far as possible the loss of endemic plant species and habitat for native fauna.

The implementation of a stormwater management plan is also recommended to manage the stormwater flows that enter Reedy Creek from the industrial areas of the subject site.

S7.3 Compensate for Residual Impacts

Despite avoidance and mitigation measures, the Project is predicted to clear an estimated 14.5 ha of remnant native vegetation that is protected under the TSC Act, albeit in a highly modified and degraded form of the original vegetation communities. As such, Gazcorp intend to provide off site compensatory offsets by buying and retiring the appropriate types and quantities of BioBanking biodiversity credits, as guided by the BioBanking Assessment Methodology, the interim offsetting policy for State Significant projects and the latest NSW offsetting principles for major projects. Discussion of the offsetting measures proposed by Gazcorp is detailed in the body of this EIA report.

S8 Conclusion

The Project will have a significant impact on threatened ecological communities listed under the TSC Act. The proposal to clear 13.1 ha of the CEEC Cumberland Plain Woodland and 1.4 ha of EEC River-flat Eucalypt Forest is significant because these communities have undergone a very large reduction in their geographic distribution in a relatively short timeframe and are likely to become extinct if considerable effort is not made to conserve remaining occurrences. Notwithstanding this, it is noted that the occurrences of these communities on the subject site exist in a highly degraded state and have little opportunity for long term recovery. These occurrences are therefore unlikely to have high conservation significance in the long term.

The Project will remove low quality foraging habitat for the Southern Myotis (*Myotis macropus*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Square-tailed Kite (*Lophoictinia isura*), and a number of other threatened microchiropteran bat and raptor species recorded in the locality, such as Eastern Bentwing-bat (*Miniopterus shreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Little Eagle (*Hieraaetus morphnoides*). The habitat on the subject site is unlikely to be important foraging habitat for these species and Project will not remove any known or important roosting or nesting habitat. Due to the poor quality of the foraging habitat on the subject site, the Project is unlikely to have a significant impact on threatened fauna species or their habitat.

Two bird species recorded on the subject site are listed as migratory and marine species under the EPBC Act. These species are Eastern Great Egret (*Ardea modesta*) and Cattle Egret (*Ardea ibis*). These species are expected to forage within the subject from time to time as they move around the locality. However, the subject site does not comprise important foraging or breeding habitat for these migratory species and therefore the Project is unlikely to have a significant detrimental impact on these species. No other matters of NES are likely to be present on the subject site.

The Project has potential to further degrade the riparian habitat that will be retained within the E2 zoning along Reedy Creek, or to hinder restoration efforts within the riparian corridor, during either construction or operational phases of the Project. Construction protocols and controls are recommended during the construction phase of the Project that includes pre-clearance and dam decommissioning protocols to limit inadvertent impacts to native flora and fauna that may currently be residing on the subject site. Ongoing management and improvement activities are recommended for the riparian area of the subject site under a coordinated riparian management plan, in conjunction with the implementation of a stormwater management plan. The risks to the riparian habitat due to the Project can be sufficiently mitigated through the implementation of these recommended measures.

In recognition of the Project's predicted impacts on Cumberland Plain Woodland and River-flat Eucalypt Forest, Gazcorp intend to provide a BioBanking offset for the Project by purchasing and retiring the appropriate types and quantities of BioBanking biodiversity credits, as guided by the BioBanking Assessment Methodology and the interim offsetting policy for State Significant projects. Suitable credits are currently available at the time of preparation of this EIA report.

Chapter 1

Introduction

1.1 Purpose

Gazcorp Pty Ltd (Gazcorp) has commissioned an Ecological Impact Assessment (EIA) to assess a proposal for the development of an industrial estate at 813-913 Wallgrove Road, Horsley Park (Lot 5, DP 24090). The purpose of the EIA is to:

- Describe the flora and fauna values of the land proposed for development;
- Identify threatened species, populations or ecological communities present on the land. Threatened species, populations and ecological communities refer to those listed on the schedules of the NSW *Threatened Species Conservation Act 1995* (TSC Act), Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and NSW *Fisheries Management Act 1994* (FM Act);
- Assess the potential occurrence of threatened species, populations or ecological communities on the land; and
- Assess the potential impacts of the proposed industrial development on threatened species, populations or ecological communities and make recommendations for the mitigation of these potential impacts.

This EIA also addresses the need to refer the development to the Commonwealth Minister for the Environment for impacts on matters of National Environmental Significance (NES) as listed under the EPBC Act.

Gazcorp seeks a Concept and Development Approval under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the proposed development, which will be assessed as a State Significant Development (SSD) by the Department of Planning and Infrastructure (DP&I). This EIA is intended to support an Environmental Impact Statement (EIS) that is being prepared by JBA Urban Planning Consultants Pty Ltd (JBA) on behalf of Gazcorp for submission to DP&I.

1.2 Background

The proposed development (hereafter referred to as 'the Project') involves the development of 52.2 ha of land at 813-913 Wallgrove Road, Horsley Park (the 'subject site') to an industrial estate. A description of the physical characteristics of the subject site is provided below.

1.2.1 Subject Site Location and Context

It is located approximately 33 km west of the Sydney Central Business District (CBD) and is approximately 11 km to the north west of Fairfield City Centre. The subject site is part of the Fairfield City Local Government Area (LGA) but belongs to land that falls within the bounds of the Industrial Release Area governed by the *State Environmental Planning Policy (Western Sydney Employment Area) 2009* (WSEA SEPP). It is in close proximity to the M4 Motorway and its intersection with the Westlink M7 Motorway.

The subject site is positioned near a number of significant industrial areas including Eastern Creek and Minchinbury to the north, Erskine Park to the west, and Wetherill Park to the east. The nearest residential area to the subject site is Bossley Park and surrounding suburbs, which are located approximately 5.5 km to the south east, and Minchinbury approximately 4.5 km to the north west (**Figure 1.1**).

The subject site has a 680 m frontage to Wallgrove Road on the east border, which offers both on- and off-ramps from the Westlink M7 Motorway and the M4 Motorway, approximately 1 km and 2.5 km to the north respectively. Reedy Creek riparian corridor forms the western border. To the south of the subject site are fragmented rural-residential lots, which together with the subject site contain a Transgrid transmission line. A Sydney Catchment Authority (SCA) pipeline and a Roads and Maritime Services (RMS) road reserve lies on the northern border of the subject site (**Figure 1.2**).

1.2.2 Environmental Characteristics and Land Use

The terrain within the subject site is gently undulating with well structured clay soils derived from Wianamatta Shale and Tertiary and Quaternary alluvial soils associated with the Hawkesbury-Nepean River system. There is one large hill situated within the middle of the subject site, which slopes down towards the Wallgrove Road frontage to the east and towards Reedy Creek to the west. A small number of farm dams are located throughout the subject site. The only significant structures on the subject site are one large metal shed in the central north and a large stock holding yard in the west of the property. The subject site is currently being used as an agistment for cattle and horses. Grassland areas may have been pasture-improved in the past and is regularly slashed.

The subject site is largely cleared of native vegetation and is dominated by pasture grasses. The native vegetation is represented by a mosaic of regenerating patches of open forest and woodland at various stages of canopy regeneration; much of the understorey is dominated by exotic shrubs and groundcovers. A few mature canopy trees can be found scattered throughout the subject site. A narrow riparian corridor that follows Reedy Creek and its tributary arm is present along the western boundary (**Figure 1.2**).

Figure 1.1 Site Location and Context

Coordinate System: MGA Zone 56 (GDA 94)

Legend

- Subject Site
- Waterway
- 2m Contour Line

N
Grid North

Image Source:
Nearmaps dated: 1/11/2012

Data Source:
© Copyright Commonwealth of Australia
(Geoscience Australia) 2006

CUMBERLAND ECOLOGY

I:\...\80511\Figures\FFA_20130125\Figure 1.2 Site Plan 20130204

Figure 1.2 Site Plan

100 0 100 200 300 400 m

1.3 Project Description

The Project will provide for a range of distribution and warehousing facilities in the Western Sydney Employment Area (WSEA). This will involve development of the majority of the subject site, requiring the clearance of most of the existing vegetation and decommissioning of existing farm dams. A riparian buffer corresponding to environmental conservation zoning along Reedy Creek and its tributary (30 m and 20 m respectively; and see **Section 1.4i**) will be observed at the western boundary. Vegetation within the south-east corner of the site will also be retained for its amenity values as part of the landscaping of the site.

The Project is proposed to be constructed in three stages. Concept Approval is being sought for the conceptual design of the entire subject site and Development Approval is being sought for Stage 1 of the Project. Future development within the RMS road reserve at the northern boundary and within the Transgrid transmission line easement at the southern boundary of the subject site has been noted but is not assessed within this EIA. Future disturbance of these easements by the RMS and Transgrid will be subject to independent assessments.

1.3.1 Key Components

The Project will comprise the following key components:

- Conceptual design for the development of an industrial estate containing warehouse and distribution related facilities over the whole subject site (**Figure 1.3**). These will be the subject of subsequent individual development applications and are intended to be constructed in stages in response to the servicing availability and market demands. It is expected that these additional facilities will range in size, depending on tenant needs.

- Stage 1 construction of a warehouse/ distribution facility, including ancillary offices and on-site services and amenities within the western portion of the subject site as well as the associated essential infrastructure required for access and services.

- Extension of existing electrical transmission easement – an allowance has been provisioned within the subject site boundary for proposed upgrades and extensions to an existing electrical easement and transmission lines running along part of the southern subject site boundary.

- Site services and infrastructure – the Project will include a detailed whole of site utilities and services infrastructure plan, as well as an on-site water detention solution. It is currently proposed that on-site detention basins will be provided near to the western subject site boundary and in the south east corner of the subject site.

- Bulk Earthworks – A bulk earthworks strategy is being investigated to accommodate the needs of the first stage of development to be included in the Project, with the aim of achieving a practical and balanced approach to earthworks relative to the subject site topography, and allow for flexibility in the future staged development of the subject site in response to market requirements.

- Internal Road Network - Each of the warehouses will be serviced by an internal estate road capable of accommodating both heavy and light vehicles. The Project will seek development approval for a section of the proposed internal estate road to provide access to and service the warehouse development proposed as part of Stage 1.

- Ancillary Services and Development – It is intended that the future development of the subject site may include smaller ancillary developments which will provide benefit to both on-site tenants and the greater public. These developments may be positioned near to the Wallgrove Road frontage for ease of access and could include a service station, publicly accessible trade retail and similar uses. Any such development will be in accordance with permissible zoning and will be the subject of future individual development applications.

Figure 1.3 Indicative Concept Plan

1.3.2 Staging Plan

An indicative staging plan is illustrated in **Figure 1.4** and briefly described below. The staging plan may be further refined during the preparation of the Development Application for each stage.

Stage 1

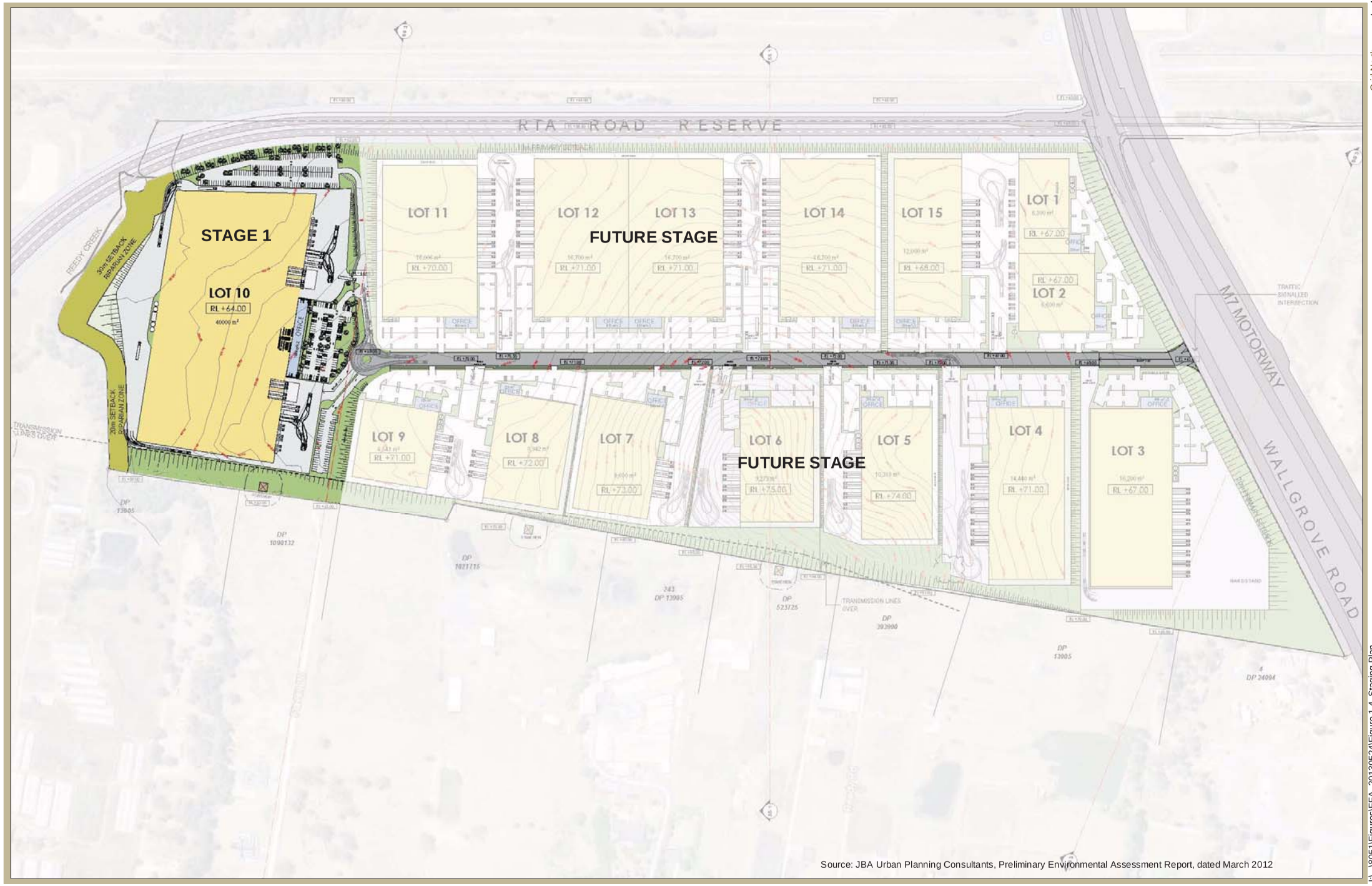
- Construction of a single warehouse development of up to 60,000sqm on the western portion of the Site;
- Construction and delivery of necessary utility services and infrastructure to the Site to accommodate the project requirements of the Stage 1 application;
- Bulk earthworks across the Site to enable development of the works proposed as part of Stage 1; and
- Site preparation works required to be undertaken in anticipation of the extension and upgrade to the electrical transmission easement along part of the southern Site boundary.

Stage 2

- Construction and delivery of utilities, services, infrastructure, internal road system and connection, and bulk earthworks to accommodate the development of the notional Stage 2 area; and
- Construction of distribution and ancillary facilities consistent with market demand. These facilities will be the subject of future development applications and approvals.

Stage 3

- Construction and delivery of utilities, services, infrastructure, internal road system and connection, and bulk earthworks to accommodate the development of the notional Stage 3 area; and
- Construction of distribution and ancillary facilities consistent with market demand. These facilities will be the subject of future development applications and approvals.



Source: JBA Urban Planning Consultants, Preliminary Environmental Assessment Report, dated March 2012

Figure 1.4. Indicative Staging Plan

1.4 Planning and Assessment Framework

This section summarises the State and Regional Planning Instruments (EPI) and key relevant environmental legislation relevant to this EIA.

i. State Environmental Planning Policy (Western Sydney Employment Area) 2009

In August 2009, the WSEA SEPP was gazetted, which provides consistent zoning and development control provisions to facilitate development of the WSEA for the purposes of employment and industry.

The zoning map for the WSEA includes areas of land zoned for industrial development and use, and areas that are zoned for environmental conservation. The environmental conservation areas are primarily located along waterways but also include larger blocks of existing bushland.

The subject site is located within Precinct 8 – "South of the Sydney Catchment Authority Warragamba Pipelines". It is part zoned IN1 – General Industrial and part zoned E2 – Environmental Conservation (see **Figure 1.5**). The E2 zoning applies to the riparian corridor for Reedy Creek, which forms the western boundary to the subject site.

Development for the purposes of an industrial estate containing warehouses and distribution facilities is permissible with consent in the IN1 Zone, and is consistent with the objectives of the zone (see **Table 1.1**), as it will:

- Provide for a range of employment-generating development including industrial, manufacturing, warehousing, storage and research uses and ancillary office space;
- Facilitate the road network link between the WSEA and the M7 Motorway; and
- Provide for small-scale local services such as commercial, retail and community facilities that service or support the needs of employment-generating uses in the zone.

Development within the E2 Zone will be limited to the permissible uses, being artificial water bodies; environmental facilities; environmental protection works; flood mitigation works; and roads (see **Table 1.1**).

Table 1.1 Zoning Table (WSEA SEPP)

	Zone IN1 General Industrial	Zone E2 Environmental Conservation
1. Objectives of zone	- To facilitate a wide range of employment-generating development including industrial, manufacturing, warehousing, storage and research uses and ancillary office space. - To encourage employment opportunities along motorway corridors, including the M7 and M4. - To minimise any adverse effect of industry on other land uses. - To facilitate road network links to the M7 and M4 Motorways. - To encourage a high standard of development that does not prejudice the sustainability of other enterprises or the environment. - To provide for small-scale local services such as commercial, retail and community facilities (including child care facilities) that service or support the needs of employment-generating uses in the zone.	- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. - To prevent development that could destroy, damage or otherwise have an adverse effect on those values.
2. Permitted without consent	Nil.	Nil
3. Permitted with consent	Depots; Food and drink premises; Freight transport facilities; Industrial retail outlets; Industrial training facilities; Industries (other than offensive or hazardous industries); Neighbourhood shops; Roads; Service stations; Transport depots; Truck depots; Warehouse or distribution centres.	Artificial waterbodies; Environmental facilities; Environmental protection works; Flood mitigation works; Roads.
4. Prohibited	Any development not specified in item 2 or 3.	Any development not specified in item 2 or 3.

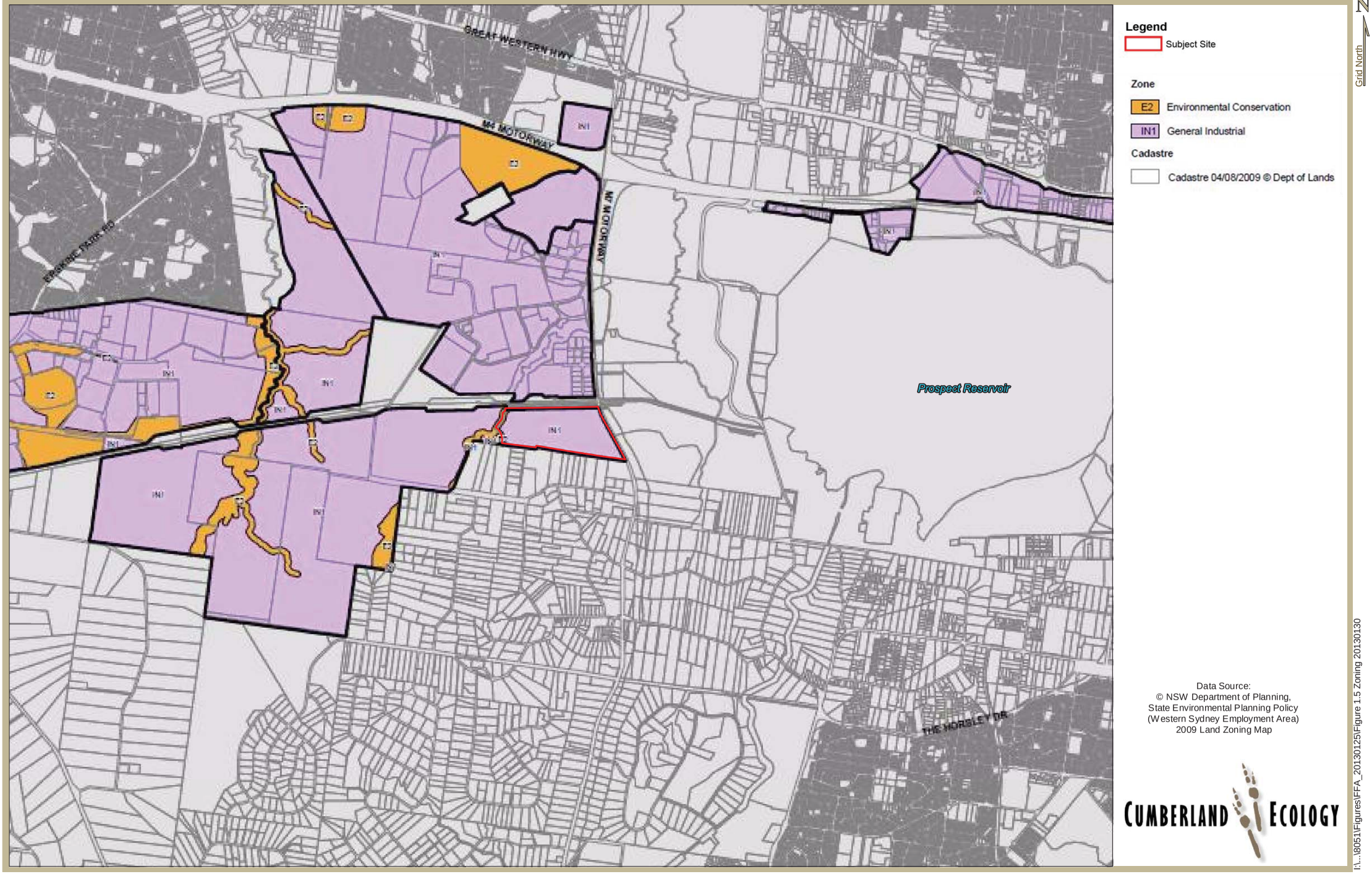


Figure 1.5 Western Sydney Employment Area Zoning Map

ii. Environmental Planning and Assessment Act 1999

The EP&A Act is the overarching planning legislation in NSW. The EP&A Act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the consideration of the environment and biodiversity values, which is addressed in Section 5A (Significant effect on species, populations or ecological communities or their habitats). This includes threatened species, communities, habitat and processes as listed under the TSC Act and FM Act.

Stage 1 of the Project is considered to be SSD under the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) and therefore the Project will be assessed by DP&I. Director-General's Requirements have been requested from and issued by DP&I for the preparation of the EIS.

The DGRs relevant to flora and fauna are reproduced in **Table 1.2** below. This EIA has been prepared to address the DGRs pertaining to flora and fauna.

Table 1.2 Director-General's Requirements for the Project

Key Issue	Requirement
10. Flora and Fauna	*Undertake a fauna and flora survey of the site in accordance with the OEH Threatened Species Survey and Assessment Guidelines or Biobanking Assessment Methodology.* *Identify any known Endangered Ecological Communities (EECs) and/or threatened species that occur on the site.* *Address impacts on flora and fauna, including threatened species, populations and EECs and their habitats and steps taken to mitigate any identified impacts to protect the environment.* *Any impacts on threatened species, populations and endangered ecological communities that cannot be avoided or mitigated must be adequately offset in accordance with OEH Principles for the Use of Biodiversity Offsets in NSW.* *Identify all watercourses on the site and provide scaled plans showing the location of the top of bank, riparian land, and any remnant vegetation surrounding the watercourses.* *Provide a description of any design features and measures to be incorporated as part of the proposal to prevent environmental disturbances (short and long term), particularly in respect of*

Table 1.2 Director-General's Requirements for the Project

Key Issue	Requirement
	maintaining the natural hydrological regime and identification of riparian buffers. *Address any potential ecological impacts from stormwater runoff entering into adjoining Reedy Creek.*

iii. Threatened Species Conservation Act 1995

The TSC Act is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The TSC Act aims to protect and encourage the recovery of threatened species, populations and communities that are listed under the Act through threat abatement and species recovery programs.

The TSC Act requires consideration of whether a development (Part 4) or an activity (Part 5) is likely to significantly impact threatened species, populations, communities or their habitat. The potential impacts of any developments, land use changes or activities would need to undergo an "Assessment of Significance" under Section 5A of the EP&A Act (also known as the "seven-part test".

Assessments of Significance have been completed as part of the preparation of this EIA (**Appendix A**) and are discussed within this report.

iv. Fisheries Management Act 1994

Threatened species legislation in NSW consists of both the FM Act, and the TSC Act. The FM Act deals with threatened fish and marine vegetation and associated threatening processes and is administered by the NSW Department of Primary Industries (DPI). The TSC Act deals with all other threatened biota and threatening processes in the State and is administered by the NSW Office of Environment and Heritage (OEH).

Under the FM Act, "fish" means marine, estuarine or freshwater fish or other aquatic animal life at any stage of their life history and includes molluscs, crustaceans, echinoderms, beach worms and other polychaetes.

v. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage eight nationally and internationally important items including flora, fauna, ecological communities and heritage places. These items are referred to in the EPBC Act as matters of NES.

The eight matters of NES are:

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance (listed under the Ramsar Convention);
- Listed threatened species and communities;
- Migratory species protected under international agreements;
- Commonwealth marine areas;
- The Great Barrier Reef marine park; and
- Nuclear actions (including uranium mines).

Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on matters of NES (including nationally threatened ecological communities and species, and listed migratory species) must be referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPAC). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

vi. Other Relevant Policies and Guidelines

Other policies and guidelines relevant to the preparation of the EIA include the following:

- Draft Fairfield Biodiversity Strategy 2010 (Eco Logical Australia, 2010);
- OEH Threatened Species Survey and Assessment Guidelines (OEH, 2011b);
- OEH Principles for the Use of Biodiversity Offsets in NSW (OEH, 2011a); and
- BioBanking Assessment Methodology (DECC, 2008).

Methodology

2.1 Desktop Study

2.1.1 Literature Review

The WSEA has been investigated in detail in recent years due to the number of development and infrastructure projects that have been put forward under the Sydney Metropolitan Strategy initiatives for employment creation in Western Sydney. As such, baseline ecological data relevant to the subject site and its surrounds exist and have been used to inform the assessment of the Project.

Information on local biodiversity values were obtained by reviewing assessments conducted within the locality (within 10 km) of the subject site (see **Figure 2.1**). This included, but was not limited to, a review of the ecological studies carried out for the following projects:

- Oakdale Concept Plan (Cumberland Ecology, 2007a);
- Minchinbury Employment Park (Cumberland Ecology, 2009a);
- Bungarribee Industrial Estate (Eco Logical Australia, 2007);
- Eastern Creek Business Hub (Eco Logical Australia, 2012);
- Eastern Creek Waste and Recycling Facility (Leonard *et al.*, 2009);
- Erskine Park Link Road, Ropes Creek Realignment (Parsons Brinckerhoff, 2010); and
- Ropes Creek Industrial Estate (Whelans InSites, 2010).

The information from these studies were used to gain an understanding of the biodiversity of the subject site in its local context and to develop a list of threatened species and ecological communities that have potential to occur on the subject site.

Figure 2.1 Key Ecological Study Sites in the Locality of the Subject Site

Other relevant background documents were reviewed and include:

- The draft Fairfield Biodiversity Strategy (Eco Logical Australia, 2010);
- Final determinations for relevant threatened ecological communities;
- Relevant threatened species profiles and recovery plans; and
- Native vegetation mapping for the Cumberland Plain (NSW NPWS, 2002; Tozer *et al.*, 2010).

2.1.2 Database Records

Threatened species records were accessed from the OEH BioNet database (OEH, 2013). The number and age of records of threatened species recorded within the locality of the subject site were used to assess the likelihood of occurrence of threatened species.

The SEWPAC Protected Matters Search Tool (SEWPAC, 2013c) was also used to generate a report of the predicted occurrences of matters of NES in the locality of the subject site. The Protected Matters Search Tool provides a list of matters of NES that are predicted to occur based on the presence of suitable habitat, which was used to guide threatened species searches during field surveys and to assist in the assessment of impacts to threatened species.

2.2 Field Study

Field investigations were carried out as part of the EIA to:

- Identify and evaluate the condition and extent of existing vegetation communities and grassland vegetation;
- Identify any threatened flora and fauna species present on the subject site; and
- Assess the nature and extent of habitat for threatened flora and fauna.

All field surveys were conducted in a manner consistent with current threatened species survey guidelines (OEH, 2011b) and the methods prescribed in the BioBanking Assessment Methodology Operational Manual (DECC, 2009). Field surveys were conducted initially in 2008 and further work carried out in summer 2012-2013; these dates are summarised in **Table 2.1** below. The general weather conditions during survey are summarised in **Table 2.2**.

Table 2.1 Survey Dates

Dates	Tasks completed	Ecologists
11, 18 and 24 June 2008	Flora surveys Fauna surveys Habitat assessment	John Whyte
25 September 2008	Flora surveys Habitat assessment	Dr. David Robertson and Cecilia Phu
8 October 2008	Fauna surveys Habitat assessment	Cecilia Phu and Grant Webster
16 November 2012	Site inspection	Dr. David Robertson and Cecilia Phu
19 and 20 November 2012	Fauna surveys Habitat assessment	Dr Gitanjali Katrak and Michelle Frolich
17 and 18 January 2013	Flora surveys Fauna surveys Habitat assessment	Dr. David Robertson and Cecilia Phu
21 January 2013	Flora surveys Habitat assessment	Dr. David Robertson and Cecilia Phu

Table 2.2 Weather Observations for the Survey Period

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)
11/06/2008	12.4	19.8	1.8*
18/06/2008	13.5	19.9	0*
24/06/2008	3.9	17.9	0*
25/09/2008	8.1	21	0*
8/10/2008	6.8	21.3	0*
16/11/2012	15.8	17.5	1
19/11/2012	10	21.6	0
20/11/2012	13.2	22.6	3.2
17/01/2013	18.3	33.4	0
18/01/2013	19.3	44.9	0
21/01/2013	19.3	29.8	0

Observations were drawn from Horsley Park Equestrian Centre AWS (station 067119).

**Not completed or unknown dataset.*

The field survey methods completed on the subject site are summarised in **Table 2.3** and are described in further detail in the following sections. Locations of survey are shown in **Figure 2.2** at the end of this chapter.

Table 2.3 Field Survey Methods and Effort

Survey Method	Survey Effort (2008)	Survey Effort (2012-13)
Flora		
Plot sampling (20 x 20 metre)		10 x quadrats
Meander transects	throughout survey period	
Area searches	7 x area search sites	
Diurnal Birds		
Opportunistic sightings	throughout survey period	throughout survey period
Area census	7 x area search sites, 30 minutes/site	
Nocturnal Birds		
Spotlighting	4 hours x 2 nights	2 person hours x 4 nights
Bats		
Ultrasonic echolocation recording		1 hour x 4 nights
Cumberland Land Snail		
Habitat searches	throughout survey period	throughout survey period
Amphibians		
Aural and visual habitat searches	4 hours x 2 nights	2 person hours x 4 nights
Other Fauna		
Opportunistic sightings	throughout survey period	throughout survey period
Spotlighting	4 hours x 2 nights	2 person hours x 4 nights
Habitat Assessment		
Visual inspection	throughout survey period	throughout survey period
Systematic plots (20 x 50 metre)		10 x plots

2.2.1 Flora Surveys

Flora surveys were conducted to map vegetation communities and assess the presence of threatened species that were considered to have potential to occur. These surveys involved:

- Full floristic survey using 20 x 20 m sampling plots (i.e. quadrats) to collect compositional and structural information of the vegetation;
- Random meander transects across the entire subject site to collect data on the condition and distribution extent of vegetation communities; and
- Targeted searches for threatened species in areas of suitable habitat.

Details of the flora survey are described below.

i. Vegetation Mapping

Meander transect surveys were conducted to ground-truth the occurrence and extent of different community types and to obtain a thorough understanding of key remnant areas of vegetation (general site floristics; topographical characters; and aspect). Records of vegetation units and boundary changes were made using a handheld Global Positioning Systems (GPS) unit. Broad units were sampled in representative areas using 20 x 20 m quadrats to obtain site-specific information on floristics and community structure.

Ecological communities were determined by comparing quadrat data and field notes against published information, including regional mapping completed for the Cumberland Plain (NSW NPWS, 2002; Tozer *et al.*, 2010). Since all vegetation communities within Fairfield City LGA are listed under the TSC Act as threatened ecological communities (Eco Logical Australia, 2010), the vegetation of the subject site was compared with descriptions within the TSC Act Final Determinations and EPBC Act Listing Advices to determine the consistency with a number of different threatened communities known to occur in the locality.

A vegetation map of the subject site was created using Geographical Information Systems (GIS) and was based on the results of survey. Aerial and topographical data were also used to interpret the survey data. GIS mapping was completed using MapInfo Version 10.5 (Pitney Bowes Software Inc., 2010) on a Windows XP platform.

ii. Quadrat Sampling

Systematic floristic sampling was completed in 20 x 20 m quadrats in representative areas of vegetation. Ten quadrats were collected in total. As a minimum, the following information was collected from each quadrat:

- All vascular flora species present within the plot or directly adjacent to the plot;
- The stratum in which each species occurred;
- The relative frequency of occurrence and abundance of each plant species;

- Vegetation structural data (i.e. height and percentage cover of each stratum);
- A waypoint to mark the location of the quadrat, using a handheld GPS; and
- Photographs of the vegetation within the quadrat.

These data are supplied in **Appendix B**.

The relative frequency of occurrence and abundance of each species within the quadrat was approximated using a scoring system adapted from the Braun-blanquet scoring system (Braun-Blanquet, 1927) and Tozer *et al.* (2010). The scores used in the flora sampling work are defined in **Table 2.4**.

Table 2.4 Frequency-abundance Scores used in Quadrat Sampling

Score	% cover	relative abundance	notes
1	less than 5%	rare	1-3 individuals in a 400 m² area
2	less than 5%	occasional	more than 3 individuals in a 400 m² area
3	less than 5%	common	-
4	less than 5%	very common	-
5	5-25%	-	covers from 20-100 m² area
6	26-50%	-	covers from 100-200 m² area
7	51-75%	-	covers from 200-300 m² area
8	76-100%	-	covers from 300-400 m² area

iii. Biometric Condition Assessment

The condition of each vegetation community was assessed as being in 'low condition' or in 'moderate to good condition' in accordance with the following biometric definition of low condition vegetation (from DECC, 2008, p. 4):

1. Woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and:
   - Less than 50% of ground cover vegetation is indigenous species, or
   - Greater than 90% of ground cover vegetation is cleared.
2. Native grassland, wetland or herbfield where:
   - Less than 50% of ground cover vegetation is indigenous species, or
   - More than 90% of ground cover vegetation is cleared.

Biometric data of over-storey cover collected during field survey was compared with benchmark values identified for each vegetation community present on the subject site. Benchmark values for each vegetation community were obtained from the BioBanking Vegetation Benchmarks database (OEH, 2008) for the Hawkesbury-Nepean region. The biometric data and the analysis of these data are presented in **Appendix B**.

Any native vegetation that was not in low condition was categorised as being in moderate to good condition.

iv. Interpretive Guidelines for Identifying Cumberland Plain Woodland

As the desktop study indicated that the threatened ecological community Cumberland Plain Woodland would be present on the subject site, guidelines for the identification of this community were considered when carrying out field mapping studies. These guidelines are described below.

a. Condition Thresholds under the EPBC Act

The EPBC Act Listing Advice prescribes a set of condition thresholds that woodland patches must meet in order to be considered the threatened ecological community Cumberland Plain Woodland. Degraded patches that no longer retain sufficient conservation values to meet these condition thresholds are not considered to be listed under the EPBC Act as Cumberland Plain Woodland. The condition thresholds are intended to focus national legal protection on native vegetation patches that are functional, relatively natural and in relatively good condition.

The condition thresholds from the EPBC Act Listing Advice for Cumberland Plain Woodland are reproduced as a flowchart of key diagnostic features and condition thresholds that should be applied to data collected from on-site assessments. This flowchart provides a prescriptive method of determining whether a patch of native vegetation is part of the listed ecological community (SEWPAC, 2010, p. 11). This flowchart is included in **Appendix C** of this EIA for reference.

b. Inclusion of 'Derived' Native Grasslands under the TSC Act

The TSC Act listing for Cumberland Plain Woodland includes areas of native grassland that are not natural grassland communities but rather were derived from the clearing of canopy trees and/or shrubs of Cumberland Plain Woodland. Whilst there is no formal prescriptive method for identifying native grasslands that are derived from the clearing of Cumberland Plain Woodland canopy and mid-storey, the TSC Act listing states that:

> *"Native grasslands derived from clearing of the woodland and forest are also part of this community if they contain characteristic non-woody species listed in paragraph 3 [of the listing]."*

The above passage indicates that to be included in the TSC Act listing for Cumberland Plain Woodland, the grassland being assessed must be predominantly native, i.e. be dominated by native grasses, and contain at least one of the characteristic native non-woody species.

v. Floristic Census

A floristic census was carried out as part of the quadrat sampling described above. In addition to this, area searches were carried out at seven locations in vegetation representative of the larger vegetation patch. Additional incidental species were also recorded during random meander transects of the subject site. A list of all the plant species recorded from the subject site during surveys is provided in **Appendix B**.

As part of a floristic census, all vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990; 1991; 1992; 1993). Other references used to assist identification of selected plant taxa include Richardson *et al* (2006) and Brooker and Kleinig (1990). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (2013). Any specimens that were not readily identifiable were lodged for identification with the National Herbarium of NSW at the Royal Botanic Gardens, Sydney.

vi. Threatened Species Targeted Searches

Targeted searches were undertaken across the subject site for threatened flora species considered to have potential to occur. Species specifically targeted included those that are known to occur in the woodlands in Western Sydney, including *Pimelea spicata* (Spiked Rice-flower), *Grevillea juniperina* (Juniper-leaved Grevillea) and *Acacia pubescens* (Downy Wattle). Targeted surveys were conducted firstly through random meander surveys and then meander-transect surveys of suitable areas of habitat.

2.2.2 Habitat Assessment

The assemblage of fauna species within the subject site is influenced by habitat availability and other factors such as habitat condition and complexity, patch size, configuration and connectivity to other areas of intact vegetation. These factors affect the quality of the habitat on a broader, landscape scale. The subject site is dominated by grassland and very young regrowth woodland.

Habitat condition was assessed by noting ground, shrub/understorey and canopy cover; number and size of tree hollows present; habitat features such as bush rock, fallen trees, forage trees and wetland areas such as creeks and soaks. Notes on the structural complexity of vegetation, the age structure of the vegetation and the nature and extent of human disturbance in the subject site and surrounds were also recorded and considered.

Indirect indicators of fauna use of the site such as droppings, diggings, footprints, scratches, nests, burrows, paths and runways were noted.

Quantitative measures of habitat quality were collected within 20 x 50 m sampling plots. The variables measured included:

- Cumulative length of fallen logs (m);
- Number of tree hollows;

- Number of trees with hollows; and
- Proportion of canopy species that are regenerating (%).

Logs included in the measure were of 10 cm diameter or more and were at least 0.5 m in length. Hollows were only recorded if they had an entrance size of at least 5 cm diameter and were at least 1 m above the ground. These data are presented in **Appendix B**.

2.2.3 Fauna Surveys

i. Birds

Area searches were carried out at seven survey locations in representative vegetation patches. Searches were carried out at different times of the day and over a 30 minute observation period each. All bird species that were sighted or heard calling within a 30 minute observation block were recorded.

Spotlight searches for nocturnal bird species were carried out over a total of four nights totalling 16 hours. All bird species that were sighted or heard calling were recorded.

Birds that were opportunistically observed or heard calling throughout the survey period were recorded.

ii. Microchiropteran Bats

Surveys to detect the presence of various microchiropteran bat species were carried out using ultrasonic echolocation detectors (AnaBat SD1, Titley Electronics). Walking transects were conducted on four nights. Each walking transect was carried out for 1 hour after dusk in woodland, riparian forest and around dams.

Ultrasonic echolocation recordings were analysed by Greg Ford from Balance! Environmental.

iii. Cumberland Land Snail

Active searches for Cumberland Land Snail (*Meridolum corneovirens*) were carried out across the subject site throughout the survey period. This entailed searches of litter and other debris at the bases of *Eucalyptus tereticornis* (Forest Red Gum) trees.

Snails were identified from photographic records by Dr. Stephanie Clark from Invertebrate Identification Australasia.

iv. Frogs

Active searches for frog species were conducted over two nights and involved visual and aural searches of roads and tracks, and damp areas such as drainage lines, fringing vegetation and areas of standing water (e.g. dams). Any frogs observed or heard calling were recorded.

v. Opportunistic Sightings

Any other fauna species opportunistically seen or heard during the survey period were recorded.

A list of all the fauna species detected from the subject site during surveys is provided in **Appendix B**.

2.3 Limitations

The biodiversity values in the locality of the subject site are well known as a result of a number of ecological studies that have been completed for various projects. As a result, detailed baseline vegetation and fauna data (including threatened species known and expected to occur within the locality) exists and are well documented. This information was used to guide field surveys and was considered during the assessment of threatened species, populations and ecological communities.

Weather conditions during frog searches, ultrasonic echolocation detection recordings and other nocturnal surveys were ideal because of preceding weeks of rain, warm evening temperatures and high insect activity.

Many plant species present on the subject site, such as grass and shrub species, show signs of grazing stress and occur in suppressed growth forms or are very small. Notwithstanding this, many features used in species identification are present, such as old seed heads, flowers, and leaf characteristics. It is probable that the majority of plant species have been recorded.

The field data acquired through field surveys are intended to be indicative of the types of species that could occur and not an absolute census of all flora and fauna species of the subject site. Although many species were detected during field surveys, additional species are likely to be present that have not been observed. Factors such as inclement weather, seasonality, migration schedules, population density and cryptic life histories can all affect the ability to detect species on ground. As a precautionary approach, the presence of suitable habitat was considered when assessing the potential occurrence of a given threatened species. Where potential habitat was present and the species was known to occur at other locations in the locality, it was assumed that the species had potential to occur and were thus assessed accordingly.

When the baseline information available from the locality is considered with the field data, the resultant information is considered to be sufficiently comprehensive to adequately support the assessment of threatened species, populations and ecological communities.

Coordinate System: MGA Zone 56 (GDA 94)

Legend

Subject Site

Waterway

Surveys

January 2013

Vegetation Quadrat

Bat Recording

Random Meander

November 2012

Random Meander

June 2008

Area searches for plants and birds

Grid North

Image Source:
Nearmaps dated: 1/11/2012

Data Source:
© Copyright Commonwealth of Australia
(Geoscience Australia) 2006

CUMBERLAND ECOLOGY

I:\...\80511\Figures\FFA_20130125\Figure 2.2 Survey Locations 20130130

Figure 2.2 Survey Locations

100 0 100 200 300 400 m

Chapter 3

Results

3.1 Vegetation of the Subject Site

The subject site is located on the Cumberland Plain, which is in the Western Sydney region of the Sydney Basin. The Cumberland Plain is characterised by gently undulating plains and low hills formed on fertile clay soils derived from Wianamatta Shale and rich Tertiary and Quaternary alluvial soils associated with the Hawkesbury-Nepean River system (DEC (NSW), 2005).

The Cumberland Plain supports a number of different dry woodland and open forest communities. Originally, the woodlands and open forests of the Cumberland Plain would have been extensive across the region and would have been characterised by a species-rich grassy understorey with a sparse or locally dense shrub layer. Due to the agricultural value of the land, the Cumberland Plain was heavily cleared in the early years of settlement for grazing and cropping purposes (Benson and Howell, 1990). The Cumberland Plain continues to support agriculture, urban expansion and industrial development (DEC (NSW), 2005). In 2003, only 12% of the original extent of pre-European native vegetation cover on the Cumberland Plain was reported to remain as intact bushland (Tozer, 2003); this figure is likely to be much less today. As a result of extensive historical and ongoing land clearing, the majority of the vegetation communities on the Cumberland Plain are now formally listed as threatened ecological communities under legislation (DECCW (NSW), 2011).

The declining extent of native vegetation on the subject site is consistent with the trends in the region. Vegetation mapping of the Cumberland Plain in 2002 (see **Figure 3.1**) shows that the subject site was dominated by grassland but retained sizable areas of Shale Plains Woodland, Shale Hills Woodland and Alluvial Woodland (NSW NPWS, 2002). Current vegetation mapping in 2012 by Cumberland Ecology (see **Figure 3.2**) shows a further decline in the extent of these communities on the subject site. The extent of vegetation validated on the subject site by the current field surveys is summarised in **Table 3.1**.

The subject site has been used as an agistment for cattle and horses for many years and is now largely dominated by exotic grassland that has possibly been pasture-improved in the past. Small patches of very young regenerating woodland are scattered across the subject site. Notwithstanding this, the vegetation communities present on the subject site are listed as threatened ecological communities under the TSC Act. Descriptions of the vegetation communities are provided in the following sections.

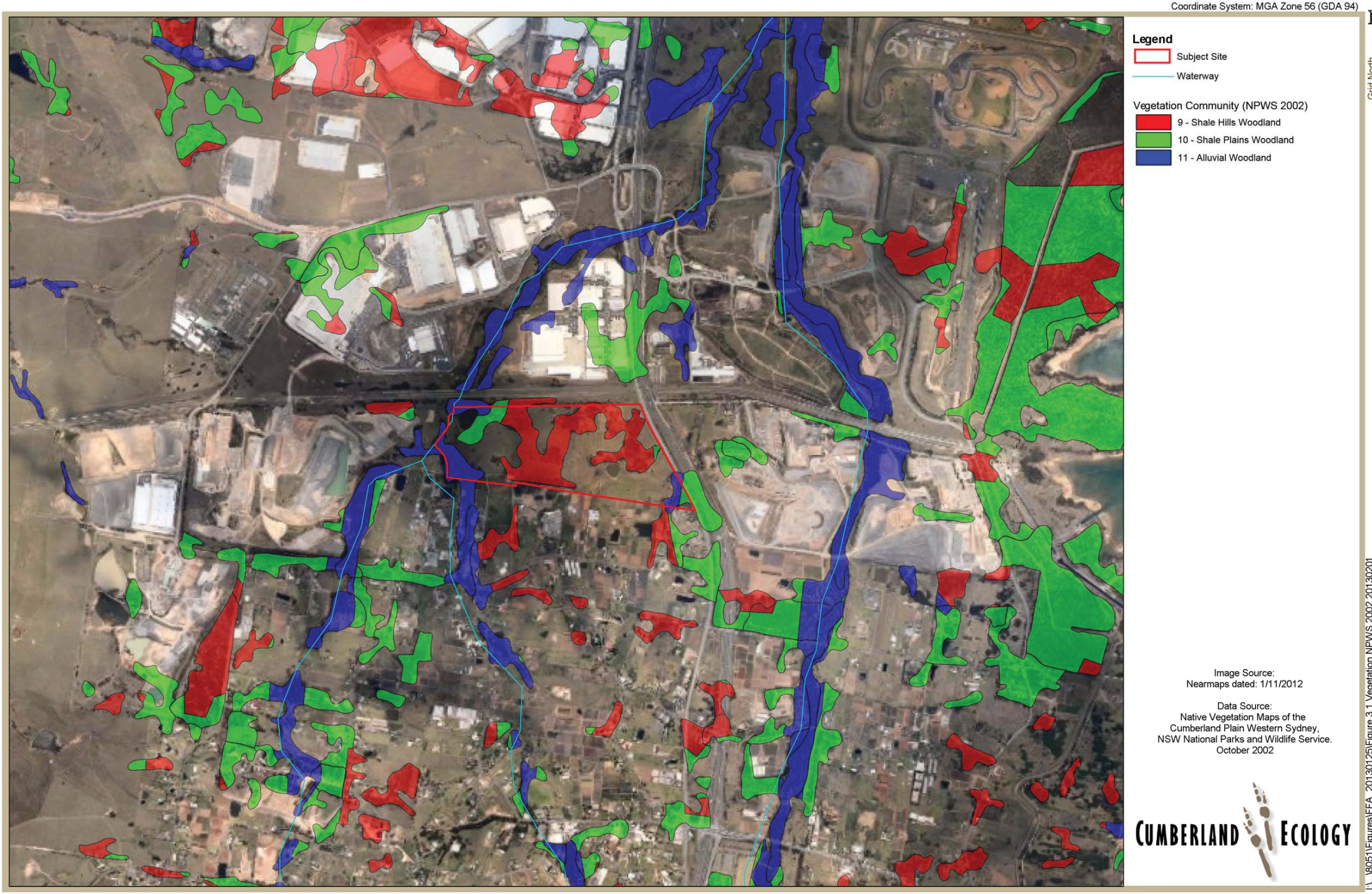


Figure 3.1 Vegetation Communities in the Locality (NPWS 2002)