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Stockland Developments Pty Ltd

Vincentia Masterplan

Giant Dragonfly Impact Assessment

Report

January 2006

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1. Introduction

1.1 Aim

GHD Pty Ltd was commissioned by Stockland Developments Pty Ltd to undertake an assessment of the likely impacts on the Giant Dragonfly (*Petalura gigantea*) (Leach 1815) of the proposed development which is to be located at the corner of The Wool Road and Jervis Bay Road, Vincentia NSW. Stockland is seeking approval for a residential subdivision and concept approval for a district town centre across the 127 hectare (ha) site (Figure 1). As a part of an application under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A) a Species Impact Statement (SIS) has been prepared (ERM 2006) and this report forms an addendum to the SIS documentation.


1.2 Background

The Giant Dragonfly is listed as an Endangered species under Schedule 1, Part 1 of the NSW *Threatened Species Conservation Act 1995* (TSC Act). Although this species was not listed as a target species in the Director-General's requirements issued on 17 December 2003 by the then NSW National Parks and Wildlife Service this species was recorded opportunistically on the subject site. These sightings included:

- ▶ The Giant Dragonfly was recorded on the subject site by Glenn Hoyer (Fly By Night Bat Surveys Pty Ltd) who sighted an adult on two occasions whilst undertaking microchiropteran bat surveys in December 2004; and
- ▶ During the 2005 / 2006 Threatened Species Orchid Monitoring three additional individuals were sighted.

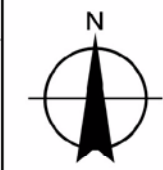
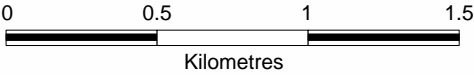
These sightings prompted an assessment of the impacts on the Giant Dragonfly in accordance with s.110 (2)(a) of the TSC Act.



 Study Area

VERSION: 19/1/06

PROJECT NO: 21-14337



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Project: **Stockland Proposal**

Figure 1 Site Location

2. Methodology

A large body of ecological work has been undertaken across the 127 ha subject site over a number of years (refer ERM 2006 for a review). Consequently, detailed and fine-scale mapping of vegetation communities and fauna habitat is available for the entire site. This detailed background information was used to assess the likely impacts of the proposed development on this species through consideration of known life history requirements and vegetation communities across the site. These data were used to assess areas of potential foraging and breeding habitat for this species and the likely impacts of this proposal on the Giant Dragonfly on the subject site, locality and region.

3. Results

3.1 Species Description and Life History

The Giant Dragonfly is one of the few extant species belonging to the ancient Petaluridae family of the Order Odonata (Richards & Davies 1960). It is known from swamps, streamlines and seepages with a deep soil base (J. Trueman, pers. comm.). This species has a larval stage lasting between 10 and 30 years during which time larvae occupy a permanent chambered burrow built under swamps and emerge from terrestrial entrances at night during wet weather to feed on insects and other arthropods (DEC 2004). The larvae are thought to be unique in their avoidance of water, as they are not known to swim or to occur around areas of open water. The availability of larval habitat is of major importance as this determines the ability of this species to breed and survive (J. Trueman, pers. comm.).

Adults emerge between October and November and fly until late January (DEC 2004). The adult is extremely large with the female being the larger of the two sexes (Table 1) (Figure 2 and Figure 3).

Table 1 Size differential between male and female Giant Dragonfly

Dragonfly Sex	Feature	Size range (mm)
Male	Abdomen	65 – 75
Female	Abdomen	90 - 100
Male	Wingspan	110 – 120
Female	Wingspan	120 – 130

Source: DEC 2004

The adults are obligate carnivores patrolling foraging areas during the day. This species is an extremely poor flier and will remain within 200 – 300 m (perhaps up to 500 m) of their breeding habitat (J. Trueman, pers. comm.).

3.2 Key Threats

The exceedingly long larval stage combined with poor dispersal capabilities makes populations of this species prone to extinction events especially through the loss of breeding habitat as a consequence of vegetation clearance, infilling burrow areas or changes to water regimes.

Figure 2 Giant Dragonfly (*Petalura gigantea*) – Male



Figure 3 Giant Dragonfly (*Petalura gigantea*) – Female



3.3 Species Records and Overall Distribution

Records of this species are known from permanent coastal and upland wetlands of New South Wales and southern Queensland. The most southerly record is of a single male from Nadgee Nature Reserve in the south-eastern corner of NSW during summer 2003. Its northern extent is likely to be southern Queensland. The largest known population of the species is from Moss Vale approximately 200 km southwest of Sydney, NSW in sphagnum swamp areas within Wingecarribee Swamp (DEC 2004).

Although no records exist on the NPWS Atlas of Wildlife Database within 10 km of the subject site, another population has been recorded at Green Patch around 9.5 km from the subject site in Booderee National Park (J. Trueman, pers. comm.).

3.4 Records on the Subject Site

One adult of the Giant Dragonfly was identified and another trapped on the subject site in December 2004. These observations have been recorded and plotted on Figure 4. Both records occur within the *Eucalyptus sclerophylla* / *Corymbia gummifera* Open-woodland which occurs on mid slopes in the northern corner of the subject site (ERM 2006). This area is dominated by mature *E. sclerophylla* and *C. gummifera* and grades into open forest and woodland communities. It had a low shrub layer and an open ground layer of native grasses, sedges and herbs. A denser shrub layer of *Leptospermum polygalifolium* subsp. *polygalifolium* occurred on the south-east facing slopes where the soil appears to be more waterlogged. It is likely that the individual(s) sighted was foraging across this area.

Due to the poor dispersal capabilities of this species it is considered likely that this individual(s) would have emerged from larval burrows in the *Eucalyptus longifolia* Open-woodland (ERM 2006) which occurs along the riparian zones of the Central and Western creeks and provides suitable habitat (J. Trueman, pers. comm.). *E. longifolia* is the dominant canopy species in this community and *Melaleuca lineariifolia* dominates the shrub layer. Ground layer species include *Lomandra longifolia*, *Hydrocotyle laxiflora*, *Centella asiatica*, *Juncus continuus*, *Dampiera stricta* and *Lepyrodia scariosa* (ERM 2006). Individuals recorded in 2004 were approximately 220 m to the west and / or 100 m to the east of these areas.

In November 2005, a male and female Giant Dragonfly was observed on the subject site during Threatened Species Orchid Monitoring on two separate occasions (Figure 4). Two individuals were recorded in the heath community of *Banksia ericifolia* / *Hakea teretifolia*. This area is characterised by low to tall and open to very dense shrub layer of *Banksia ericifolia*, *Allocasuarina distyla*, *Hakea teretifolia* and *Viminaria juncea* (ERM 2006). One other dragonfly was recorded on a different day in the sedgeland community of *Lepidosperma laterale*. This community occurs in waterlogged soils and has a dense to very dense ground layer. The dominant species is *Lepidosperma laterale* and other common species include *Juncus pallidus* and *Entolasia stricta* (ERM 2006). It is likely that the individuals sighted were foraging in the shrub and sedgeland. The closest drainage line is approximately 100 m to the north of the most southerly records and around 50 m to the north of the Eastern creek. The Central creek is over

700 m to the north of the most southerly records suggesting that these individuals would be breeding within the habitat of the Eastern creek.

The riparian areas of the subject site are considered potential breeding habitat (Figure 4) as they contain very little or no standing water but have a high soil moisture content and therefore support large boggy areas. Based on the poor flying capabilities of this species it is possible that areas within at least 200 – 300 m of the riparian zones would provide potential foraging habitat. All records on the subject site were within 300 m of a riparian area.

3.5 Potential Habitat within the Locality

The Giant Dragonfly was recorded foraging in three of the vegetation communities known to occur on site and these are:

- ▶ *Eucalyptus sclerophylla* / *Corymbia gummifera* Open-woodland in which this species was recorded foraging corresponds to Vegetation Community 5.4 *Eucalyptus sclerophylla* / *Corymbia gummifera* Forest as mapped by Mills (1993). This community is considered to be relatively widespread within the locality;
- ▶ *Banksia ericifolia* / *Hakea teretifolia* Heathland occurs east of Moona Creek Road and north of The Wool Road and grades into woodland, open-woodland and sedgeland communities. This community corresponded to Community 4.3 Mallee - heathland of Mills (1993), which is widespread on sandstone soils and is botanically significant in the Jervis Bay region because it is floristically rich and contains many rare plants; and
- ▶ *Lepidosperma laterale* Sedgeland occurs on waterlogged soils in the north-west of the Commercial Site and grades into *Anisopogon avenaceus* Grassland and *Eucalyptus sclerophylla* Low Open-woodland. This sedgeland corresponds to Community 4.4 Sedgeland – heathland (fresh swamp) of Mills (1993), which is widespread on sandstone soils and is botanically significant in the Jervis Bay region because it is floristically rich.

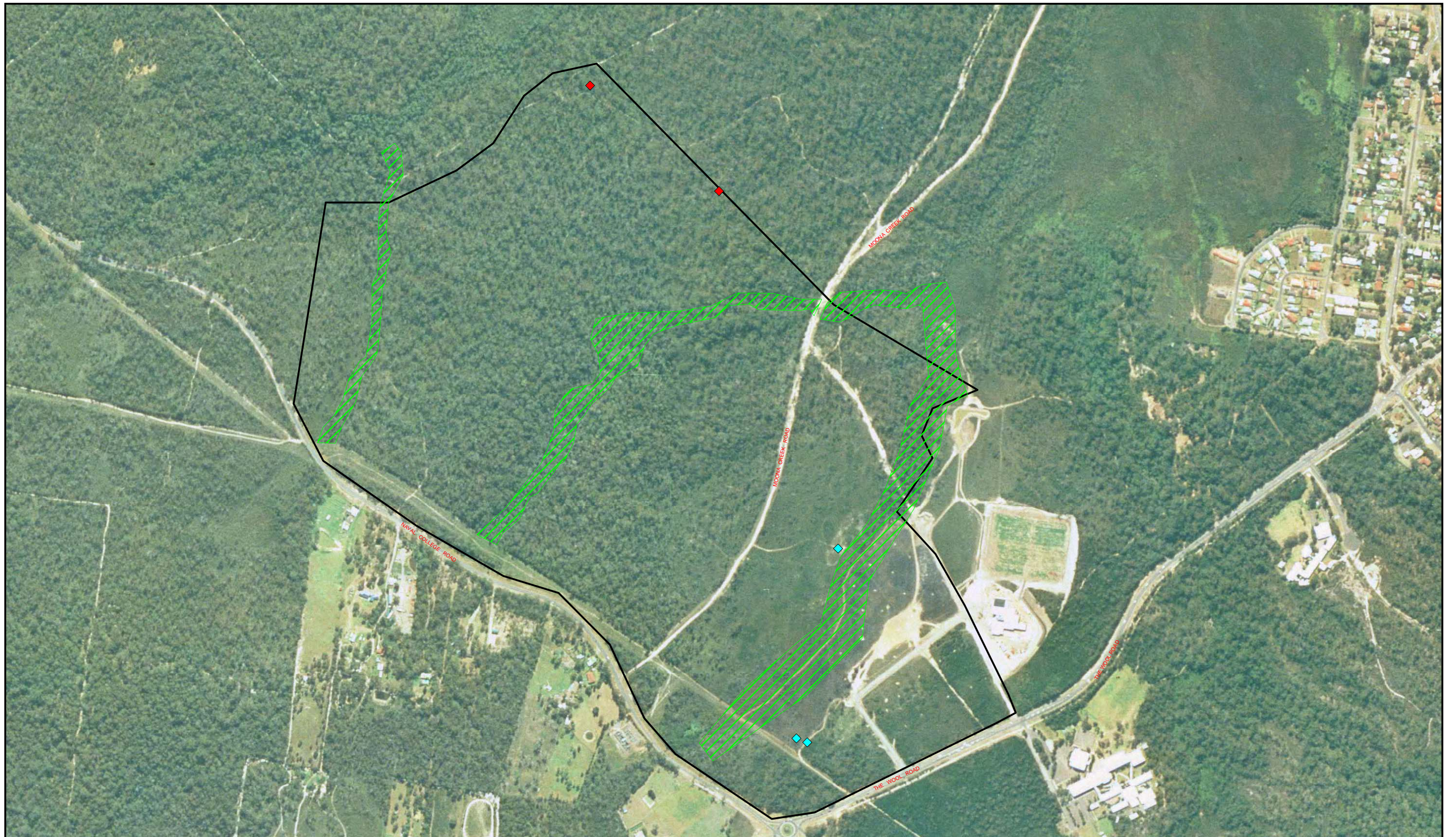
All three of these communities are relatively widespread throughout the locality indicating that suitable foraging habitat for Giant Dragonfly is reasonably common. However, due to the limited dispersal capability of this species foraging habitat needs to be closely associated with areas of potential breeding habitat and these would be found within riparian / wetland habitats.

Drainage in the Vincentia area is divided into three main catchments, the largest being in the north. The northern catchment covers over half of the Vincentia locality and drains into environmentally sensitive areas. Two smaller catchments occur in the east and the west. The western catchment has no well-defined watercourses, while the eastern catchment drains directly into Jervis Bay (SCC 1996).

Three watercourses of the western catchment flow through the Vincentia development site in a northerly direction, discharging into two wetlands downstream of the subject site. These two wetlands were former SEPP 14 Wetlands (No. 325 and No. 324) before being incorporated into the Jervis Bay National Park. These both drain into

Moona Moona Creek and subsequently into Jervis Bay Marine Park (SCC 1996). Neither of these two wetlands currently has standing water but instead are boggy areas with patches of Tea Trees, Paperbarks, Banksia and sedges throughout. The extent of terrestrial vegetation within the central sections of the wetland suggest that these wetlands, like the riparian zones at the subject site, would generally not contain standing water except after major rain events. Consequently it is considered that these areas and adjacent woodlands would potentially provide habitat for breeding and foraging of the Giant Dragonfly.

Although the occurrence of this suitable breeding habitat is likely to be restricted within the locality, the occurrence of a population of the Giant Dragonfly 9.5 km to the south east of the subject site at Green Patch in Booderee National Park indicates that other suitable habitat exists.



- ◆ Giant Dragonfly record 2004
- ◆ Giant Dragonfly record 2005
- ▨ Potential breeding habitat
- Study Area

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Figure 4 Giant Dragonfly records and breeding habitat

4. Assessment of Likely Impacts

The records of the Giant Dragonfly across its range suggest that this species occurs as disjointed populations within patches of suitable habitat in relatively undisturbed swamps, seepages and wetland areas. The poor dispersal capabilities of this species combined with an extremely long larval stage and relatively short adult lifespan means that there is likely to be little genetic exchange between even proximate populations. Consequently, this species is likely to be prone to localised extinction events and there would be little opportunity for recolonisation after the disappearance of a local population. It is thought that its distribution within the current range was more extensive as historical records exist for the Sydney region (DEC 2004). Although there are no quantifiable data on the response of this species to urbanisation and industrialisation, the contraction of its range is likely to be associated with destruction of habitat and the effects of urbanisation and industrialisation including changes to flow regimes and water quality.

Threats to local populations of this species are likely to include:

- ▶ Vegetation clearance of riparian areas;
- ▶ Vegetation clearance of nearby foraging habitat;
- ▶ Changes to water regimes;
- ▶ Changes to water quality; and
- ▶ Infilling, draining or flooding of areas of breeding habitat.

The extent of the distribution of the Giant Dragonfly across the subject site is unknown as targeted surveys for this species were not undertaken. Instead, these records were opportunistic and give little information of numbers and extent. However, sightings in northern areas of the subject site adjacent to the Jervis Bay National Park, near to the Eastern creek and along a dirt track near to the power line easement in the south-western most section of the subject site indicates that this species may be widespread within suitable habitat across the subject site. It is also possible, that the Dragonfly's distribution could possibly extend into suitable habitat in the adjacent Jervis Bay National Park including the two wetland areas as both of these wetlands experience infrequent inundation.

All areas in which the Giant Dragonfly was recorded will be retained and form part of the Environment Zone developed for the subject site with the aim of conserving a number of threatened species and an endangered ecological community. Consequently, it is possible that the retention of the riparian areas and adjacent key foraging habitat would mean that this species could survive post construction (J. Trueman, pers. comm.). However, this would be dependent on the retention of the current water table and surface water regimes. The proposed water sensitive urban design is aimed at maintaining water quality and current flows through a series of bioswales and holding ponds near the western boundaries with Jervis Bay Road. Extreme care should be taken to construct the bioswales outside potential breeding

habitat of the Giant Dragonfly to avoid destruction of burrow areas. For this species to survive on the subject site it is also of paramount importance that water flows be maintained at current levels as flooding and retention of water within potential breeding habitats would destroy larvae. It is considered that the potential for recolonisation from outside sources are likely to be minimal and that the success of a recolonisation event may be reduced due to the development of the site .

Disruption of hydrological processes would most likely cause a local extinction event across the subject site and potentially downstream if an increase or decrease in current water levels and water quality is experienced as this species is heavily dependent on swampy / boggy areas that experience infrequent inundation. Disruption of the current population would mean that proximate populations, including that recorded at Green Patch, would also become more isolated and possibly more prone to local extinction due to a reduction in genetic diversity amongst individuals especially as it is probable that there would be few opportunities for adults to recolonise those areas should a major disturbance event occur.

Few impacts on the species, locally, regionally or across its range, would be expected if the current riparian areas are conserved and the water regimes maintained across the subject site.

5. Recommendations and Mitigation

A range of mitigation measures to assist in the retention of threatened species and general biodiversity across the subject site and within the locality are explored in the SIS (ERM 2006). It is recommended that these be applied as retention of as much biodiversity across the subject site will enhance the opportunities for ecosystem health to be maintained. Importantly this includes the conservation of 47.8 ha within an Environment Zone comprised of riparian areas and a range of foraging habitat within several vegetation communities across the subject site.

Of paramount importance for this species will be the protection of riparian areas, especially areas of breeding habitat, and the retention of current water regimes and water quality. The water sensitive urban design proposed for development site is detailed in Forbes Rigby Pty Ltd (2006) and outlined in the SIS (ERM 2006) and this is aimed at assisting in the retention of water quality and flows across the subject site. These measures include:

- ▶ Retention of riparian areas within the Environment Zone;
- ▶ Retention of foraging habitat within the Environment Zone;
- ▶ Bioswales for physical filtration and capture of fine sediments;
- ▶ General pollutant traps to remove coarse pollutants; and
- ▶ Constructed wetlands for physical filtration and capture of and storage of sediments.

These measures would assist individuals of the Giant Dragonfly both on site and downstream in other suitable habitat.

6. References

6.1 Personal Communications

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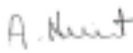

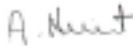

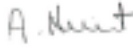
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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	T. Haslehurst	A. Hunt		A. Hunt		15/06/05
2	T. Haslehurst	A. Hunt		A. Hunt		20/01/06
3	T. Haslehurst	A. Hunt		A. Hunt		1/02/06