

Revised Report - Jordan Springs Development Stage 2A, Western Precinct, St. Marys Property (formerly ADI Site)

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Report to Environmental Defenders' Office

1. Introduction

This report follows a desktop review of biodiversity reports prepared for Stage 2A of the Jordan Springs development and provides a preliminary opinion as to whether the proposal is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats.

The Stage 2A biodiversity assessment is the latest in a series of assessments prepared by Cumberland Ecology including an assessment for the entire Western Precinct (229 ha) and for Stage 1 which has already been approved by Penrith City Council and development commenced.

This report is provided to assist in determining the likely success of proposed judicial review proceedings in relation to the Stage 2A development application. It is based primarily on the following reports:

- Cumberland Ecology for Delfin Lend Lease *Flora & Fauna Impact Assessment for Village 2 Jordan Springs Development, St. Mary's Property* (Dec 2010).
- JBA Urban Planning Consultants *Statement of Environmental Effects (SEE): St. Mary's Property Jordan Springs Development (Stage 2A Subdivision)*, (Dec 2010).
- Cumberland Ecology for Maryland Development Company *Western Precinct Biodiversity Assessment* (August 2008).
- Chronology of facts prepared by the Environmental Defenders Office.
- DECCW (October 2010) Wianamatta Regional Park Landscape Masterplan

Additional references are listed at the end of this report.

2. Effect of the proposal on Cumberland Plain Woodland (CPW)

It is my opinion that the proposed residential development within Stage 2A of the Jordan Springs Village (the subject site) will have a significant impact on a local occurrence of CPW and its habitat. The flora and fauna assessment supporting the DA provides a 7-part test for the entire Village 2 area and not specifically for Stage 2A. The following 7-part test addresses Stage 2A with additional comments relating to the larger Stage 2 area.

2.1 Seven-part test for Cumberland Plain Woodland

Parts (a) and (b) pertain to threatened species and endangered populations, therefore, will not be considered further.

(c) in the case of an endangered ecological community or critically endangered community, whether the action proposed:

- (i) is likely to have an adverse effect on the extent of the ecological community that its local occurrence is likely to be placed at risk of extinction**

A local occurrence is defined in the Threatened Species Assessment Guidelines (DECC 2007) as the ecological community that occurs within the *study area*. The local occurrence of CPW for Stage 2A, therefore, comprises areas mapped as CPW, regenerating CPW and derived grassland within the subject site and on adjoining land that may be affected by the development either directly or indirectly. An approximate extent of this local occurrence within the study area is shown in figure 1 of this report. It includes a zone of potential indirect impact of 100 m width consistent with the flora and fauna impact assessment methodology (CE 2010). Two small areas within the Regional Park (total of approx.4 ha) are included within the study area.

(i) As documented in the flora and fauna assessment all CPW within the subject site will be cleared or substantially modified and a range of indirect impacts are likely to occur beyond the subject site. The subdivision and precinct plans indicate that development will occur right up to the boundary of the Regional Park. More specifically, the park will adjoin a main collector road (C1) also identified in the Engineering Plans as Road 9 (Appendix F of SEE) along with a pedestrian/cycle way. The total width is 21 m and this will also accommodate the required 10 m wide APZ for bushfire protection (Ecological 2010). Proposed activities in close proximity to the park and other boundaries include the following:

- Bulk earthworks (including cut and fill) required to grade the residential lots and roads.
- Construction of perimeter road and walkway/cycle-way.
- Construction of storm-water pipelines.
- Vegetation removal (only 2 out of 13 existing trees within approx.20 m of the Regional Park boundary will be retained).

Based on the mapping provided in the flora and fauna assessment, 8 ha of CPW will be directly impacted within the Stage 2A area and 15.4 ha in the entire Stage 2 area. Indirect impacts may also affect the extent of CPW over time but are discussed in detail under (ii). Existing vegetation to be retained within the subject site is essentially limited to trees in streetscapes and one pocket park located at the southern end, surrounded by roads and houses. The level of protection of CPW within the park is minimal with the retention of five trees and potential landscape plantings of local and non-local species (Section 4.5 of CE 2010). The SEE (section 3.5.2) identifies the recreational focus of the park with facilities for a playground, barbecues, shelters, trails etc. among landscaping, lawns and pathways. The CPW community (plants, animals, soils, abiotic environment and the processes that link them) is not protected. The retention of some trees while providing limited canopy connectivity for foraging fauna does not maintain genetic diversity within the community itself (i.e. a community is more than the trees). The park will be isolated from the Regional Park.

Extension of the local occurrence

The Threatened Species Assessment guidelines (DECC 2007) indicate that the local occurrence may include adjacent vegetation if areas of the same community are contiguous and that exchange of genetic material is likely to occur. Loss and degradation of CPW associated with the development will have less impact at a local level if it is part of a larger occurrence.

Although extent of the local occurrence is not specified in the Cumberland Ecology assessment it assumes that all CPW occurring within the Regional Park is included and consequently the level of impact is significantly reduced. The DECC guidelines require evidence of the movement of individuals and exchange of genetic material across the study area boundary to support the adoption of a larger local occurrence. Although no such evidence is provided in the flora and fauna assessment prepared for the DA, it is reasonable to expect some level of movement and exchange under present conditions beyond the study area. There is some argument, therefore, for the local occurrence to include CPW to the north and north-east of the study area. The boundary of this larger "local occurrence" would be ecologically determined by any barriers that compromise connectivity and genetic exchange. Potential barriers to flora and fauna movements within CPW include a change in vegetation community, landscape characteristics (e.g. topography, soils) and disturbance including roads, tracks, buildings and degraded areas e.g. areas previously cultivated or subject to earth works. The following barriers are identified to the north and north east of the study area:

1. Creek-line and associated band of Alluvial Woodland within the Regional Park to the east and north-east of the study area between approx. 100 and 600 m wide providing a significant impediment to flora and fauna movement for CPW biota in view of the wetter environment and different assemblage of plant species. An area of SGTF increases the distance further in the north and north-east to approx. 1000 m.
2. Cultural landscape features that contains cleared areas, earth mounds, roads and buildings. These have generally been maintained as open space and

are likely to continue to be so as part of the Regional Park cultural heritage landscape.

- The obsolete storage area (DECCW 2010 - L24 of Figure 3.46 Vol. 2) to the north-east that contains various artifacts such as mounds, roads etc.
- Bomb Filling area (L-30)
- Jackson's Dairy (L-10) and cleared grassland

3. Existing access tracks and roads.

These features separately and cumulatively create degraded or sub-optimal habitat for CPW species. Restoration of CPW is known to be significantly impaired in sites that have been exposed to soil disturbance including earthworks, cultivation and use of fertilisers (Paragraph 14 of Final Determination). Weed invasion is prevalent in such areas and poses a major threat to CPW. Weedy grasses e.g. African Lovegrass form a dense cover and can smother native plants (Invasion of native plant communities by exotic perennial grasses is a Key Threatening Process listed under the Schedule 3 of the TSC Act). The ability of these areas to recover is questionable particularly if resources are limited. Studies undertaken on degraded land in Western Sydney Regional Park (Wilkins et al., Nichols (2005), Nichols et al. (2005) indicate that any recovery is likely to be extremely slow, after 10 years there was little convergence between restored areas and nearby remnants. It is noted that mapping of CPW (e.g. DECCW 2010, Tozer 2003) does not identify the degraded and modified areas in western parts of the Regional Park and consequently the extent of CPW is likely to be overestimated.

Modified or degraded areas, as well as different vegetation types or landscapes, result in fragmentation of the CPW community and loss of ecological function. Population size of some species, particularly in the ground layer, may be limited by the distance to adjoining suitable habitat reducing genetic diversity and increasing risks from environmental stochasticity. Eighty to ninety percent of biodiversity within CPW occurs within the ground layer (TSSC 2009a) and component species are generally small and lack long-distance dispersal mechanisms (Botanic Gardens Trust 2009). Dispersal in these species is often facilitated by ants or explosive fruits and typically within a few to several metres from the parent plant. The success rate for species with longer dispersal capabilities (e.g. dispersal by wind or more mobile animals) is also likely to be low where significant barriers exist such as the riparian corridor. Creek-lines provide different environmental conditions that may not be conducive to seed establishment and competition from wetter-loving and invasive species is likely to reduce growth & survival rates. It is likely that the life cycles of a large proportion of CPW species will be disrupted due to loss of habitat, weed competition, loss of pollination services, reduced seed production, survival and dispersal.

Future development of visitor facilities within the Western Visitor Precinct as outlined in the Regional Park Masterplan (Dec 2010) will similarly create barriers (and enforce existing ones) to plant/animal movements and genetic exchange. In view of the likely cumulative impact of past, present and future fragmentation on community composition, condition and ecological function, the long-term integrity of CPW beyond the subject site is uncertain. In these circumstances

application of the precautionary principle is warranted and the “local occurrence” of CPW restricted to the study area accordingly.

Figure 1 of this report identifies the “local occurrence” within the study area. A secondary area is also identified where some connectivity and genetic exchange is likely to occur but is likely to be limited by fragmentation, past land use and uncertain future impacts. This area includes the proposed Western Visitor Precinct of the Regional Park and the adjoining area to the north (see figure 1 of this report) comprising a total area of approx. 200 ha.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The composition of an ecological community includes both the plant and animal species, and the physical structure (DECC 2007). The proposal is likely to substantially modify the composition of CPW remaining within the study area and local occurrence largely resulting from the actions discussed under (i) and edge effects. Areas likely to be affected are the proposed park, streetscapes, the Regional Park and adjoining CPW to south. Key changes are likely to include:

- Loss and simplification of vegetation structure
- Loss of biodiversity and “resilience”
- Selection of more hardy, generalist species (flora and fauna)
- Increased dominance of exotic species (flora and fauna)
- Loss of plant and animal habitat
- Loss of pollinators and seed dispersers (fauna)
- Loss of natural fire regime

The greatest impact will be in the understory including the ground layer where eighty to ninety percent of biodiversity occurs within CPW. There will be loss of more sensitive species and the life cycles of many CPW species are likely to be disrupted through changes in availability of suitable habitat, pollinators and seed dispersers, as well as increased competition from invasive and resilient species. There will be flow on effects to other species and there will be generally an increased susceptibility to extreme events and diseases.

Edge Effects

The Regional Park boundary is presently buffered by scattered trees and grassland. The boundary to the north of the subject site, at least, comprises regenerating CPW and derived grassland in relatively good condition with high native species richness (see details for quadrats 3 and 4 in table 1 of appendix 1 of this report). The “new” environment will predominantly comprise roads, pathways and houses. The requirements for bushfire protection minimize the retention of existing trees and new landscape plantings. There will be significant changes in local environmental conditions such as temperature, wind characteristics, infiltration of rainwater into the soil and soil chemistry that will cause “edge effects” beyond the development including within the Regional Park. Such edges can act as traps and concentrators for wind-borne nutrients and pollutants from adjoining urban landscapes with cascading effects on ecological processes. There is likely to be degradation of habitat for many species, increased weed invasion, greater predation pressure on native fauna and

reduced opportunities for pollination and dispersal of plant propagules. The risk of increased penetration of weeds such as African Lovegrass along such boundaries has been confirmed in local studies (Tozer 2003). It has also been found that higher species richness and abundance of weeds is closely associated with CPW that has been previously cleared and grazed (Hill *et. al* 2005). Aerial photographs of the former ADI site clearly indicate the extent of past clearing and both native and domestic grazing is known to have occurred across the site. Such factors in combination with climatic extremes (e.g. drought) are likely to have eroded much of the resilience otherwise inherent in more natural, pristine remnants. Changes to the natural fire regime will also impact on ecological function. High frequency fire is often associated with interfaces between urban development and bushland as a result of increased arson, car dumping, accidental ignitions, fuel-reduction burns etc. (Final Determination, paragraph 22) resulting in reduced diversity of native species and further depression of natural resilience. Conversely low frequency or intensity of fire can also be an issue (protecting adjoining property) and is detrimental to CPW encouraging the spread and dominance of shrubs, including exotic weeds, at the expense of ground flora.

CPW within the Western Precinct and adjoining areas of the Regional Park will be highly sensitive to further adverse impacts or change and successful recovery will depend on strict and focused conservation management.

Based on existing research edge effects can be expected to occur over a distance of at least 20-40 m and up to 100 m from the boundary depending on factors such as the type of development, the vegetation communities involved and the local environmental conditions. A study by Smith & Smith (1997) in the Blue Mountains that looked at edge effects along a bushland boundary separated from housing by a road (similar to the current situation) identified impacts for 60 m. In consideration of these studies, the proposed development layout and the impacted resilience of the CPW, a 50 m wide zone of potential impact is considered reasonable.

Although not shown in the DA plans, there is a proposal as part of the Regional Park Masterplan (2010) to connect the perimeter road to roads and pathways within the Regional Park. Figure 2 of this report shows a vehicle access point along the northern boundary and a cycle-way access point along the eastern boundary. Increased edge effects are likely to occur in the vicinity of these access points and along the road/cycle-ways. It is expected that these impacts, combined with those along the development/park boundary, are likely to affect the entire 100 m wide zone beyond the subject site in the vicinity of the Regional Park. The DA proposal will create the access and much of the demand for the recreational facilities planned within the Western Visitor Precinct.

The potential cumulative impacts of the DA, the proposed Regional Park works and management regime are all relevant to the assessment of impacts

Mitigation measures

Specific measures proposed to reduce impacts of the Stage 2 development include drainage and waste management strategies (to control potential impacts of nutrient enrichment and stormwater), fencing, and creation of a pocket park (Section 4.5 of CE Dec 2010). The limited conservation value of the park has

been discussed; it is essentially a village park providing recreational facilities. Additional measures include avoiding the use of fertilisers and the mowing of grassland along the perimeter of the Regional Park. The two proposed interface zones between the 2A development and the Regional Park, however, do not have any provision for grassy areas. The proposed APZ for these interfaces will consist of public perimeter road reserves (Ecological 2010) that typically comprise a road with a planted strip and footpath/cycleway on either side. Edge effects as discussed above will occur along this boundary.

The primary mitigation measure is not site specific. The protection and conservation of approximately 900 ha of the highest quality native vegetation within the Regional Park (Section 4.5 of CE Dec 2010) is the primary measure identified for all development within the Western Precinct. Less than half of the 900 ha is CPW, however, and over 50% of this has been subject to significant past clearing, fragmentation, grazing etc. The adequacy of this offset is highly questionable. Additional issues of concern include:

- no detail is provided in relation to how well vegetation to be affected is represented within the Regional Park;
- unreliability of existing mapping and documentation of species both within Stage 2A and the Regional Park;
- assumptions that the entire Regional Park comprises the “local occurrence” and that it will be protected by best practice management.

Additional measures identified for the Western Precinct generally may also be implemented within the Stage 2A area including management of weeds, feral animals, macrofauna and bushfire across the Western precinct. No specific details of the relevant management plans, however, are provided to determine their relevance or effectiveness. Management is unlikely to continue once development is complete yet edge effects will continue indefinitely along the urban area/bushland interface.

These measures are unlikely to effectively reduce impacts resulting in poor conservation outcomes for CPW. They do not provide for in-situ conservation of CPW within the subject site or effectively manage edge effects long-term along the Regional Park boundary. Inadequate detail is provided to support the assumption that impacts on CPW resulting from Stage 2A are adequately offset by protection of CPW within the Regional Park.

Conclusions

The approximate areas to be affected by the proposed development directly and indirectly are summarized in Table 1.

Table 1: Summary of extent of impacts on CPW

Area of impact	Nature of impacts		
	Direct impacts	Indirect impacts	Total impacts
Stage 2A	8 ha	At least 10 ha	At least 18 ha including within Regional Park
Stage 2 (all parts)	15.4 ha	Approx. 11 ha	26.4 ha including within Regional Park

All CPW identified within the study area, including areas within the Regional Park (RP), will be cleared, modified or potentially modified *and this is likely to result in a significant impact that is likely to place the local occurrence at risk of extinction.*

Furthermore, the extent of impact is likely to be underestimated. Only 41% of the Stage 2A site is identified as CPW despite the very broad identification criteria identified in the Final Determination for critically endangered CPW. Paragraphs 2 & 6 of the Final Determination refer in detail to the variable nature of CPW including woodland, open areas with regenerating woody trees and/or shrubs, and grassland with characteristic CPW species. An analysis of the quadrat and transect data for Stage 2A indicates that 60-78% of the species recorded were native and over 70% of these were characteristic species as listed in paragraph 3 of the Final Determination. This includes quadrat 3 located near the boundary of areas mapped as exotic and CPW grassland, and transect 6 reported to be located within exotic grassland. Along transect 6 there were 15 native species recorded, almost half of which were common/very common and >60% characteristic species (as listed in Final Determination) in contrast to 10 exotic species with 5 common or very common. Based on this data and the presence of Grey Box and Native Blackthorn in the quadrat, the vegetation is consistent with CPW as listed under the TSC Act. This is a strong indication that the mapping of CPW is unreliable.

The poor level of sampling within most of the 2A site also reduces the reliability of the mapping. Only three quadrats (Q2, Q3 & Q4) were sampled within or on the boundary of the Stage 2A site and all of these were located within approx. 30 m of the boundary with the core area of CPW not sampled. Transects 6 and 7 were also located in peripheral parts.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed

The habitat of CPW, including both biotic and abiotic aspects, will be impacted as discussed under (c).

(ii) Whether an area of habitat is likely to be fragmented or isolated from other areas of habitat as a result of the proposed action

Development of the Stage 2A area will contribute to ongoing fragmentation and isolation of CPW within the Western Precinct resulting from residential development (Stage 1 already commenced). Regenerating CPW located between stages 1 and 2, for example, will have development on three sides with significant loss of connectivity with the Regional Park. Connectivity of the larger area mapped as intact CPW to the south of the subject site will similarly be

reduced. The threatened species *Pimelea spicata* has been recorded from this area (Figure 4.2 of CE Aug 2008).

One pocket park is proposed for the 2A development at the southern end and will be surrounded by roads and houses. There are no details evident in the flora and fauna report to indicate that the CPW community will be protected in this park other than the retention of five trees. The SEE (section 3.5.2) confirms that the park will be a recreational area with playground, barbecues, shelters, trails etc. among landscaping, lawns and paths. Other parks in the Western Precinct e.g. Western Village Oval and Western Pocket Park are similarly isolated by development.

Fragmentation is known to result in loss of flora and fauna in CPW including vertebrates and invertebrate species e.g. the endangered Cumberland Plain Land Snail (paragraph 16 of Final Determination). It is also believed to play a role in the dieback of eucalypts and loss of species due to reduced fire regimes. The integrity and survival of small, isolated stands is impaired by small population size, increased risk of environmental stochasticity, disruption to ecological function and reduced genetic diversity.

(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

CPW habitat to be removed, modified or fragmented is important to the long-term survival of CPW in the locality for the following reasons:

- It is representative of a critically endangered community (CEC) that faces an extremely high risk of extinction. This is the highest conservation status identified under current environmental legislation. The recent upgrading of CPW to a CEC reflects the ongoing loss of this community and the lack of any effective recovery planning. Only 9% of remaining CPW is on NPWS estate and 39% on priority lands as identified in the CPRP. There is clearly a need to protect CPW beyond the formal reserve system.
- The Stage 2 area (and Western Precinct) is part of one of the largest extant remnants of CPW on the Cumberland Plain. CPW within Stage 2A and adjoining areas add to the overall size of the remnant and associated flora and fauna values, increase east-west connectivity beyond the site, and provide support and buffering for areas within the Regional Park. Loss and fragmentation leading to increasingly smaller remnants is identified as the principal threat to biodiversity of the Cumberland Plain. Smaller remnants are more susceptible to degradation, provide less habitat values and support fewer species (Cumberland Plain Recovery Plan 2011).
- CPW within the subject site is likely to represent a subtle form of CPW typical of more undulating topography, drier conditions (away from creek-lines) and soils with a higher clay content and less influence from ironstone gravels or Tertiary alluvium. Grey Box is the dominant tree

species with limited occurrence of Broad-leaved Ironbark and Forest Red Gum. This form of CPW is not likely to be well represented within primary conservation areas of the regional park. Effective recovery of a CEC requires recognition and protection of such diversity. Both the St Mary's Development Agreement (2002) in Section 11.4 and SREP 30 (Section 5-24) identify the importance of protecting such values.

- CPW within Stage 2A is of similar conservation value to that within the north-western precinct of the Regional Park that is also listed on the National Estate as a Natural Heritage Area and identified as "priority land" in the Cumberland Plain Recovery Plan (2011). Recent aerial photographs indicate patchy CPW within the Regional Park similar to that present within the subject site, reflecting past and ongoing disturbances. The regeneration potential of CPW in Stage 2 has not been taken into consideration in the flora and fauna assessment.

Much of the CPW within the north-western precinct of the Regional Park had similar canopy cover and structure to current vegetation within the subject site prior to recognition as a protected area as shown in figure 2 of Perkins (1999). An analysis of data from the various reports (see appendix 1) indicates that intact and regenerating CPW within the Stage 1 and 2 areas are consistent with moderate to high quality CPW included within the Regional Park based on the Perkins assessment in 1999. Survey within this area for the Perkins study was very limited and no 20 m x 20 m quadrats were sampled. The biodiversity value and potential of these areas was underestimated and this situation continued with a series of inadequate survey and assessment studies in recent years (Cumberland Ecology 2008, July & December 2010). This level of survey and assessment is not commensurate with the current critically endangered listing for CPW. The importance of finer scale study in relation to recording species richness, for example, is shown in table 2 of appendix 1 of this report. Of three quadrats sampled within the Stage 2A area only one is located in an area with reasonable canopy. Quadrats 3 and 4 are located close to the northern edge and Quadrat 2 close to the southern edge of the subject site with most of the site not sampled despite being in an active stage of regeneration (Figure 2.1 of CE 2010).

There is no reliable comparison of condition and general values of CPW between Stage 2A, Stage 2 (all parts) or the Western Precinct and the Regional Park. There is no reference to any species listing for the Regional Park that may have been used for comparison. It is likely that species more characteristic of CPW found in western parts of the SMP, with less influence from ironstone gravels and Tertiary alluvium, will be more poorly represented within conservation areas of the Regional Park. Similarly, there is no detail provided relating to the location and viability of populations of rare or threatened species (at all levels) within the Regional Park.

- CPW within the Regional Park is likely to be affected by indirect impacts resulting from the proposal. Such an impact is incompatible with the objectives of the Regional Park. Furthermore, the Regional Park is identified as "priority land" in figure 1 of the recently approved

Cumberland Plain Recovery Plan (2011) and is listed on the National Estate. Priority land as identified in the plan by definition must include areas that are crucial to the survival of TEC's as they can "contribute most to the long-term recovery and maintenance of threatened biodiversity". Key, larger remnants such as Wianamatta Regional Park can be considered equivalent, therefore, to "critical habitat". If a proposed development is likely to affect critical habitat, a species impact statement will often be required (Office of Environment and Heritage website; critical habitat protection) it is reasonable to expect the same in respect of priority land.

The DECC Guidelines (2007) under part (d) recommends that when assessing the importance of habitat to be affected there should be some consideration of the tenure and security of the habitat which will remain in the locality. Although most of this habitat is included in the Regional Park, its integrity and long-term viability is not assured. It will be subject to impacts resulting from development of the Western Precinct Visitor area. The Draft Masterplan (2010) proposes the development of a visitor precinct immediately adjoining the subject site including cycle and pedestrian access points and tracks, limited public vehicular access and parking (mostly confined to the edges), picnic areas and visitor facilities. Water, sewage and power services to the main visitor facilities will be provided. Impacts will be spread across the visitor precinct resulting in persistence of present fragmentation, additional fragmentation, disturbance and edge effects (see figure 2). The potential for appropriate ecological fire management will be limited and the risk of spreading weeds and plant diseases increased. The easily spread Myrtle Rust (new threat) and Phytophthora are of particular concern. Habitat values, connectivity and genetic exchange will be reduced (see earlier discussion). This may be appropriate in marginal habitat of a less threatened ecological community but it is not commensurate with a critically endangered community and land that is identified as "priority conservation land". The CPW in this part of the Regional Park is particularly sensitive due to past clearing, fragmentation, grazing, weed invasion etc. (see discussion under factor c (ii)) and requires best practice management to achieve recovery success.

Wianamatta Regional Park Draft Plan of Management (2007) and the Draft Master Plan (2010) both identify several competing management objectives including protection of natural values, protection of cultural values and promotion of recreational opportunities. One of the strategies proposed is to ensure there are no negative impacts on significant biodiversity within the park. CPW adjoining the subject site, as a CEC and worthy of inclusion in the Regional Park, should be identified as significant yet the Western Visitor Precinct is located in this area with a recreation focus rather than conservation habitat focus (i.e. outside of the primary and secondary conservation zones). It is clearly not "good practice" to locate such facilities within significant vegetation. This also appears to be premature as an issue identified in the Plan of Management (Section 4) is the inadequacy of current knowledge of flora and fauna within the park to inform sound decision making. There is no evidence that I am aware of that scientifically establishes that CPW in the Western Precinct of the Regional Park is less significant than other areas.

Vegetation management proposals include widespread natural regeneration and small areas of re-vegetation (Figure 5.2.28, Volume 3 of Draft Masterplan 2010)

with selective weed management. The ability of many of the more disturbed areas to regenerate, however, is questionable (paragraph 14 of the Final Determination) and the impacts of fragmentation are likely to persist in these areas. The use of locally propagated material and the range of species identified for planting are consistent with best practice. The intensity and effectiveness of management, however, is likely to be inadequate in view of the extent of disturbed areas, the size and impact of the Western Visitor Precinct and other recreational areas of the Regional Park, and the many demands on limited resources.

A level of fragmentation will be maintained by design to protect different landscapes within the Regional Park. There will also be maintenance of existing open grassy areas along the track network and in other areas to protect rural landscape values and views (5.2 of Vol. 3 of Masterplan). Some small earth-forms identified as important cultural features are also likely to be retained (Figure 2.6.1, Volume 3 of Draft Masterplan). Adverse impacts of such facilities and features include increasing the risk of exotic weed invasion, the spread of diseases and creation of barriers to the movement of some plants and animals. CPW within the Western Precinct is particularly sensitive to impacts due to a history of clearing and grazing and "resilience" is already compromised. There appears to be no specific action to address "edge effects" other than some buffer plantings and fencing, but mostly in relation to the extensive boundary of the Regional Park and not for developments within the park. The primary issue with most influence on the integrity and long-term survival of CPW is weed management. The requirement and responsibility for weed control is likely to be high and compounded by the proposed high recreational use of the Western Visitor Precinct and the 37 km boundary to the park. It is unlikely that a level of management sufficient to maintain and improve CPW values can realistically be achieved.

It is evident that CPW will be impacted by both the Stage 2A proposal and planned development within the Regional Park. The long-term integrity of CPW within the locality, therefore, is uncertain and cannot be considered secure. Under such circumstances reliance on the Regional Park to offset impacts of the Stage 2 development is not considered appropriate.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No areas of critical habitat are declared for CPW despite it being a critically endangered community. CPW across the St Mary's Property, however, has always been identified as a core or priority conservation land (e.g. UBBS 1997, Cumberland Plain Recovery Plan 2011). It is not unreasonable to equate priority conservation land with critical habitat in this instance. There is likely to be both direct and indirect impacts on CPW present on priority conservation land within the Regional Park.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

The recently approved Cumberland Plain Recovery Plan, 2011(CPRP) is the only relevant plan, however, it is generic and relates to all threatened biodiversity on the Cumberland Plain and has no specific actions for CPW despite its critically endangered status. The overall objective of the CPRP is to provide for long-term survival and protection of the threatened biodiversity of the Cumberland Plain. The specific objectives are:

1. To build a protected area network, comprising public and private lands, focused on the priority conservation lands
2. To deliver best practice management for threatened biodiversity with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation
3. To develop an understanding and enhanced awareness in the community of the threatened biodiversity, the best practice standards for its management, and the recovery program
4. To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

The proposal is not consistent with objectives 1 and 2 in that there will be adverse impacts occurring on a protected area and priority conservation land that is not compatible with best practice biodiversity conservation. If the current proposal is approved it will be inconsistent with objectives 3 and 4 and send a very different message to the community. It is also contrary to SREP 30 (5-24 (3)) that requires any adverse impacts on the Regional Park from development in the urban zone to be minimized. There are no effective measures proposed to minimize indirect impacts along the development/park boundary.

A similar conclusion could be reached in respect of proposed development within the Regional Park itself.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process

The proposed development constitutes 'Clearing of Native Vegetation', a key threatening process listed under Schedule 3 of the TSC Act. The history of clearing on the Cumberland Plain for timber, agriculture and more recently urban development is responsible for the critically endangered status of CPW. This development proposal perpetuates the ongoing impacts of this threatening process. The loss or modification of around 18 -26 ha of CPW (depending on extent of Stage 2 area considered) is significant, particularly when of high conservation value. Based on proposed developments and more accurate or up-to-date identification of CPW, there will be cumulative losses of >180 ha or 30% of CPW across the SMP.

Other threatening processes that may be increased as a result of the proposed development include:

- Competition and grazing by the feral European Rabbit;
- Ecological consequence of higher frequency fires;
- Invasion of native plant communities by exotic perennial grasses.

Making an assessment of significance

An assessment of significance takes into consideration all of the above factors. The 7-part test identifies that a significant impact is likely to occur on a local occurrence of CPW and its habitat within the Stage 2A study area resulting in a likely risk of extinction. The impacts extend to parts of the Regional Park which may contravene SREP 30 Part 5 (Provision 24–3) that requires any impact to the park to be minimized. Furthermore, it is likely that due to inadequate survey, assessment and reporting the extent and value of CPW has been underestimated and impacts will be even higher.

Cumulative impacts of Stage 2A, proposed development within the Western Precinct and across the SMP is also significant with over 180 ha or >30% of the pre-development area of CPW likely to be lost. This is significant loss of an important remnant as determined by its critically endangered status and as part of one of the largest remaining areas of CPW, much of which is identified as priority conservation land. Of the remaining area less than 40% will be protected and managed at the level required within the Regional Park. This is not consistent with a CEC or the objectives and principles of the Cumberland Plain Recovery Plan (2011). It is also inconsistent with the principle of environmental sustainability as identified in Section 11.14 of the St. Marys Development Agreement (2002) to achieve preservation, protection and improvement (where possible) of biodiversity values.

Any reliance on extending the local occurrence to include 400 ha of CPW within the Regional Park is not justified. A marginal area in which some movement of flora and fauna and genetic exchange can be expected is identified, however, the level of uncertainty associated with the current and future condition, and function of this vegetation warrants application of the precautionary principle. It is also noted that only a small part of the Regional Park has been transferred and gazetted to-date, plans of management are not finalized and there is a lack of detailed information available on flora and fauna within the park to assess the relative importance of different areas and likely success of proposed management actions. Any assessment based on the larger extent should be supported by reliable scientific evidence.

The only real reason provided in the assessment for concluding an insignificant impact is that larger and better areas of CPW are protected within the Regional Park. This assumption is flawed and reliance on the Regional Park as an offset is challenged for the following reasons:

- There is insufficient information or evidence to conclude that CPW within the north-western part of the Regional Park is of greater conservation value than CPW in parts of the Western Precinct including Stage 2A. To

the contrary aerial photographs testify to the extent of past clearing across this area and an analysis of data (see appendix 1) indicates that CPW within Stage 2 is of similar floristic value. The regeneration potential of CPW in the subject site has not been considered despite the regeneration that has occurred within adjoining areas in recent years.

- Over 50% of CPW within the Regional Park has been subject to significant clearing, fragmentation and grazing.
- The area of CPW within Stage 2A is likely to have been underestimated.
- There is no evidence indicating that the performance objectives of SREP 30 Part 5 (Provision 24 - 1) are satisfied in relation to the importance of conserving a representative and significant proportion of the natural values of extant CPW within the regional park.
- CPW within the Stage 2A area is currently contiguous with CPW within the Regional Park and as part of this larger remnant contributes to the important values of higher carrying capacity, diversity and resilience associated with increased size. It also assists in protection and buffering of impacts on the Regional Park.
- Regional Parks are multi-use reserves that cannot provide a level of conservation commensurate with a CEC despite repeated objectives of protecting biodiversity. The management objectives and conservation outcomes are limited by legislation (National Parks and Wildlife Act 1974 No 80), the St Mary's Development Agreement (2002) and SREP 30 St Mary's. To achieve a primary conservation focus, CPW on priority conservation land should be protected within a nature reserve or national park. CPW within the Regional Park is fragmented by roads, degraded areas and development (existing and proposed). Of the 530 ha of CPW only around 40% will be managed primarily for conservation within a Primary Habitat Focus zone (see zone 1 in figure 3). Most of zone 1 is along the creek corridors and contains Alluvial Woodland rather than CPW. Remaining areas of CPW, outside of Zone 1, will be affected by development and operation as visitor or recreational precincts e.g. western, southern central, northern central and main precincts or managed as secondary habitat focus areas where conservation is one of a range of management objectives. This is despite the entire park being identified as "priority land" in the Cumberland Plain Recovery Plan (2011) and contrary to the objectives of the plan.
- The Regional Park is an existing reserve that is invalid as a further offset for a current development application. It was determined by national criteria and listed in 1999 prior to any development planning or proposals. If the park was a valid offset then you would expect that this would be legally documented and no further assessment required.

3. Effect of the proposal on threatened species

There is insufficient information to reliably determine the effect of the proposal on threatened flora or fauna. Detailed information of the location, size and health of populations within the Regional Park is required and more detailed targeted survey within the Stage 2 area. There is much reliance on previous surveys although the adequacy of these is also questionable. Species at most risk are discussed further.

Pimelea spicata

There are two records of this cryptic herb within or close to the Stage 2 area (Figure 4.2 of Cumberland Ecology Aug 2008). There is no indication in the Dec 2010 report that these records exist (i.e. shown on a map) and that known habitat was searched. This species is difficult to detect and flowering is unpredictable. The use of known local reference sites to determine suitable timing of survey is standard procedure but not mentioned in the report. No 7-part test was included for this species. The present status of the one other record within the Regional Park is unknown.

Cumberland Plain Land Snail *Meridolum corneovirens*

There are scattered records and known habitat of this species across the SMP including the Western Precinct (CE Dec 2010). Only one snail search point was located within the Stage 2A development area (next to Quadrat 2) with another point located to the north of the subject site but within the study area (see figure 2.1 of Cumberland Ecology Dec 2010). Most of the subject site including extensive areas of regenerating CPW was not searched. No information is provided on the location, size and health of sub-populations of this species within the RP to determine the importance of habitat within the Stage 2 area.

Other threatened fauna species of particular concern are the smaller woodland birds for which there are a number of recent sightings by locals yet the report dismisses the available habitat as negligible.

4. Conclusion & recommendations

There is good evidence for a significant impact on Cumberland Plain Woodland and a local occurrence is likely to be placed at risk of extinction requiring a Species Impact Statement to be prepared. All CPW within the subject site will be cleared or highly modified and indirect impacts are likely on adjoining CPW, including within the Regional Park. These indirect impacts will combine with past impacts (clearing, grazing), and future impacts from proposed activities and management within the Western Visitor Precinct. There is no evidence provided to indicate that CPW to be lost or modified is well represented and secure within primary conservation areas of the Regional Park.

Additional reasons for requiring a SIS includes:

- Lack of adequate survey and information to reliably inform the assessment of conservation values and impacts on threatened biodiversity.
- The extent and value of CPW within the subject site is likely to have been underestimated.
- Impact will occur on the Regional Park, National Estate listed land and Priority Conservation Land as identified in the Cumberland Plain Recovery Plan (2011).
- The conservation outcomes for CPW are inconsistent with provisions of the St. Mary's Development Agreement (2002) and SREP 30 that identify the importance of conserving a representative and significant proportion of the natural values of extant CPW within the Regional Park.

5. Bibliography

Botanic Gardens Trust (2009) Ecology of Cumberland Plain Woodland.

Cumberland Ecology for Maryland Development Company *Flora & Fauna Impact Assessment for Residential Development – Jordan Springs Development (Stages 1E-G), Western Precinct, St. Mary's Property* (July 2010).

JBA Urban Planning Consultants *Statement of Environmental Effects (SEE): St. Mary's Property Jordan Springs Development (Stages 1E-G), Western Precinct* (August 2010).

DEC (2005) Recovering bushland on the Cumberland Plain: best practice guidelines for management and restoration of bushland.

DECC (2007) Threatened Species Assessment Guidelines

DECCW (October 2010) Wianamatta Regional Park Landscape Masterplan

DECCW (2011) Approved Cumberland Plain Recovery Plan.

Ecological Australia (2010) *Bushfire Protection Assessment for Jordan Springs, Village 2*

Hill *et al* (2005) Relationships between anthropogenic disturbance, soil properties and plant invasion in endangered Cumberland Plain Woodland. *Austral Ecology* 30, 775-788.

National Parks and Wildlife Act 1974 (No 80).

NPWS (2002) Native Vegetation Maps of the Cumberland Plain.

Report for Jordan Springs Stage 2A – May, 2011

NSW NPWS (1997) Urban Bushland Biodiversity Survey (UBBS) *Stage 1: Western Sydney: Native flora in Western Sydney*.

NSW NPWS (2007) Wianamatta Regional Park Draft Plan of Management.

NSW Scientific Committee (2009) Cumberland Plain Woodland in the Sydney Basin Bioregion – critically endangered ecological community listing.

Perkins, I (1999) Flora Assessment of the Disputed Areas of the Western Sydney Shale Woodlands Report to the Australian Heritage Commission.

Smith & Smith (1997) Buffer zones for protection of sensitive vegetation units in the City of Blue Mountains Report to Blue Mountains Conservation Society

SREP 30 (2001, 2009) Sydney Regional Environmental Plan No 30 - St. Marys.

St. Marys Development Agreement (2002)

Tozer, M. (2003) The Native Vegetation of the Cumberland Plain, western Sydney: a systematic classification and field identification of communities *Cunninghamia* 8 (1)

Threatened Species Scientific Committee (2009a) Listing advice for Cumberland Plain Woodland and Shale Gravel Transition Forest ecological community

Threatened Species Scientific Committee (2009b) Approved Conservation Advice for Cumberland Plain Woodland and Shale Gravel Transition Forest ecological community

Appendix 1: Analysis of flora data

Assessment of condition

Using quadrat data from the Stage 1E-G and Stage 2 reports an analysis of native species richness, relative proportions of native and exotic species and average cover abundance values for native and exotic species was undertaken to inform this report and the assessment of significance. Comparisons of this data with the quadrat data of Perkins (1999) for the Western Precinct, is provided in table 1. It is noted that the recent Cumberland Ecology Western Precinct study (2008) only used 5 m x 5 m plots for condition assessment. The percentage of native species present listed in the Final Determination (FD) as characteristic species are calculated for Stage 2A and Perkins (1999) plots.

Table 1: Data analysis of sampled quadrats (20 m x 20 m) within the Western Precinct

Quadrat Id	Description of vegetation	Total number of species	No. of native species	% of native species present	% of FD species	Average cover abundance value
Stage 1E-G report						
Q1	CPW (intact)	46	34	74%		Native 2.1, Exotic 1.8
Q2	CPW (intact)	44	36	82%		
Q3	CPW (grassland)	27	18	66%		Native 2.3, Exotic 1.6
Q4	Exotic (drainage line)	20	12	60%		Native 2, Exotic 3.2
Q5	Exotic grassland	19	5	26%		Native 1, Exotic 2.9
Q6	Exotic grassland	14	5	36%		
Q7	CPW (regenerating)	23	17	74%		Native 2.4, Exotic 2
Stage 2A						
Q2	CPW (intact)	51	40	78%	31 = 77%	Native 2, Exotic 1.5
Q3	Exotic grassland near CPW grassland	26	18	69%	16 = 88%	Native 2.7, Exotic 1.9
Q4	CPW (regenerating)	47	30	64%	27 = 90%	Native 1.8, Exotic 1.9
T6	Exotic grassland	25	15	60%	11 = 73%	No values
Perkins (1999)						
Q1	CPW (high quality)	55	48	87%	40 = 83%	No values
Q3	CPW (moderate quality)	35	25	71%	23 = 92%	No values
Q6	CPW (moderate quality)	34	25	73%	24 = 96%	No values
Q9	CPW (low quality)	11	4	36%	4 = 100%	No values
C1	Biodiversity zone	59	53	90%	42 = 79%	No values
C2	Biodiversity zone	48	41	85%	34 = 83%	No values

Quadrats 1, 3 & 6 sampled by Perkins within western parts of the ADI site in 1999 were identified as satisfying the National Estate assessment criteria and are now included within the Regional Park. The analysis indicates that intact and

regenerating CPW on the Stage 1 and 2 areas as reported in 2010 (Jan & Dec) are consistent with moderate to high quality CPW based on Perkins (1999) in respect of native species richness with between 64% and 87% of all species recorded in quadrats being native species. Control quadrats (C1 & C2) within a biodiversity zone and now within the Regional Park had levels of 85-90%.

It is noted that quadrat 4 of Stage 1 and quadrat 3 of Stage 2A (and transect 6) are more consistent with moderate quality CPW than Exotic Grassland.

Cover-abundance values are also a criteria used to measure the condition of vegetation. Although there may be many native species present they may be low in number and of low cover value. The analysis indicates that only the exotic grassland quadrats of Stage 1 contain significantly greater abundance and cover of exotic species.

Using a combination of native species richness and cover-abundance only quadrat 5 of Stage 1 is clearly exotic grassland. The conclusion by Cumberland Ecology in the various reports that CPW within Stage 1E-G and Stage 2A is inferior to that within the Regional Park does not appear to be supported by the data.

Species richness & survey effort

A comparison of native species recorded in the various assessments (Western Precinct, Stage 1E-G, Stage 2, Perkins 1999) is summarized in Table 2. The importance of finer scale survey in improving survey outcomes is well illustrated. The reliability of assessment within the large scale studies is clearly compromised by inadequate survey effort.

Table 2: Native species richness and survey effort

Study area	Area (approx.)	Quadrat & transect details	Total local native species (approx.)	Significant species
Western precinct	229 ha	No general quadrats Meandering transects	83 (0.36 per ha)	1 TS, 3 REG, 18 V
Stage 1E-G	13 ha	7 quadrats (20 m x 20 m)	50 (4 per ha)	2 REG, 14 V
Stage 2	66 ha	4 quadrats (20 m x 20 m) & 10 transects	88 (1.3 per ha)	1 TS, 3 REG, 28 V
Western Precinct (Perkins 1999)	>300 ha	13 quadrats (20 m x 20 m)	89 (0.3 per ha)	1 TS ,4 REG, 21 V