

**Appendix 3 – Report by Michael Doherty,
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Review of Biodiversity Issues in Relation to the Proposed Re-Zoning and Development of ADI Land, St. Marys, Sydney

Report Prepared for Penrith City Council

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1.0 Introduction

Penrith City Council requested that CSIRO Wildlife and Ecology undertake a review of literature dealing with biodiversity issues in relation to the proposed re-zoning of land owned by Australian Defence Industries (ADI) at St. Marys, in western Sydney. The purpose of the study was to assist Council in its assessment of, and submission in response to, the draft *Regional Environmental Plan, Environmental Planning Strategy and Outline Development Agreement* for the site. Particular emphasis was placed on assessing the appropriateness of the boundaries of a proposed Regional Park which has been delineated, in theory, to protect conservation values on the site. The boundary of the proposed Regional Park was evaluated in relation to recent assessments which were undertaken by the Australian Heritage Commission in order to resolve objections to the listing of part of the site on the Register of the National Estate.

2.0 Aims and Objectives

The aims and objectives of the study as defined by Penrith City Council were:

- *To undertake a rigorous scientific analysis of all the biodiversity information currently available for the ADI site;*
- *To compare and contrast the results, conclusions and recommendations of all biodiversity reports on the land;*
- *To identify what biodiversity conservation limitations may apply to the future development of the ADI land;*
- *To identify if there will be a significant impact on a threatened species, or endangered ecological community or their habitat as a result of development envisaged by the draft REP and EPS; and*
- *To recommend broad management strategies that will facilitate the conservation of any threatened species and community identified for retention.*

To achieve these aims and objectives, the study was broken up into the following six tasks, which form the basis of the report structure:

Assessment of Previous Biodiversity Studies
Threatened Species Assessment
Conservation Area Determination
Management Implications
Conclusion
Identification of Further Work and Recommendations

The report is a summary and interpretation of available information relating to biodiversity on the ADI site which was available at the time of the review. Not all reports relating to the ADI site were available for review, but the documents that were available appear to adequately reflect the known available information base.

3.0 Assessment of Previous Biodiversity Studies

All available previous studies relating to biodiversity on the ADI site were critically reviewed, particularly in relation to the conservation issues surrounding Cumberland Plain vegetation and the appropriateness or otherwise of those areas identified as having high, medium and low conservation value.

In the earliest document obtained relating to proposed re-zoning and development of the ADI land at St Marys, Kinhill Engineers Pty. Ltd. (1994) outline the biophysical and heritage features of the ADI site, based on preliminary work for the Regional Environmental Study. Regarding flora, it is stated on page 1 that: "*Vegetation communities and certain species on the ADI site have high conservation value and require preservation and appropriate management. This will be a constraint on potential development for large areas of the ADI site*" and it is stated on page 2 that: "*Remnant vegetation on the ADI site is of high conservation value*". The report then specifically states on page 4 that: "*The patches of Grey Box woodland on the ADI site are linked by less dense regrowth of Grey Box. Collectively, these patches represent one of the largest remnants of this woodland type left on the Cumberland Plain. There is also a significantly large area of woodland remnant on the Tertiary alluvium in the west of the site*". It is clear from these statements that a high value is being placed on Grey Box woodland irrespective of the apparent tree density. Indeed, the report maps the contentious area in the north west of the ADI site as Grey Box – Forest Red Gum Savannah (Fig 1.1 in the report). The report also maps strips of riparian vegetation in South Creek as being River-flat Forest. The report summarises Benson's (1992) points in relation to the inadequacy of conservation of western Sydney vegetation, particularly compared to the surrounding sandstone vegetation. Regarding the potential for rehabilitation and restoration of areas currently grazed, the document states on page 8 that: "*It is possible that the flora will regenerate if the existing grazing pressure were reduced on the ADI site. With appropriate management, this would further enhanced the ecological value of the site*"

The Department of Urban Affairs and Planning (1995) draft Regional Environmental Study states in its foreword that: "*It is essential that future urban development demonstrate innovative responses to issues such as community development, transport, energy efficiency and water conservation*" and further that "*...if new development is to occur, it must be considerably better than current practice*". It is doubtful after reading through the draft RES that the proposed development of the ADI site will be innovative or better than current practice, given the potential impacts associated with the proposed development. The document contradicts itself from the beginning, stating on page 1 that the ADI site provides an opportunity for a successful urban development and yet claiming in the next paragraph that the purpose of the RES is to investigate the site's suitability for urban development. There does not appear to have been any real consideration of a "no development" option for the ADI site despite its obvious high value for the conservation of Cumberland Plain vegetation which was already known from earlier work. The document states on page 13 that: "*There are two areas of Grey Box Woodland larger than the remnant on the ADI site, but no areas of this community larger than the remnant on the ADI and Shanes Park CAA sites combined*". In relation to fauna, the report also states on page 13 that: "*The ADI site provides an uncommonly large area of woodland/forest habitat on the Cumberland Plain. This habitat is very different to the extensive sandstone areas to the west of the Nepean-Hawkesbury River and the sand deposits in the Agnes Banks area. Compared to other areas on the Cumberland Plain, the relatively large area of*

woodland/forest and the diversity of species that have been recorded there make the site one of the major areas of native fauna habitat in the region. Loss of this habitat could therefore result in loss of biodiversity.” However, in the whole 88 page document, only 2 pages deal with flora and fauna. The document identifies flora and fauna conservation issues as being a constraint to development and states on page 26 that: “As the plant communities on the site are diverse, in good condition and represent some of the largest remnants of Cumberland Plain vegetation types, they provide suitable habitat for a range of fauna including rare and endangered species. Consequently, the management of the flora and fauna on the site is a critical issue which requires resolution to enable detailed site planning to occur”. The RES then presents four vegetation management options in relation to vegetation retained versus urban development (Figs. 15-18 in report) and yet none of these options identify the north west area as having any vegetation significance despite the fact that Fig. 13 in the report identifies the area as Grey Box - Forest Red Gum Savannah as did the previous Kinhill report. Because of this, the vegetation management options as presented in the draft RES and the subsequent constraints analysis are fundamentally flawed and create a position whereby adoption of any of the four options will lead to significant loss of Cumberland Plain vegetation.

Gunninah Environmental Consultants / ERM Mitchell McCotter (1997) respond to issues raised by the Section 22 Committee in a detailed report which summarises the biodiversity information available for the site to that date. Although most of the methods used appear to be standard, it is somewhat alarming to read that part of the information was obtained from “Aimless wanderings” which have been “...conducted by F Dominic Fanning, over the years 1991 to 1997 inclusive”. If these observations were truly “aimless” of what value are they in assessing the conservation value of the site ? Interestingly, the report discusses the proposed Eastern Creek, South Creek and Ropes Creek corridors in relation to areas of Cumberland Plain Woodland that will be protected and more importantly, the potential of these corridors to be “...rehabilitated to support Cumberland Plain Woodland communities” and their potential to provide “.....significant areas for future regeneration of Cumberland Plain Woodland and allied vegetation” (page 8). Yet their assessment of the ADI site does not place a similar value on areas within the site which could be similarly rehabilitated or regenerated. A case of transferring the responsibility for ecological restoration off the ADI site and onto other publicly owned lands. The report then goes on to discuss the fact that most of the site is post 1947 regeneration. Ironically, this reinforces the fact that the north west corner of the site has good rehabilitation potential, even without human intervention. The report even identifies the fact that: “A large portion of the northwestern corner of the ADI site supports a Grey Box savannah in which moderate-sized trees have been retained whilst the understorey has been mown or regularly slashed, grazed and modified by structures and roads.” (page 13). All through the report, it is stressed that the site consists of regrowth vegetation, such as on page 15: “It should be noted that essentially all of the vegetation on the ADI site is regrowth, and that a substantial proportion of it has also been subjected to ongoing impacts (such as slashing, grazing and occasional clearing).” yet it is clear that the site still has high conservation value as noted on page 16: “Despite previous clearing activities on the ADI site, and ongoing management and use of the site, a number of plant species of conservation interest are known to be present.” and “These species are present on the site despite the high level of modification of the site, although they generally are located in areas of regrowth vegetation.” The report details the conservation status of these species and provides valuable information on their distributions. Although the endangered species *Pimelea spicata* has not been recorded from the site, the report states that: “Moderately

large areas of suitable habitat for Pimelea spicata (Grey Box/Ironbark woodland) are present in the western portions of the ADI site. Suitable woodland communities, dominated by Grey Box and Ironbark and with a grassy understorey, including occasional patches of Blackthorn, are located in the north of the ADI site in the central southern portion and in the southwest. Searches have failed to locate populations but the report does suggest that these areas may provide suitable habitat for transplantation of individuals from other threatened populations. While these populations of threatened flora are significant and warrant full protection, the report has biased conservation toward these areas which are in Castlereagh woodland and neglected significant areas of Cumberland Plain woodland which also warrant protection. After assessing threatened fauna issues, the report then assesses the conservation value of the site using detailed comparative protocols, citing such authors as Margules and Usher (1981) and Usher (1986).

However, although Gunninah site Margules and Usher (1981) as a basis for their methodology, Margules and Usher actually state that for small sites, ecological fragility, threat, and both species and habitat rarity were the most important criteria whereas representativeness, size, naturalness and position in an ecological/geographical unit were the most important for large sites. I think it can be reasonably argued that the ADI site, while being a large remnant by Cumberland Plain standards, is not a large site in terms of conservation evaluation and hence habitat rarity and threat become major considerations in assessing the vegetation found on the site.

If Margules (1986) six criteria for estimating conservation value (representativeness, diversity, rarity, naturalness, area and threat of interference) are used to assess the Cumberland Plain vegetation as a whole, it is clear that three of the criteria – rarity, area and threat of interference - will all place a high value on *any* remnant of Cumberland Plain Woodland simply because over 90% of its former extent has been cleared. And because of extensive modification, it cannot be readily proved that any particular remnant is more representative or more “natural” than any other remnant. Because of this, diversity within remnants will be very heterogeneous and reflect a variety of historical influences. A diverse remnant cannot necessarily be said to be better than a less diverse remnant – both will be important in the case of Cumberland Plain vegetation.

The methodology used by Gunninah to assess the conservation value of vegetation within the ADI site is inappropriate when assessing conservation value at a fine (small patch) scale. The approach that they have used is a regional or even continental one and one that has been used by others to design and plan conservation reserves over large areas to capture *minimal* examples of vegetation or species populations. Gunninah compare one small patch with another within the ADI site in an attempt to find the larger/most intact/more species rich patches and patches that contain the greatest number or largest populations of threatened plant species and then attempt to show that these are representative of the vegetation on the site. However, when vegetation types such as occur on the Cumberland Plain are reduced to the tiny disturbed representation that is left, all patches become important, so long as they have some existing value for flora and/or fauna or the *potential* to obtain such value in the future via regeneration processes. When dealing with a greatly reduced and highly fragmented vegetation type, no patch or cluster of patches can be expected to realistically represent all values or be “representative” and it is the sum total of what is left that becomes important. The Gunninah approach will only lead to further fragmentation and loss of Cumberland Plain vegetation types. It is appropriate to quote from Doherty (1988) on this topic:

“In the case of the Cumberland Plain, because the disturbance history of any given remnant stand of native vegetation may be unique, the concept that any given stand can be representative is probably erroneous. It is therefore inappropriate to try and allocate priorities to tiny patches of these vegetation types based on perceived notions of naturalness or their state of degradation. Effectively, a threshold point has been passed beyond which any area of remaining vegetation of that type must assume at least initially some conservation value. This could relate as a first approximation to those vegetation types which are represented by less than the nominal 15% of original extent recommended for the Comprehensive, Adequate and Representative (CAR) reserve system currently being put forward as part of the Comprehensive Regional Assessment (CRA) process. In the case of such poorly protected vegetation types as exist on the Cumberland Plain, it is the sum total of what is left that will contribute to long term conservation of plant species and communities, so assigning priority amongst what little is left, seems a misdirected exercise and one that will inevitably lead to further clearing and degradation of these vegetation types. Hence, establishing a hierarchy of conservation significance may be appropriate for widespread vegetation types but amongst small remnants of uncommon vegetation types, this approach is likely to be unproductive.

There are many factors to consider when determining the relative conservation value of a vegetation remnant and apart from condition, the use of vulnerable species may also be of use. However, the remaining areal extent of the vegetation type in question is of primary importance as a factor because beyond some lower limit, the presence of vulnerable species in one remnant versus their absence in another becomes less significant than the fact that the vegetation type generally has been so extensively cleared that any remnant assumes some importance simply because it is a remnant of the original vegetation.

What is important is adequate representation of the vegetation type in terms of area and species composition and this may be achieved by larger or smaller areas. However, no one area can be expected to be fully representative of the vegetation type, given stochastic factors such as fire and other disturbance and the natural variation of vegetation with environment. What needs to be avoided is the implied assumption that greater species richness is ‘better’, that is, that the site with the largest number of species overall or the largest complement of vulnerable species is ‘better’ than a possibly less diverse neighbour and that therefore the less diverse remnant is of no importance. This is not to say that a large number of regionally significant species found on a site is not significant, but that, logically, further subdivision of a remnant into smaller and smaller parcels for comparative purposes will always result in one area that is less ‘diverse’ than another and so on ad infinitum. There is often no clear benchmark to compare back to, to gauge what is in fact representative and what is anomalous. This is also a particular problem when a comparison is made between vegetation types where one may be inherently more species rich than another.

Hence, in the case of the Cumberland Plain Woodlands and Castlereagh Woodlands the lower limit of comparison has probably been reached such that all remnants are important and have some, probably high, conservation value. Given that the gradual attrition of what is left on private land still continues, remnants

remaining on Commonwealth or State land for example assume an even greater importance, although the Threatened Species Conservation Act, 1995 now affords greater protection to species and communities regardless of tenure. However, prioritising within these larger remnants, beyond the most grossly physically disturbed areas – that is, fully cleared and/or cultivated with no regeneration - is an exercise that guarantees further loss of these already threatened vegetation types and the restriction of populations of plants and animals to only a few key areas with attendant problems with the long term maintenance of these populations.”

Austin and Margules (1986) re-enforce this view by stating (page 46) that: *“Representativeness does not refer simply to some notion of typicalness but rather that a reserve or system of reserves should contain biota which represent the range of variation found within some land class or region. Thus, land classification and regionalisation become central problems in clarifying the idea of representativeness.”* Further, Margules (1986) page 310 states that: *“Because it is unlikely that any one habitat fragment will represent the range of that habitat type fully, it may not be appropriate to apply representativeness to particular habitat fragments. As representativeness is based on the idea that a system of reserves for conservation in a given region should encompass the range of natural variation in that region it is a criterion that can be applied more easily to a group of sites”.*

Gunninah have inappropriately applied the methodology to patches within a site. These types of evaluations are generally made across tenures, rather than within a small tenure, in order to set, for example, acquisition priorities for a large region.

Regarding fragment size and long term viability, Simberloff (1986) argues that the Equilibrium Theory of Island Biogeography as espoused by MacArthur and Wilson has been an ecological red herring and that the view of pre-equilibrium research planners that the major consideration is conserving enough habitat for the target species has been, ironically, confirmed by subsequent research on the equilibrium theory. Hence, dismissing fragments as too small or isolated misses the whole biological point of habitat availability for a species and the cumulative effects of the destruction of small habitat patches scattered over a landscape.

Department of Urban Affairs and Planning (1997) details the report of the Section 22 Advisory Committee for the ADI Site. The report makes some interesting points and notes that: *“... the site has much resilience and should be considered as having good regeneration potential”.* It also states that: *“...ideally, all extant remnants of Cumberland Plain Woodland and Castlereagh Woodland communities should be protected and conserved”.* The report questioned some of the Masterplan’s methodology, for example: *“... the Masterplan’s comparative assessments of the significance of communities seemed not to recognise the inherent differences between the ecosystem structures of the Castlereagh Woodland and Cumberland Plain Woodland communities”* and advocated further refinement. However, after further work was done on the comparative values between patches, the Section 22 Committee agreed to the inappropriate comparison protocols used by Gunninah and critiqued above. This appears contradictory given the Committees comments as quoted above. Interestingly, although some emphasis has been given to vertebrate fauna, no mention seems to be made of the value or potential value of the site for invertebrates. The document also discusses management issues and whether the conservation areas should be a Nature Reserve or Regional Park. Even

though Cumberland Plain vegetation and its associated threatened species is inadequately protected, the Committee recommended that the conservation area should be a Regional Park rather than a Nature Reserve, based on the false notion that a Nature Reserve would need to be greater in area and could not include recreational uses. This is patently not the case. Two Nature Reserves from the Southern Highlands provide pertinent examples – regarding size, Robertson Nature Reserve is only 5 hectares in area yet protects the largest remnant example of the Yarrawa brush; regarding recreational use, Barren Grounds Nature Reserve of 2024 hectares provides a variety of walking tracks and bird watching activities and has a high usage for passive environmentally based recreation.

ERM - Mitchell McCotter / EDAW (Aust) Pty. Ltd. (1998) provides detailed documentation on the South Creek and Ropes Creek corridors in terms of conservation and recreation potential. The report is based on the Section 22 Committee boundaries only and does not consider how appropriate these are. The main point to emerge from reviewing this document is that ample recreational opportunities as well as limited conservation potential exists in the South Creek and Ropes Creek Corridors, which re-enforces the point that the ADI lands would be more appropriately managed as a Nature Reserve.

Department of Urban Affairs and Planning (1998) is a summary of comments received on the above document and does not differ in its conclusions from that document on anything other than minor points.

Dray, S.; R. Bali and J. Yugovic. (1998) and Ian Perkins Consultancy Services (1999) provided detailed assessments of both the objections to, and areas in dispute arising from, the interim listing of parts of the ADI site by the Australian Heritage Committee. Of particular relevance is the assessment of objections to the listing of the north west area of the site. Although this area was claimed to be lacking many species that “typify Cumberland Plains woodland”, the assessors disagreed and found that the Gunninah plots closest to the area were indeed characterised by Cumberland Plain species. The assessors noted that fewer plots were located in the western area of the site. Indeed, only *one* Gunninah plot was located in this entire north western area, which implies that it was grossly under sampled. Further detailed plot work by Ian Perkins confirmed that the area does fulfil the criteria of being Cumberland Plain Woodland and additional full floristic plots were completed in this area to provide comparable information for its assessment. Even in the treeless areas, the species composition is still predominantly native. Dray et al. (1998) state: *“The vegetation in this area has been subject to localised soil disturbance and filling; however the topsoil remains and the overstorey retains the woodland structure. Therefore according to Giddins (1997), the remnant vegetation has not been altered to a state no longer considered as Cumberland Plain Woodland. The vegetation therefore meets the definition of a “modified” community as opposed to a “destroyed” community.”* They also note that: *“It was noted that during the site visit that regeneration was occurring in areas that weren’t mown (for example along/in drainage lines), and that eucalypt species were coppicing at ground level in the mown areas, indicating that a higher density of canopy species would be present if mowing ceased.”* Most importantly, they conclude that: *“The ecological systems present extend beyond the Section 22 boundaries and areas have been considered in this Objection Assessment as components of the whole. The contiguous nature of the vegetation communities present on the site (Cumberland Plain Woodland, Castlereagh Woodland and Riverflat Forest) contributes to the integrity and viability of the site.”* Perkins notes that the results of his on the ground surveys in the north west corner: *“.....indicate that several significant areas of remnant Cumberland Plain*

Woodland (as defined by the NSW Threatened Species Conservation Act (1995)) occur within the disputed areas. It appears that the assumption, made at a previous stage of flora surveying on site, that the entire north-west sector was so heavily degraded that it no longer contained species or communities of significance or sufficient diversity to be significant was unjustified. Accordingly, the conclusions of the Section 22 assessment process may have been adversely influenced by the lack of data collection in the north-west sector." The potential for natural regeneration in the area is also noted given the amount of topsoil still remaining and the number of suppressed eucalyptus seedlings. Overall, these two reports supply valuable information that highlights the importance of the previously neglected north west sector. Australian Heritage Commission (1999a) details the resolution process for the objections to the listing and Australian Heritage Commission (1999b) details the final listing for the ADI site as a result of the work undertaken.

Department of Urban Affairs and Planning / National Parks and Wildlife Service (1999) underlines the fact that NSW NPWS has given priority to management issues rather than the actual biodiversity values of the site in their dealings over the issue. Their support of the Section 22 boundaries is unfortunate and appears to be based on a lack of detailed knowledge of the site or of vegetation dynamics in general. For NPWS to state that the Section 22 boundary captures a representative sample of vegetation communities and threatened species across the site indicates a lack of appreciation as to how little Cumberland Plain vegetation is left in total, how little is and can be formally protected and the potential for regeneration of these communities in some areas, if given a chance. Their contention that extra values which would be protected by the AHC boundary are considered to be already well represented and conserved is patently not the case.

Department of Urban Affairs and Planning (1999a), (1999b) and (1999c) are all based on the Section 22 boundaries and do not take any account of subsequent information gathered by the Australian Heritage Commission. In relation to conservation outcomes, the draft *St. Mary's Environmental Planning Strategy* and draft *Sydney Regional Environmental Plan – St Marys* differ in only minor ways from the *draft Regional Environmental Study* completed in 1995 by the same Department. Although much discussion by advocates of the Section 22 boundary is directed toward achieving a "balanced" planning and conservation outcome for the site, these discussions have always presumed that urban development will proceed. The development of Precinct Plans for the ADI site in relation to the subsequent submission of Development Applications for particular works remains unclear in terms of an overall framework for assessing the environmental impacts of development on the site. These documents simply re-enforce the long held view by the Department that urban and retail development of the ADI site will proceed, under the guise of sustainable development. These documents do not provide adequate detail as to how any proposed development can be guaranteed to be ecologically sustainable and the planning process for the site has lacked and still lacks an overall guiding vision for how development and conservation could be integrated.

In summary, urban development of the site has been assumed to be an appropriate use from at least the early 1990's. The joint venture between ADI and Lend Lease by its very nature assumes urban development will proceed. Biodiversity values have only been considered as an afterthought and have been dealt with in an inadequate fashion. The methodology used for assessing the values is inappropriate and will result in further loss of significant areas of Cumberland Plain vegetation. The biodiversity values of the site should have been fully assessed before any joint venture was undertaken to propose

urban and retail development of the site. The role of the Department of Urban Affairs and the Section 22 Committee in the whole process remains ambiguous. It can be readily argued that the Heritage Commission listing boundary represents an already compromised minimum for protection of the biodiversity values of the site. Further areas in the west and north west and some of the riparian strips should also have been included. If the re-zoning as proposed in the draft REP goes ahead, and urban and retail areas are developed as proposed, there will be a significant impact on Cumberland Plain communities. The whole process appears to have been lacking in public and scientific input and is rolling on inexorably toward further destruction of Cumberland Plain vegetation. Alternative uses for the most heavily disturbed parts of the site, such as the provision of regional sporting or other community facilities, should be considered rather than consigning these areas to urban and retail development. This would also complement the usage of the South Creek and Ropes Creek corridors for recreational and sporting facilities.

A summary table of the documents reviewed is presented in Table 1.

Table 1: Main Findings and Strengths and Weaknesses of Reports Reviewed

REPORT	FINDINGS	STRENGTHS	WEAKNESSES
Kinhill Engineers Pty. Ltd. (1994)	General biophysical description of site, but does stress conservation importance of Grey Box Woodlands, irrespective of tree density and points out potential for rehabilitation/restoration	Useful early summary of information	Not enough detail - unclear where information has come from
Department of Urban Affairs and Planning (1995)	Constraints are not sufficient to prevent urban development, but there is a conflict between the conservation of flora and fauna and the provision of housing and jobs	Useful background information on a variety of topics relating to any potential development of the site	Ignores N.W. corner; little effective weight given to biodiversity
Gunninah Environmental Consultants / ERM Mitchell McCotter (1997)	Hierarchy of conservation value for remnants	A lot of detailed survey work undertaken and useful information acquired	Inappropriate methodology used and hence assessments of conservation values invalid
Department of Urban Affairs and Planning (1997)	High biodiversity value areas to be conserved which form basis for conservation zone	Some attempt made to protect biodiversity	Agreed to Gunninah methodology. Ignored N.W. corner because of this
ERM - Mitchell McCotter / EDAW (Aust) Pty. Ltd. (1998)	Need for conservation of natural and cultural heritage and the provision for recreational facilities.	Detailed assessment of conservation and recreation potential	Based on Section 22 Committee boundaries only
Department of Urban Affairs and Planning (1998)	Supportive of above document	-	Superficial consideration of additional issues
Dray, S.; R. Bali and J. Yugovic. (1998)	Areas of contention do contain significant values and are Cumberland Plain Woodland	Detailed assessment of objections	No additional site data gathered
Ian Perkins Consultancy Services (1999)	Areas of contention do contain significant values and are Cumberland Plain Woodland	Detailed assessment of objections plus additional site data gathered	Perhaps too conservative with boundary in north western sector

Australian Heritage Commission (1999a)	Background information only	-	-
Australian Heritage Commission (1999b)	Background information only	-	-
Department of Urban Affairs and Planning / National Parks and Wildlife Service (1999)	Supports Regional Park encompassing Section 22 Committee boundaries	-	Accepts Section 22 boundary unmodified. No critical analysis
Department of Urban Affairs and Planning (1999a)	Supports Regional Park encompassing Section 22 Committee boundaries	-	Section 22 Committee boundary supported despite findings of Australian Heritage Commission
Department of Urban Affairs and Planning (1999b)	Supports Regional Park encompassing Section 22 Committee boundaries	-	Section 22 Committee boundary supported despite findings of Australian Heritage Commission
Department of Urban Affairs and Planning (1999c)	Supports Regional Park encompassing Section 22 Committee boundaries	-	Section 22 Committee boundary supported despite findings of Australian Heritage Commission

4.0 Threatened Species Assessment

The ADI site has considerable conservation value and supports populations of significant species and communities present under the NSW Threatened Species Conservation Act. The work done on site by Gunninah has provided useful information on the distribution and abundance of these species, even though their assessment of the overall conservation value of individual patches of significant communities is questionable. Significant species and communities on site are:

a) Flora

Schedule 1 (Endangered) Part 1

Persoonia nutans - 2ECi (Important populations east of Ropes Creek)
Pultenaea parviflora - 2E (Important populations east of Ropes Creek)
Pimelea spicata – 3ECi (Possible)
Pterostylis gibbosa – 2E (Possible)

Schedule 1 (Endangered) Part 3

Cumberland Plain Woodland Community
 Sydney Coastal Riverflat Forest Community

Schedule 2 (Vulnerable)

Acacia pubescens – 3VCa (Possible)
Dillwynia tenuifolia – 2RCa (Important populations east of Ropes Creek)
Micromyrtus minutiflora – 2V (Important populations east of Ropes Creek)

All of these species are also listed under the Commonwealth Endangered Species Protection Act as endangered or vulnerable as the case may be, except for *Pultenaea parviflora*, which is listed as vulnerable rather than endangered at the Federal level. Cumberland Plain woodland is also listed as Endangered at the Federal level under this act. In addition, there are 68 other regionally significant plant species present on the site.

b) Fauna

Schedule 1 (Endangered) Part 1

Bush Stone-Curlew (Possible)
 Green and Golden Bell Frog (Possible)

Schedule 2 (Vulnerable)

Black Bittern
 Common Bent-wing Bat (likely all over site)
 Greater Broad-nosed Bat (likely all over site)

The impact of rezoning as proposed in the draft REP is likely to be significant, particular in relation to the Cumberland Plain Woodland endangered ecological community. A Species Impact Statement would also be necessary for any proposed development given the potential impact on endangered and vulnerable species and endangered ecological communities. However, the proponent of any development would be responsible for providing a detailed assessment of impact. Whether this should be done at the Precinct Plan stage or the Development Application stage is unclear and needs to be resolved in the draft REP. Ideally, impact should be assessed earlier rather than later in the planning and approval process so that areas which form fundamental constraints to development can be identified.

Doherty (1998) provides a review of the conservation value of regrowth native vegetation. It is important to stress that just because an area is regrowth, its conservation value is not necessarily low, as evidenced by the work Gunninah have done on the ADI site. The regenerative potential of areas outside the proposed Regional Park, based on evidence gathered by the Australian Heritage Commission is high for the north west area, and possibly high for the western area in general. Areas to the east also have high potential and areas around South Creek probably medium to low potential. This needs to be investigated. Nonetheless, many areas outside proposed Regional Park have capacity to regenerate naturally and therefore have high conservation value. The long term survival of the species and communities which are not formally protected cannot be guaranteed. It must be kept in mind that development pressures on remnant Cumberland Plain vegetation is great and if areas are bargained off one against the other, much less than 10% of Cumberland Plain woodland will be left in another 10 years time. While large reserves are preferable, small patches also contribute to conservation and a small remnant patch cannot be dismissed as being of low conservation value simply because it is small.

5.0 Conservation Area Determination

Based on the review of available documentation, an appropriate conservation zone for the ADI site would be comprised of the final Australian Heritage Committee boundary plus additional areas on the western part of the site, the eastern part of the site and along South Creek. These modifications would protect additional areas of Cumberland Plain Woodland and Riverflat Forest. Additionally, the conservation zone should preferably be a Nature Reserve rather than a Regional Park given its high conservation value. Some recreation is feasible within Nature Reserves and the proximity of the South Creek and Ropes Creek corridors takes pressure off the ADI site to accommodate all of these other recreational values.

The conservation area delineated in the draft REP is inadequate to protect the important conservation values contained on the site, particularly as regards Cumberland Plain Woodland and Sydney Coastal Riverflat Forest. The boundary in the draft REP effectively corresponds to that of the Section 22 Committee and has stood unchanged if not unchallenged for many years. Unless additional patches of vegetation are added to the conservation area, significant impact will be likely if retail and urban development proceeds.

6.0 Management Implications

It is very difficult to assess the proposed level of funding required for the long-term management of the proposed conservation area. The document gives a figure of 2.5 million dollars over at least 3 years plus \$500 per residential lot sold on an annual basis to be used for these purposes. In the absence of a detailed break down of how the money is to be used, it is difficult to determine if this amount of funding is adequate or not. NSW National Parks and Wildlife Service would be in a better position to evaluate these figures. Essentially though, the more money that is provided, the greater the flexibility of management. Unfortunately though, NPWS appear to be assessing the value of the ADI site simply in terms of management issues and the possibility of monetary assistance to tackle these, rather than evaluating the area initially solely on its inherent value for conservation.

The fact that conservation values have been retained on the ADI site despite disturbance and lack of management implies that management of the ADI site should not be approached too hastily. In the absence of a clear strategic and tactical approach to weed management and other issues, a great deal of money may be spent with little apparent gain for conservation. At present, the conservation area is being proposed as a Regional Park and there may well be a conflict between money spent on conservation works and money spent on recreational facilities.

Given that there are some very disturbed areas on the site, it should be considered that these areas may best be stabilised and rehabilitated for public recreation facilities for the region, rather than as retail or urban areas. Use of these areas for low key activities would be far more compatible with nature conservation than a situation where urban and retail areas are situated adjacent to and amongst important stands of remnant Cumberland Plain vegetation.

7.0 Conclusion

Throughout the whole process of considering the ADI site for urban development, there appears to have been no serious consideration of a no development option which would protect the whole area for nature conservation purposes. Although detailed biodiversity survey work was only undertaken after 1995, the Department of Urban Affairs and Planning draft RES of 1995 had already delineated what was to become the proposed Regional Park. Despite subsequent detailed Australian Heritage Commission reports on the areas of contention, both NSW National Parks and Wildlife Service and the proponents have not re-considered the suitability of the original Section 22 Committee boundary for the proposed Regional Park. Additionally, there has been no peer review or independent assessment of the suitability of the methodology used by Gunninah for their conservation assessment of vegetation. The reason for this may partly be attributed to the fact that there appears to be some confusion surrounding the intent of Benson's 1992 vegetation map for the Penrith 1:100000 sheet. Because it is a regional map, not all small patches of vegetation could be mapped. Hence, areas such as the north west corner of the ADI site where vegetation is more open were not mapped as discrete polygons. However, subsequent mapping by NPWS has identified these areas as Cumberland Plain vegetation. The planning process for proposed development of the ADI site has not been adaptive and has failed to adequately respond to new information as it became available. The process has not adequately addressed the fact that the high value of the Cumberland Plain vegetation on the site poses a fundamental constraint to any proposed development.

Very little information exists on the conservation value of regrowth native vegetation (Doherty 1998). However, in one of the few experimental approaches identified, Johnson (1997) summarises the results of a long term study begun in 1964 (Johnson 1981) in which an area of brigalow regrowth has been monitored for 30 years after pulling and burning. The resultant sucker regrowth of 28000 brigalow stems per hectare 9 months after burning has now halved, with a significant loss of stems at 27 to 32 years post clearing (4000-6000 stems per hectare was noted pre-clearing). Most of the pre-existing understorey and canopy species are present in the regrowth but at lower densities and all ground species recorded in untouched surrounding areas have been recorded at some stage in the regrowth. He states:

'I have little doubt that given time mature communities that arise from remnant suckers will be indistinguishable from uncleared communities.'

He advocates that large areas of brigalow sucker regrowth be conserved as the existing reserves have concentrated on small, virgin remnants and these alone will be inadequate for long term conservation. However, he stresses that brigalow is among the most resilient communities and that what applies for plant species conservation may not apply for animal species conservation. This is the only Australian paper found that specifically assessed the conservation value of regrowth native vegetation and found a high value in regrowth stands. In this instance, the regrowth has high value not only because 95% of the brigalow belt has been cleared but because the regrowth retains a high floristic similarity to virgin brigalow, notwithstanding short term structural differences.

I believe it can be convincingly argued that in a vegetation type with less than 90% of its former distribution extant, any patch however small will have high conservation value. Indeed, I would be concerned for a vegetation type that had less than 50% of its distribution still extant. In the case of the ADI site, the opportunity arises to sample a full Cumberland Plain topographic sequence of vegetation from shale hills on the western side, through riparian vegetation, to the Tertiary terrace on the eastern side of the site – a unique opportunity given the patchiness of the remaining remnants and their general small size.

The detailed work by Gunninah on the site has, ironically, shown the remarkable regenerative capacity of Cumberland Plain vegetation on the site and hence it can be readily argued that most of the site has high conservation value either in its present state or as vegetation that has a high regenerative capacity. Hence the site provides an ideal opportunity to protect a relatively large, diverse and dynamic patch of Cumberland Plain vegetation. Urban and retail development as proposed will have a significant impact on this vegetation.

It remains unclear why the area has only been proposed as a Regional Park and not a Nature Reserve, given its obvious high conservation value.

8.0 Identification of Further Work and Recommendations

It is clear from observations and detailed work undertaken on the site and in surrounding areas that there is a marked potential for the further regeneration of Cumberland Plain vegetation in areas which are currently only sparsely vegetated. Areas of the ADI site which are undergoing regeneration have been undervalued in the studies undertaken by the proponents of urban development on the site and inadequate value has been assigned to those areas, such as the north west corner.

It is recommended that:

- 1) as the conservation area delineated in the draft REP is inadequate, a more appropriate conservation zone for the ADI be delineated which would comprise the final Australian Heritage Committee boundary plus additional areas on the western part of the site, the eastern part of the site and along South Creek. The conservation zone would preferably be a Nature Reserve rather than a Regional Park

2) a long term study on the regenerative potential of Cumberland Plain vegetation communities be undertaken by an independent scientific team on the ADI site in relation to:

release of areas from cutting, mowing or other forms of vegetation 'management';
release of areas from grazing by kangaroos and emus;
regeneration on decontaminated areas

3) alternative uses other than housing and retail be considered for the most heavily disturbed areas, such as community facilities

These recommendations require action before any serious consideration is given to rezoning for urban and retail development on the ADI site.

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