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DRAFT CUMBERLAND PLAIN ASSESSMENT REPORT

SUMMARY REPORT

PREPARED FOR THE NSW GOVERNMENT DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT

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Summary Report Contents

The purpose of this report is to provide the community and other stakeholders with a summary of the Cumberland Plain Assessment Report, including the overall impacts and evaluation of the conservation benefits of the Cumberland Plain Conservation Plan on biodiversity values and other protected matters

1 Introduction

The NSW Government has identified four areas for urban growth and other development ('nominated areas') and a series of transport corridors within and outside the nominated areas to support the future growth of Western Sydney for the next 36 years. These initiatives are identified under two key planning strategies:

- *A Metropolis of Three Cities - The Greater Sydney Region Plan* (Greater Sydney Commission, 2017)
- *Future Transport 2056* (Transport for NSW, 2018)

The NSW Department of Planning, Industry and Environment (the Department) has prepared the Cumberland Plain Conservation Plan (the Plan) as part of the environmental approvals for the development.

The Plan will establish long-term certainty for biodiversity conservation and development in Western Sydney. The Plan supports the delivery of infrastructure, housing and jobs for Western Sydney in a planned and strategic way that also protects and maintains key biodiversity values of Western Sydney.

The Plan describes the proposed urban and other development and sets out a conservation program comprising a range of specific commitments to avoid, mitigate and offset the impacts of the development on biodiversity values and other matters protected under Commonwealth and NSW biodiversity legislation.

1.1 WHAT IS THE CUMBERLAND PLAIN ASSESSMENT REPORT?

The purpose of the Cumberland Plain Assessment Report (Assessment Report) is to evaluate the Plan's acceptability under Commonwealth and NSW biodiversity legislation in terms of the impacts of the development on biodiversity values and other protected matters, and the commitments made to avoid, mitigate and offset these impacts.

The Assessment Report examines the direct, indirect, prescribed and cumulative impacts of the development.

The report comprises both:

- A Biodiversity Certification Assessment Report prepared in accordance with the NSW Biodiversity Assessment Method (BAM) made under the NSW *Biodiversity Conservation Act 2016* (BC Act)
- A Strategic Assessment Report (SAR) prepared in accordance with the Terms of Reference made for the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Table 1 shows the approvals being sought for the different developments under the Plan.

Table 1: Actions being assessed for approval under the BC Act and EPBC Act

Development	Biodiversity certification under BC Act	Approval under Part 10 of EPBC Act
The following development within the nominated areas: • Urban, industrial, infrastructure and agribusiness development • Transport corridors	✓	✓
Transport corridors outside the nominated areas*	-	✓

* Biodiversity certification may be sought for the transport corridors outside the nominated areas at a later date, and included as a modification or series of modifications to this biodiversity certification

1.2 WHAT AREA IS COVERED BY THE ASSESSMENT?

The Assessment Report examines the impacts of the development within the Plan Area (see Figure 1).

The area is primarily within the Cumberland subregion of the Sydney Basin Bioregion. It also includes some minor areas of the adjacent Sydney Cataract subregion. The Plan Area is approximately 200,000 hectares.

Prior to European settlement, the Cumberland subregion supported a wide variety of vegetation types, including grassy woodlands, ironbark and turpentine forests, and floodplain communities. The subregion has historically been extensively cleared for agricultural development and is now under pressure from urban development.

Only approximately 13 per cent of the pre-1970 extent of native vegetation in the Cumberland subregion remains intact, with an additional 12 per cent occurring as heavily degraded communities (DECCW, 2011).

The remaining vegetation in the Plan Area is often of high conservation value as it typically contains threatened ecological communities (TECs) and habitat for threatened species, as well as species that occur only in the subregion.

Current key threats within the subregion include:

- Habitat loss and fragmentation due to land clearing
- Weeds invasion
- Predation and competition from pest animals
- Altered fire regimes
- Altered hydrological regimes and water quality, particularly runoff from urban and agricultural areas
- Spread of disease, including *Phytophthora* and Myrtle rust

1.3 WHAT DEVELOPMENT IS PROPOSED UNDER THE PLAN?

The development under the Plan comprises:

- Urban, industrial and infrastructure development within urban capable land in four nominated areas:
  - Wilton Growth Area
  - Greater Macarthur Growth Area (GMAC)
  - Western Sydney Aerotropolis (WSA)
  - Greater Penrith to Eastern Creek Investigation Area (GPEC)
- Agribusiness development within urban capable land in the agribusiness precinct within WSA
- Major transport corridors (see Table 2):
  - Outside urban capable land within GPEC, WSA and a small part of GMAC (a transport corridor tunnel)
  - In several locations outside the nominated areas (within the broader area covered by the Plan)

Figure 1 shows the area covered by the Plan and the location of the four nominated areas and the transport corridors.

Not all parts of the nominated areas are proposed for development. The proposed development will occur within specified urban capable land within the nominated areas. Other parts of the nominated areas include:

- Land avoided from impacts under the Plan, including for biodiversity and other reasons (such as steep slopes)
- Land excluded from coverage under the Plan that is not part of the approvals (such as already developed land)

Table 2: Transport corridors for investigation

Project	Description	Timing for investigation
Sydney Metro Greater West south from Western Sydney Aerotropolis to Macarthur (except for those areas within the existing South West Growth Area)	Provides for a commuter railway line	0 to 10 years
Western Sydney Freight Line corridor	Provides for a future freight rail line to connect Port Botany and Western Sydney	10 to 20 years
Outer Sydney Orbital (Stage 1) from Palmyra Avenue to the Hume Motorway	Provides for a future north south motorway and freight rail line	
Remaining Outer Sydney Orbital 1		20 or more years
M7/Ropes Crossing Link Road	Provides for a future east-west motorway linking the M7 to the future Outer Sydney Orbital at Ropes Crossing	

1.4 WHAT CONSERVATION IS PROPOSED UNDER THE PLAN?

A key part of the Plan's objective is to:

Deliver biodiversity outcomes and support the ecological function of the Cumberland Plain….

The Plan also specifies a series of environmental outcomes to be achieved. These include to increase and improve the extent and condition of native vegetation and ensure threatened ecological communities (TECs) and populations of target species persist and their habitat improves, in areas most likely to support long-term viability in the Cumberland subregion.

The Plan includes a conservation program and a set of 28 commitments and 141 associated actions to achieve the objective and outcomes, and to mitigate and offset the impacts of the urban, industrial, infrastructure, agribusiness and transport development under the Plan. In summary, the key commitments under the Plan are:

- Avoiding at least 4,315 hectares of land within the nominated areas, including 3,670 hectares of native vegetation
- Protecting at least 5,475 hectares of high biodiversity value areas in the Cumberland subregion in perpetuity. As part of this commitment, the following will be delivered under the Plan:
    - Providing offsets for TECs and several threatened species likely to be at risk of impacts under the Plan
    - Establishing a reserve to protect the north-south Koala movement corridor along the Georges River between Appin and Kentlyn and at least two other reserves to protect areas of high biodiversity value
    - Securing priority habitat corridors
    - Undertaking ecological restoration in priority sites
- Managing landscape threats across the subregion, including through weed, pest animal, disease and fire programs
- Implementing an evaluation program, including use of adaptive management, to ensure the commitments are efficiently and effectively delivered and outcomes are achieved

As part of these commitments, the NSW Government proposes to establish three new public reserves within the first five years of the Plan's implementation to deliver early strategic offsets. These are the Georges River Koala Reserve, Gulguer Reserve Investigation Area, and Confluence Reserve Investigation Area. Other areas have also been identified for further investigation as future reserves to provide greater landscape connectivity, such as in the Bargo area.

The commitments relating to the protection of land for conservation under the Plan will be delivered within Strategic Conservation Areas (SCAs). SCAs were identified through an independently peer-reviewed process and represent the areas in the Cumberland subregion that are considered most likely to be viable in the long-term and to maximise ecological function and connectivity across the landscape. In determining the location of the SCAs, priority was given to including the largest, best condition and best-connected areas of native vegetation remaining in the subregion.

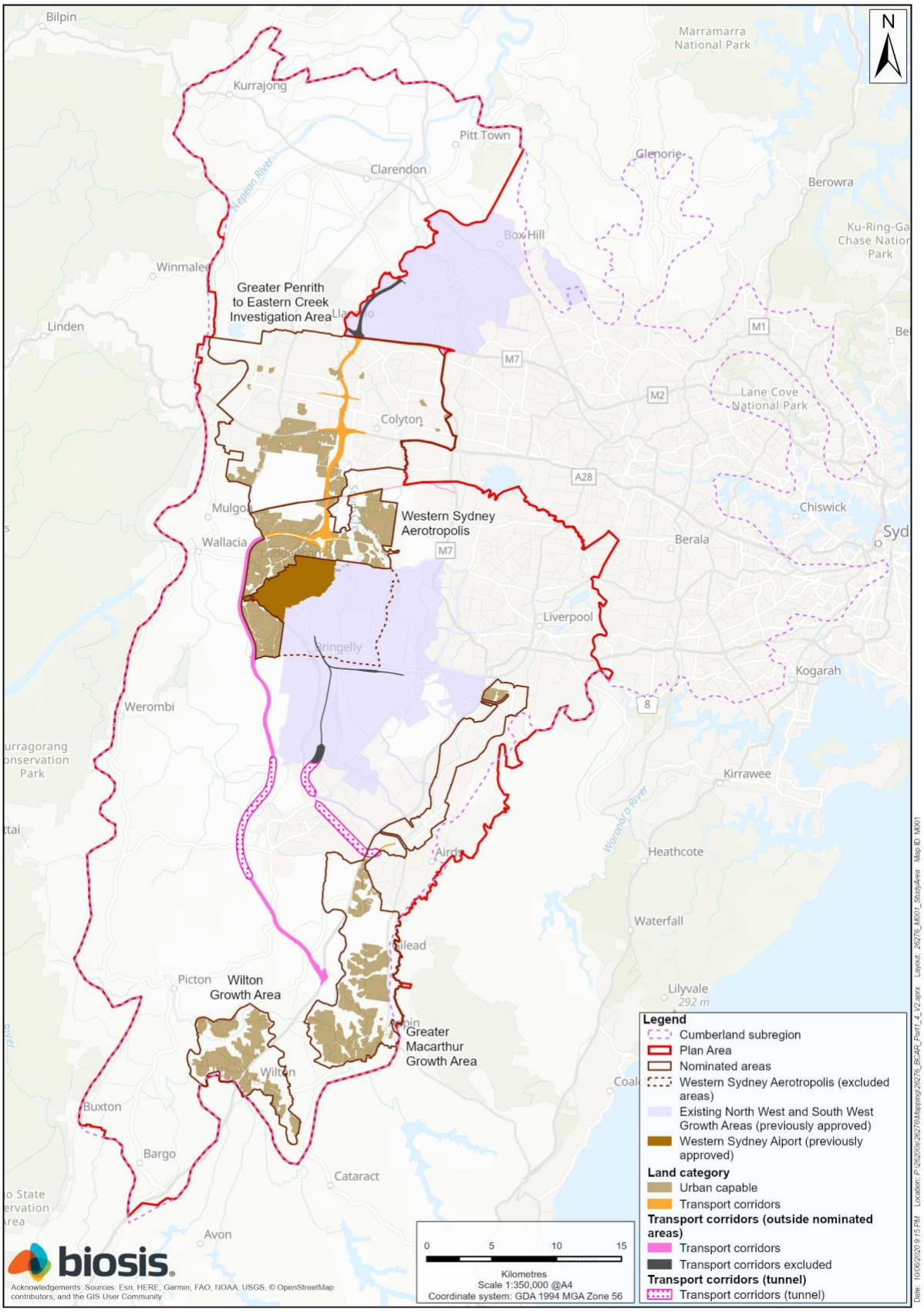

Figure 1: Location of the Plan Area, nominated areas and transport corridors

2 Assessment approach

The Assessment Report examines the direct, indirect, prescribed and cumulative impacts of the development under the Plan on biodiversity values and other matters protected under NSW and Commonwealth biodiversity legislation. The report was prepared in accordance with two main assessment methods:

- The BAM that applies under the BC Act
- Steps to address the Terms of Reference that applies under the EPBC Act

The assessment approach to address both of these methods was based on the best available data on biodiversity values of the Plan Area and informed by multiple field investigations, expert reports and peer review. The assessment is complex, which reflects the large geographic scale and long timeframes of the Plan. To help address this complexity, a wide range of detailed, technical analyses informed the assessment. Some examples of these include:

- Detailed analysis of the outcomes for each protected matter (e.g. threatened species) against key regulatory documents such as recovery plans and conservation advices
- A trend analysis undertaken by RMIT University (Gordon & Peterson, 2019) that examined the extent and condition of a component of Cumberland Plain Woodland to understand how it will fare over the life of the Plan
- A viability analysis for Commonwealth listed TECs, which mapped the most viable patches across the Plan Area

In accordance with the Terms of Reference, the Department commissioned an independent peer reviewer to review the methods used to determine the Commonwealth listed biodiversity values of the Plan Area. The report concluded that the methods were sound and appropriate for a large scale assessment such as this project, and are generally conservative and are unlikely to under-represent the presence or distribution of TECs or species habitat.

2.1 WHAT BIODIVERSITY VALUES OCCUR AND NEED ASSESSMENT?

The BAM and Terms of Reference require the Assessment Report to identify the NSW and Commonwealth listed species, TECs and other protected matters that may occur in the Plan Area and that need assessment. Separate processes were undertaken to identify NSW and Commonwealth matters.

Details of these processes are set out in Part 3, Chapter 11.1 of the Assessment Report.

2.1.1 NSW MATTERS

NSW listed species were identified in accordance with a process under the BAM to predict the species that may occur in the nominated areas and consider whether any can be excluded from the assessment based on their likelihood of occurrence. This takes into account habitat suitability and other published information on the species.

NSW listed TECs were identified on the basis of detailed native vegetation mapping undertaken within the nominated areas for this project, and the relationship between plant community types and TECs.

2.1.2 COMMONWEALTH MATTERS

Commonwealth matters were identified by through searches of the Australian Government's online Protected Matters Search Tool and other relevant databases to establish an initial list of matters that may occur in the Plan Area. A set of criteria was applied to Commonwealth listed species to further determine their relevance and reliance on the Plan Area.

2.1.3 LIST OF MATTERS THAT NEED ASSESSMENT

The Commonwealth and NSW listed biodiversity values and other protected matters that occur in the Plan Area and that were assessed in the Assessment Report are summarised in Table 3.

Table 3: Biodiversity values and other protected matters covered in the Assessment Report

Value/protected matter	Plan Area	Nominated areas
Plant community types (PCTs)	39 PCTs (> 1 hectares)	16 PCTs
	Commonwealth matters	**NSW matters**
TECs	8 TECs, plus one nominated for listing	9 TECs
Threatened flora species	23 flora	Ecosystem credit species – 0
		Candidate species credit species – 23
Threatened fauna species	20 fauna (including 6 migratory sp.)	Ecosystem credit species – 45
		Candidate species credit species – 17
Migratory species	21 migratory shorebirds 9 other migratory species	N/A
RAMSAR wetlands	1 site	N/A
World and National Heritage	4 places	N/A
Commonwealth land	12 sites	N/A

2.2 WHAT NEW SURVEYS WERE DONE?

A range of new and existing information was used to identify and assess the biodiversity values in the Plan Area.

New surveys were undertaken within the nominated areas in accordance with the BAM and Terms of Reference. Surveys were completed between 2017 and 2019 and included two main types:

- Vegetation plots to confirm plant community types and TECs and their condition
- Threatened species surveys to confirm species presence and habitat suitability

Vegetation plots and threatened species surveys were undertaken on land where landholders granted access. Some areas of the nominated areas were not able to be accessed, which limited the ability to undertake threatened species surveys for some species in accordance with NSW EES threatened species guidelines.

Outside the nominated areas, data and mapping of vegetation, TECs and species habitat is based on existing vegetation maps and species records. No surveys were undertaken outside the nominated areas.

A total of 258 native vegetation plots were surveyed within the nominated areas, which meets the requirements of the BAM. A total of 2,190 hectares of combined species habitat was surveyed across the nominated areas.

2.3 HOW WAS NATIVE VEGETATION AND HABITAT MAPPED?

2.3.1 NATIVE VEGETATION MAPPING

Detailed mapping of the extent and condition of native vegetation within the nominated areas was undertaken based on field surveys and data analysis, including interpretation of aerial photo imagery. Mapping of the remaining Plan Area outside the nominated areas was based on existing native vegetation maps (OEH, 2013, 2016).

2.3.2 THREATENED ECOLOGICAL COMMUNITIES MAPPING

Commonwealth and NSW listed TECs were mapped based on associations between plant community types and TECs identified in NSW BioNet. For the Commonwealth listed TECs, rule-sets were then applied to these associations to refine the maps based on definitions in Commonwealth Conservation Advices.

2.3.3 SPECIES HABITAT MAPPING

Different mapping methods were applied within the nominated areas and outside the nominated areas, as well as to NSW and Commonwealth listed species, because of the different requirements of the BAM and Terms of Reference. Three methods were used to map species habitat:

- Preparing expert reports (reports by recognised experts on a particular species). Expert reports were prepared for 14 species that could not be sufficiently surveyed due to either access restrictions, seasonality or their cryptic nature
- Identifying potential habitat using a 'knowledge-based' mapping method and assuming the species is present
- Undertaking Species Distribution Modelling (this was undertaken outside the nominated areas only)

The 'knowledge-based method' applied rule-sets based on the ecological requirements of each species to refine initial broad habitat maps based on the relationship between a species and plant community types. These maps are likely to overestimate the extent of actual habitat for most species and are therefore considered very precautionary.

Within the nominated areas, habitat maps were refined based on species surveys. Where areas were adequately surveyed and the species was not found, the habitat map for that species was refined to reflect this.

Specific separate mapping was undertaken for Koala, including:

- Species Distribution Modelling for the species across the Cumberland subregion
- Corridor habitat mapping to identify 'important habitat' required to be mapped under the BAM
- Mapping of habitat critical to the survival of the species

2.4 WHAT ARE THE LIMITATIONS OF THE ASSESSMENT?

Key limitations of the assessment include:

- Native vegetation plots and species surveys were only undertaken within the nominated areas and were restricted to sites where access was granted by landholders. Access was not possible over all areas of land
- Species surveys were not always able to be undertaken in accordance with EES survey guidelines due to the very large scale of the Plan Area and limited access to land at the appropriate survey season
- Only potential habitat for species was able to be mapped due to the very large scale of the Plan Area. The species maps are therefore likely to be precautionary and greatly overpredict actual habitat

3 Avoidance and minimisation of impacts

Avoiding and minimising impacts to biodiversity values is a critical step in reducing the impacts of the proposed development and the need for commitments and actions to offset those impacts.

3.1 WHAT DOES AVOIDANCE MEAN?

There may be several reasons why land is not impacted under the Plan, including because:

- Land has high biodiversity value and is avoided for biodiversity purposes
- Land is not suitable for development because it is a riparian corridor and is regulated under *Water Management Act 2000* or it is too steep for development (any land with a slope greater than 18 degrees)
- Land is excluded from the area covered under the Plan (excluded land) including because it is existing protected land, is Commonwealth land, or is land that is already developed (e.g. existing urban areas)

Under the BAM, avoidance refers to land that is suitable for development and included in the area proposed for development or biodiversity certification, but has been avoided because of its biodiversity value.

3.2 WHAT WERE THE STEPS TAKEN TO AVOID IMPACTS?

3.2.1 URBAN, INDUSTRIAL, INFRASTRUCTURE AND AGRIBUSINESS DEVELOPMENT IN NOMINATED AREAS

As part of developing the Plan, the Department designed the urban capable land within the nominated areas (containing the urban, industrial, infrastructure and agribusiness development) to avoid and minimise impacts on biodiversity values. This work was guided by the requirements of the BAM and Terms of Reference.

STEPS TAKEN TO AVOID IMPACTS

The process to identify the urban capable land and avoided areas within the nominated areas was iterative and began early in the assessment process before the final data on biodiversity values was completed.

The boundaries of the urban capable land were identified in three main phases:

- Strategic planning to locate the nominated areas
- Initial development of footprints through preparation of Land Use and Infrastructure Implementation Plans
- Iterative refinement of the urban capable land through development of the Plan and assessment of impacts.

The third step involved the compilation of data on the biodiversity values of each nominated area and the development and application of criteria to identify priorities for biodiversity avoidance. The avoidance criteria were applied to each nominated area through a series of workshops with precinct planners and ecologists.

The final urban capable land boundaries within each nominated area reflect the priorities for biodiversity avoidance determined through application of the criteria, and, where avoidance of less important biodiversity values was not possible, a balance between biodiversity and urban development priorities.

The avoidance criteria are set out in Chapter 14 of the Assessment Report.

COMMITMENTS FOR AVOIDANCE

The Plan includes a commitment (Commitment 2) to avoid and minimise impacts to at least 4,315 hectares of land within the nominated areas, including 3,670 hectares of native vegetation.

Environment (E2) conservation zoning will be applied to all lands avoided for biodiversity purposes and other purposes (riparian corridors, steep land). Note that avoided land will have environment (E2) conservation zoning applied except

for land owned by Local Aboriginal Land Councils (LALCs) or under claim by LALCs. LALC owned land and land under claim represents 90 ha of the 4,795 ha of avoided land.[1]

The environmental conservation zoning will strengthen the protection of avoided lands from the impacts of new development and land uses, but will not affect existing land uses.

3.2.2 TRANSPORT CORRIDORS

STEPS TAKEN TO AVOID IMPACTS

Avoidance and minimisation of impacts from the transport corridors is being undertaken in two stages:

- Process to locate the transport corridors. This has been completed, and the details are set out in Chapter 14
- Future detailed design of the footprints for each transport project within the transport corridors to further avoid and minimise impacts. This will be undertaken as part of future strategic planning processes and environmental impact assessments for each transport project under NSW planning and assessment legislation

COMMITMENTS FOR AVOIDANCE

The Plan includes commitments to ensure further avoidance and minimisation of impacts during detailed design of the transport projects within the transport corridors. This will be undertaken through a process of strategic planning and detailed design, which will determine the final alignment of each transport project.

Commitments 3 and 4 of the Plan commit Transport for NSW to avoid and minimise impacts to TECs, species and habitat. This includes avoiding where possible:

- Areas of high biodiversity value
- Areas of potential habitat connectivity, particularly vegetation in riparian corridors, for specific species
- Known flora populations in specific locations, other identified areas of high biodiversity value, and specific Commonwealth land sites

3.2.3 ESSENTIAL INFRASTRUCTURE DEVELOPMENT

Planning for essential infrastructure to support the nominated areas, such as water and electricity utilities, is in various stages of development, and this infrastructure may need to be located outside urban capable lands. The Plan is seeking approval under the EPBC Act for certain essential infrastructure development to occur within the nominated areas outside urban capable lands (i.e. within avoided lands but not excluded lands).

STEPS TAKEN TO AVOID BIODIVERSITY VALUES

The Plan specifies that every effort should be made to ensure that essential infrastructure development is limited to urban capable lands. Where essential infrastructure occurs outside urban capable lands (i.e. within avoided lands), the development must comply with the 'Guidelines for essential infrastructure development' in Appendix A of the Plan. This includes a requirement to assess the biodiversity impacts of each project under the BC Act and BAM, which requires an avoid, mitigate and offset process to be applied.

COMMITMENTS FOR AVOIDANCE

As part of avoidance under Commitment 2 of the Plan, the total direct impacts over the life of the Plan from essential infrastructure to Shale Sandstone Transition Forest within avoided land will be limited to no more than 20 hectares in Wilton and 20 hectares in GMAC. Furthermore, avoidance of several known populations of flora and important Koala corridors to maintain their integrity within Wilton and GMAC will be prioritised (Commitment 2.3 and 2.4).

[1] The total area of avoided land at the start of the Plan is 4,795 hectares. The avoidance target of 4,315 hectares has reduced this figure by 10 per cent to allow for potential future development of essential infrastructure in non-certified land

3.3 WHAT WERE THE AVOIDANCE OUTCOMES?

Urban, industrial, infrastructure and agribusiness development in urban capable land within the nominated areas has avoided the majority of native vegetation, including almost all native vegetation in high condition, and the majority of the most important NSW and Commonwealth listed TECs and species habitat and areas of habitat connectivity.

Within the nominated areas, total avoidance (not including excluded lands) is summarised in Table 4. The biodiversity values presented in the table are consistent with the guidance for avoidance under section 8 of the BAM.

Table 4: Avoidance outcomes for urban, industrial, infrastructure and agribusiness development within nominated areas

Biodiversity values	Summary of avoidance outcome in the nominated areas*
Native vegetation	67.2% avoided
High (intact) condition native vegetation	95.2% avoided
Commonwealth listed TECs (critically endangered/endangered)	87.5% avoided
NSW listed TECs (critically endangered/endangered)	71.7% avoided
Potential habitat for the three NSW listed species with a very high biodiversity risk weighting (>3) under BAM	77.8% avoided
Potential habitat for the 31 NSW listed species with a high biodiversity risk weighting (>/=2) under BAM	78.6% avoided
Commonwealth important populations	12 of the 14 species avoided (either wholly or partially)
Habitat connectivity (Bio Map areas)	88.3% of Bio Map core areas
	86.0% of Bio Map corridors

*Note that these figures include the amount of land 'avoided' for other purposes (e.g. riparian corridors and steep land) and not just biodiversity purposes. The figures do not include excluded land (land not covered by the Plan)

3.3.1 TRANSPORT AND ESSENTIAL INFRASTRUCTURE DEVELOPMENT

The commitments for future avoidance relating to the transport corridors and essential infrastructure are considered adequate to ensure this development avoids and minimises the risk of unacceptable impacts on biodiversity values.

The commitments ensure:

- Avoidance outcomes are achieved consistent with the Plan
- There is a robust process in place to assess impacts and apply an avoidance process to detailed design of the projects
- Impacts to existing key biodiversity values are avoided and minimised where possible, including specific species and their habitat, and/or specific locations of high biodiversity or other value
- Avoidance of biodiversity values as well as the costs of offsets, is taken into account in during detailed design

4 Impacts and benefits of the Plan

The Assessment Report examines the direct, indirect, prescribed, and cumulative impacts of the urban, industrial, infrastructure, agribusiness and transport development on biodiversity values and other protected matters.

The assessment of impacts, particularly direct impacts, is done differently for Commonwealth and NSW listed matters to meet the requirements of the BAM and Terms of Reference. In particular, direct impacts for native vegetation and NSW matters are assessed quantitatively to determine the number of credits to offset the impacts of the development, while impacts on Commonwealth matters are assessed through a combination of quantitative and qualitative analysis.

As described in Chapter 1, the Plan includes a conservation program and a set of 28 commitments and 141 associated actions to achieve its objective and environmental outcomes, and to offset and mitigate the impacts of the development under the Plan. This includes a commitment to protecting a minimum of 5,475 hectares of native vegetation in the Cumberland subregion to conserve biodiversity values in perpetuity.

As part of this commitment, offset targets were established for:

- Each impacted Commonwealth and NSW listed TEC
- Those Commonwealth and NSW listed species considered likely to be at risk of residual adverse impacts

4.1 WHAT ARE THE OVERALL IMPACTS?

4.1.1 NATIVE VEGETATION

The urban, industrial, infrastructure, agribusiness and transport development in the nominated areas will directly impact approximately 1,778 hectares of native vegetation. An additional 89 hectares of Commonwealth listed vegetation will be impacted by the transport corridors in the Plan Area outside the nominated areas.

All native vegetation impacted within the nominated areas comprises NSW listed TECs.

The vast majority of direct impacts to native vegetation in the nominated areas occurs to vegetation in low condition. Of the total impacts, only about 7 per cent (118 hectares) occur to vegetation in high (intact) condition. About 50 per cent of the impacts occur to vegetation in low condition (scattered trees or derived native grassland).

4.1.2 THREATENED ECOLOGICAL COMMUNITIES

The urban, industrial, infrastructure, agribusiness and transport development in the nominated areas will directly impact eight NSW listed TECs and five Commonwealth listed TECs (one of these is subject to listing).

Two Commonwealth listed TECs will be impacted by the transport corridors outside the nominated areas.

4.1.3 THREATENED SPECIES

The urban, industrial, infrastructure, agribusiness and transport development within and outside the nominated areas will directly impact potential habitat of 49 Commonwealth and/or NSW listed flora and fauna species. Of these, 15 species are identified as being at risk of residual adverse impacts from the development (see Appendix A).

4.2 WHAT ARE THE BIODIVERSITY VALUES MOST AT RISK OF IMPACTS?

The TECs and species most likely to be at risk of residual adverse impacts due to the development are identified Appendix A in Table 5 (Commonwealth listed TECs), Table 6 (NSW listed TECs), and Table 7 (Commonwealth and NSW listed species). The tables in Appendix A summarise the key direct impacts of the development and identify the offset targets that will be implemented under the Plan to manage impacts to each of these matters.

Commitments and specific mitigation measures under the Plan to manage indirect and prescribed impacts are expected to adequately address the risks to each of the TECs and species in Table 5, Table 6 and Table 7. These commitments and mitigation measures and the processes to implement them are discussed further in Section 4.3.

4.3 WHAT ARE THE INDIRECT AND PRESCRIBED IMPACTS?

The urban, industrial, infrastructure, agribusiness and transport development under the Plan has the potential to result in a range of indirect and prescribed[2] impacts on biodiversity values and other protected matters.

The indirect impact types are summarised in Appendix B (see Table 8) and include potential issues such as the spread of weeds and pest animals, inappropriate fire regimes, and habitat disturbance.

Prescribed impacts include impacts on, or associated with:

- Karst, caves, crevices, cliffs
- Rocky habitat
- Human-made structures
- Non-native vegetation
- Habitat connectivity/movement of species
- Water bodies/hydrological processes
- Vehicle strikes

4.3.1 COMMITMENTS AND MITIGATION MEASURES TO ADDRESS INDIRECT AND PRESCRIBED IMPACTS

The Plan includes commitments to mitigate the indirect and prescribed impacts of urban, industrial, agribusiness, infrastructure and transport development on biodiversity values and other protected matters. The processes to implement these commitments are different for the types of development under the Plan.

URBAN, INDUSTRIAL AND AGRIBUSINESS DEVELOPMENT

The Plan includes a commitment to mitigate indirect and prescribed impacts from development to best practice standards (Commitment 5). This commitment will be delivered through the NSW planning system.

Specific Development Control Plans (DCPs) will be prepared for each nominated area, or controls may be integrated into existing local government DCPs where precincts require the use of existing DCPs.

A DCP provides detailed guidelines and environmental standards for new development, which need to be considered when preparing a development application seeking development approval.

The Department will work with the relevant consent authorities to introduce development controls in DCPs to protect biodiversity, specific species and other key environmental features in urban development areas. The Department will provide support to councils in applying DCP controls and sharing knowledge, maps and data.

DCPs will include a range of general development controls relevant to managing the indirect and prescribed impacts of the urban, industrial and agribusiness development. DCPs will also include several TEC or species-specific mitigation measures identified in the Plan through the indirect impact assessment (see below).

TRANSPORT AND INFRASTRUCTURE DEVELOPMENT

The Plan includes commitments to mitigate indirect and prescribed impacts from infrastructure development (Commitment 5.3) and transport development (Commitment 6). These commitments will be delivered through processes of environmental assessment and approval that will be applied under NSW planning and assessment legislation to detailed design of each project, at the time the projects are brought forward for development.

[2] Prescribed impacts are a specific list of impacts that are required to be assessed under the BAM. They are defined generally as impacts on biodiversity values that do not comprise direct clearing of native vegetation that are assessed through credits. Prescribed impacts can be direct impacts (e.g. impacts on species' habitat of a type that is not native vegetation, such as rocks) or indirect impacts (e.g. impacts on species associated with the severing of a habitat corridor)

Transport projects will be assessed under the State Significant Infrastructure approval process under the EP&A Act and infrastructure projects under Part 4 or Part 5 of the EP&A Act (or equivalent at the time).

These future environmental assessments provide a process through which to identify and implement mitigation measures relevant to managing the indirect and prescribed impacts of the transport and infrastructure development, including several TEC or species-specific mitigation measures identified in the Plan (see below).

ADDITIONAL SPECIFIC MITIGATION MEASURES

In assessing the risks of indirect and prescribed impacts as part of the Assessment Report, several TEC and species-specific mitigation measures that apply in specific locations were identified where general development controls or future assessment processes were not considered to adequately manage the risks to these species.

These specific mitigation measures have been incorporated into the commitments and actions under the Plan, and are set out in Chapter 15 of the Assessment Report and Appendix E of the Plan.

The commitments and specific mitigation measures under the Plan, along with processes to implement them, are expected to adequately manage the potential indirect and prescribed impacts risks of the development on biodiversity values and other protected matters.

4.4 WHAT ARE THE CUMULATIVE IMPACTS?

Cumulative impacts are required to be assessed under the EPBC Act. The purpose of the cumulative impact assessment was to identify the protected matters most impacted under the Plan and by other major projects in the Cumberland subregion, and determine whether the commitments are adequate to in the context of those cumulative impacts.

The protected matters that are most likely at risk from cumulative impacts and that may need additional commitments under the Plan in the context of those impacts are those matters where:

- The Plan is having a notable impact on the matter, and
- The major projects make a significant contribution to cumulative impacts, and
- There is a significant total cumulative impact from the Plan and major projects

Several Commonwealth listed species and TECs met these criteria, including:

- *Acacia pubescens*
- *Cynanchum elegans*
- *Micromyrtus minutiflora*
- *Pimelea spicata*
- *Pultenaea parviflora*
- Regent Honeyeater
- Swift Parrot
- Dural Land Snail
- Grey-headed Flying-fox
- Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest

The Assessment Report concluded that the Plan adequately addresses the potential cumulative impacts (from the Plan together with other major projects) on these species and TECs in the context of the risks to these matters from the Plan and the contribution the Plan makes through offsets to conserve these matters in the Cumberland subregion.

4.5 WHAT ARE THE IMPACTS ON OTHER VALUES?

Direct and indirect impacts on other values, including migratory species, Ramsar wetlands, World and National Heritage, and Commonwealth land, are required to be assessed under the EPBC Act. These matters have been assessed in relation to the nominated areas and the transport corridors within and outside the nominated areas.

MIGRATORY SPECIES

Migratory birds

Nine bird species listed in the *Draft Referral guideline for 14 migratory birds listed under the EPBC Act* (DoE, 2015) have been observed within the Plan Area. These species have large areas of important habitat across Australia.

Potential impacts of the development on these species are considered to be negligible.

Only one of the species (White-throated Needletail) has been observed in ecologically significant numbers in the Cumberland subregion. This species is found over a wide range of habitats including extensively modified and urban areas. Development under the Plan is considered unlikely to disrupt this species' use of the Plan Area.

Migratory shorebirds

Thirty-seven species of migratory shorebirds regularly visit Australia during their non-breeding season. Twenty-one of these species have been recorded within the Cumberland subregion. Two of those have been recorded at a site level in important numbers, including the Sharp-tailed Sandpiper and Latham's Snipe.

Potential impacts of the development on these species are considered to be negligible. No important habitat will be lost, and the risk of indirect impacts such as degradation of habitat and disturbance of birds is considered to be low.

RAMSAR WETLANDS

There will be no direct impacts to any Ramsar sites due to development under the Plan. The closest Ramsar site to the development is Towra Point Nature Reserve, which is approximately 23 km from the northern part of GMAC.

A small part of the Plan Area – 170 hectares of urban development in GMAC and 9 hectares of transport corridors – is located within the Georges River sub-catchment, which is one of four major sub-catchments connected to the Ramsar site. Development under the Plan has the potential to cause reduction in surface water quality and changes to surface water flows due to run-off from the development, and potential impacts increased recreational use of the reserve associated with larger populations in Western Sydney facilitated by the urban development

The Plan includes a commitment to mitigate the indirect impacts of the development to best practice standards, including implementing several development controls on new urban development though the NSW planning system to control urban-run-off. It is considered that these development controls, and the existing measures already in place to manage increased human visitation, are adequate to mitigate these potential impacts on the Ramsar site.

WORLD AND NATIONAL HERITAGE

Three World and/or National Heritage sites occur within or near the Plan Area.

There will be no direct impacts to these sites. The closest site to the development is the Greater Blue Mountains World Heritage Area, which is located approximately 1 km from the western edge of GPEC.

The indirect and facilitated impacts to these sites from the Plan are negligible. There is the possibility of facilitated impacts from increased human visitation, but visitor impacts are already managed at each site and the existing management arrangements for these sites are considered sufficient to manage this risk.

COMMONWEALTH LAND

Under the EPBC Act, an assessment of impacts to Commonwealth land needs to consider the whole of the environment, which is broader than biodiversity values and includes the qualities and characteristics of places, and heritage values.

There are 12 Commonwealth land sites within the Plan Area. Potentially only one site (Site 10) will be directly impacted by development (by the transport corridors outside the nominated areas). Three other sites – Site 4 (Western Sydney University – Campbelltown Campus), Site 6 (Camden Airport) and Site 7 (a small site at Grassmere) – may also be directly impacted by the tunnels associated with the transport corridors.

Many of the Commonwealth land sites are located a large distance and/or upstream from the nearest development under the Plan, meaning they very unlikely to be affected by impacts typically associated with construction, such as air quality, noise, construction traffic, or impacts to hydrology or water quality.

The Plan includes commitments to avoid and minimise impacts from the development on biodiversity values and disruption to existing services and infrastructure on Commonwealth Land. The Plan also includes a commitment to mitigate indirect and prescribed impacts to best practice standards. These commitments are considered adequate to address the indirect impacts of development on Commonwealth land.

5 Evaluation of the Plan

The purpose of the Assessment Report is to evaluate the Plan's acceptability under Commonwealth and NSW biodiversity legislation in terms of the impacts of the development on biodiversity values and other protected matters and the commitments made to avoid, mitigate and offset these impacts.

Strategic assessments represent large, complex programs that will run over long timeframes. Lessons learnt from previous projects around Australia of a similar nature highlight the importance of ensuring these programs are well designed, supported by robust governance arrangements, and implemented adaptively.

5.1 WHAT WAS THE APPROACH TO EVALUATING THE PLAN?

The Assessment Report sets out the approach used to evaluate the acceptability of the Plan. The approach was based on:

- Guidance provided in the draft *Guidelines for planning authorities for proposing conservation measures in strategic applications for biodiversity certification* (draft version 6) ('draft guidelines for planning authorities') (EES, 2019)
- Requirements of the Terms of Reference, which requires the report to evaluate the commitments and outcomes for protected matters, and specifies several factors to consider

The evaluation was undertaken at three levels:

- In relation to the principles of Ecologically Sustainable Development (ESD)
- In relation to the overall adequacy of the Plan in accordance with the 'draft guidelines for planning authorities' and requirements of the Terms of Reference
- For individual Commonwealth protected matters, which is set out in Chapters 29 – 35 of the Assessment Report

The requirements of the 'draft guidelines for planning authorities' (EES, 2019) and Terms of Reference are similar or overlap in some cases, and so they were grouped and addressed together in themes. The themes are:

- Theme 1: Are serious and irreversible impacts avoided and minimised?
- Theme 2: Do the commitments address the values being impacted?
- Theme 3: Do the commitments address the most important values?
- Theme 4: Do the commitments improve values and ecological function in the long-term?
- Theme 5: Are the commitments additional to existing requirements?
- Theme 6: Do development controls proposed as commitments conserve the environment?
- Theme 7: Are proposed new national parks consistent with the CAR reserve framework?
- Theme 8: Will the Plan be effectively implemented and will outcomes be certain?
- Theme 9: Does the Plan facilitate adaptation to climate change?

5.2 WHAT WERE THE CONCLUSIONS OF THE EVALUATION?

5.2.1 THEME 1: ARE SERIOUS AND IRREVERSIBLE IMPACTS AVOIDED AND MINIMISED?

The avoidance outcome achieved through the process to design and locate the urban capable lands within the nominated areas is considered adequate and generally consistent with the BAM and Terms of Reference.

The avoidance process was detailed and robust and based on the best available data on biodiversity values. The process achieved substantial avoidance outcomes for native vegetation, high (intact) condition native vegetation, the majority of Commonwealth listed and NSW listed TECs, including the most endangered TECs, as well as potential habitat for species with a very high and high biodiversity risk weighting (greater than three).

Avoidance effort has generally focused on native vegetation and TECs in higher condition that are more likely to be viable in the long-term, with residual impacts from the development generally occurring to:

- Smaller patches
- Native vegetation or TECs in lower condition
- Only the edges of larger, contiguous patches associated with waterways and gullies and gorges, particularly in Wilton and GMAC, which minimises fragmentation and impacts on habitat connectivity

Despite this overall conclusion, for some SAII entities, about half or less of the TEC or potential species habitat was avoided and residual impacts remain. This includes:

- Cumberland Plain Woodland
- Cooks River/ Castlereagh Ironbark Forest
- *Allocasuarina glareicola*
- Green and Golden Bell Frog

For these TECs, the scale of impacts are relatively minor when considering the extent of these TECs across the Plan Area, and the majority of impacts are to lower viability areas. The offsets proposed by the Plan for these TECs (Commitment 8) will provide a substantial addition to the level of protection of these TECs and address key threats to the TECs identified in BioNet profiles and Conservation Advices.

For *Allocasuarina glareicola*, there are no impacts to records or important populations of the species (one important population occurs on excluded lands and will not be impacted).

While there will be direct impacts to small areas of Green and Golden Bell Frog habitat for a potential population in GPEC, it is not known whether this population still exists. Under Commitment 5, the Department will undertake surveys for this species along Ropes Creek, and if confirmed present, the Plan includes a species specific measure to consult with land managers of the riparian corridor to ensure key habitat features are protected and enhanced.

5.2.2 THEME 2: DO THE COMMITMENTS ADDRESS THE VALUES BEING IMPACTED?

The analysis of Theme 2 involved an assessment of the adequacy of the offset targets for each impacted NSW listed TEC and the extent to which commitments involving offsets meet the principles of the EPBC Act Environmental Offsets Policy (DSEWPC, 2012).

The analysis concluded that:

- The total offset target for NSW TECs (5,475 hectares) is estimated to be broadly within the range required to satisfy the BAM credit requirements (between 4,698 hectares and 9,820 hectares)
- The offset targets are estimated to generally satisfy the minimum credit requirements of the BAM for the majority (7 of 9) of the impacted NSW TECs (for three of these seven TECs, there is a negligible shortfall (< 6 hectares))
- The Commonwealth listed TEC offset targets meet the requirements of the EPBC Act Environmental Offsets Policy when assessed on the basis of the requirements of the offsets assessment guide
- The SCAs contain enough Commonwealth listed TECs to broadly satisfy the offset target for four of the five TECs. The shortfall for Cooks River/Castlereagh Ironbark Forest (26 hectares) could potentially be negated through the restoration of PCT 725 within SCAs, which is estimated to be 47 hectares

5.2.3 THEME 3: DO THE COMMITMENTS ADDRESS THE MOST IMPORTANT VALUES?

The analysis of Theme 3 suggests that the commitments generally prioritise the protection of important biodiversity values. This is because the SCAs (where the offsets are intended to be delivered):

- Contain each impacted Commonwealth and NSW listed TEC
- Contain potential habitat for the majority of Commonwealth and NSW listed species
- Significantly contribute to increasing representation of PCTs in protected lands in the Cumberland subregion
- Include substantial areas of land identified by the NSW Government as priorities for conservation, including BIO Map core areas and corridors (OEH, 2015) and areas in the EES biodiversity values map (OEH, 2019)

BIO Map core areas represent the habitat in the subregion most likely to support species persistence and interactions between species and landscape scale ecological processes, while BIO Map corridors play a crucial role in maintaining connections between species populations that would otherwise be isolated and at greater risk of local extinction.

Furthermore, it is likely that offset sites for the majority of species with specific offsets under the Plan are currently available (or are soon to be available) on Biobank or Stewardship sites and/or are represented within the SCAs. The data indicates that sourcing offsets for these species should be achievable under the Plan.

5.2.4 THEME 4: DO THE COMMITMENTS IMPROVE VALUES AND ECOLOGICAL FUNCTION IN THE LONG-TERM?

The analysis of Theme 4 suggests that the commitments broadly ensure biodiversity values and ecological function are likely to be improved in the long term. This is because the SCAs (where the offsets are intended to be delivered):

- Include many large patches greater than 50 hectares (these comprise over 87 per cent of the total native vegetation in the SCAs) and contain substantial amounts (35 per cent) of the total area of patches greater than 50 hectares in the Plan Area
- Contain substantial amounts of BIO Map core areas and corridors (see above)

Importantly, the Plan further addresses ecological function and landscape-scale ecological processes within the Cumberland subregion by committing to undertaking ecological restoration in priority areas within the landscape and managing key landscape threats in strategic areas to benefit conservation lands, including weeds, pest animals and fire.

5.2.5 THEME 5: ARE THE COMMITMENTS ADDITIONAL TO EXISTING REQUIREMENTS?

The 'draft guidelines for planning authorities' (Principle 5) requires that commitments are additional to existing conservation obligations. Existing conservation obligations are actions that are legally required to be carried out on land. The Plan ensures that commitments are additional to existing conservation obligations through:

- Accounting for existing conservation obligations in the process to identify SCAs
- Securing land in SCAs in accordance with the rules and processes under the BC Act and BAM, which account for existing conservation obligations
- Establishing an accounting process to track progress in meeting offset targets, including a method to reduce the number of hectares that are counted towards an offset target where existing conservation obligations apply to a site

5.2.6 THEME 6: DO DEVELOPMENT CONTROLS PROPOSED AS COMMITMENTS CONSERVE THE ENVIRONMENT?

The Department is proposing a new State Environmental Planning Policy (SEPP) to implement the Plan's strategic conservation planning requirements, as well as introduce a Ministerial Direction under section 9.1 of the EP&A Act to apply to avoided land and the SCAs as mapped in the proposed SEPP.

Note that these planning controls will be applied across the SCAs except for land owned by LALCs or under claim by LALCs. Deerubbin owned land has been excluded from the SCAs at their request. Other LALC owned land and land under claim represents 1,700 ha of the 28,300 ha of the SCAs.

The SEPP and Ministerial Direction will improve the security of biodiversity values in avoided lands and the SCAs, and represent a significant upgrade to existing levels of protection in these areas, as they will:

- Include zoning objectives and permissible uses consistent with conservation (for avoided lands)
- Reduce the risk of rezoning avoided land or increasing development or intensifying land uses in the SCAs, which reduces the likelihood of potential impacts from future planning proposals within these areas
- Ensure planning authorities take into account the land use objectives that apply to avoided land or, if the development proposal is for the SCAs, the matters in the planning controls that apply to the area, when considering development and other planning proposals for avoided lands or SCAs
- Facilitate the acquisition of high biodiversity value land within the SCAs under the conservation program

5.2.7 THEME 7: ARE PROPOSED NEW NATIONAL PARKS CONSISTENT WITH THE CAR RESERVE FRAMEWORK?

The Department has identified initial locations for land that will be potentially reserved under the *National Parks and Wildlife Act 1974* within the SCAs. This includes three new reserves proposed to be established within the first five years of the Plan's implementation to deliver early strategic offsets. These are:

- The Georges River Koala Reserve – This is the most important north–south Koala movement corridor along the Georges River between Appin and Kentlyn, and contains larges areas of several TECs
- The Gulguer Reserve Investigation Area – This investigation area covers about 1,800 hectares and is located in the Warragamba area. A reserve in this area will support the east-west connection between Burragorang State Conservation Area and Gulguer Nature Reserve and contains large areas of several TECs
- The Confluence Reserve Investigation Area – This investigation area lies in the Hawkesbury LGA in the north of the Plan Area, to the east of Londonderry and covers about 600 hectares, and provides areas important for restoration

These reserve locations are not final and are likely to be refined. Note that other areas within the SCAs have also been identified for further investigation as future reserves to provide greater landscape connectivity, such as the Bargo area.

The analysis suggests that the potential reserves are broadly consistent with the CAR reserve system scientific framework (after Commonwealth of Australia, 2010) as the reserves:

- Include the vast majority of PCTs impacted by the development
- Comprise patches greater than 50 hectares for the vast majority of native vegetation in the reserves
- Contribute greater than 10 per cent to existing levels of representation for the majority of PCTs

Further consideration of the CAR reserve system scientific framework will be made in finalising the locations of the potential reserves during implementation of the Plan.

5.2.8 THEME 8: WILL THE PLAN BE EFFECTIVELY IMPLEMENTED AND WILL OUTCOMES BE CERTAIN?

The Plan includes the key elements that are considered to be important for effective delivery of a large scale development and conservation program. In particular, the Plan provides:

- Clear and feasible outcomes that the Plan will deliver
- Clarity about the delivery framework and mechanisms to implement the Plan
- Appropriate flexibility within the Plan to ensure it remains relevant over time
- Clear governance arrangements, including certain funding
- Comprehensive processes to monitor and report on implementation, and adapt implementation as needed

Importantly, the Plan includes an accounting process to track the impacts of the development on biodiversity values as clearing progresses and progress in securing the offset targets. If progress in securing offsets is not keeping pace with the impacts, the Plan sets out an adaptive management response that will triggered at a specific point to rectify the balance. This will include, in order of priority:

- Voluntary or compulsory property acquisition to secure offsets
- Land use planning responses to development, which may include a pause in rezoning of remaining precincts in the nominated areas until sufficient offsets are secured

The Department will consider the use of compulsory acquisition only after voluntary options are not successful, and would consult with the community and key stakeholders before compulsory acquisition was undertaken.

These arrangements provide assurance to regulators and other key stakeholders that if progress in implementing the conservation program is delayed, a process will be put in place to address this situation.

It is also important to note that the Plan and subplans are high level documents providing an overarching framework and assurance processes for implementing the Plan, and that successful implementation relies on considerable further work being done during the early stages of implementation to sort out details.

This is appropriate because it allows detailed consideration of complex issues, seeking of expert advice, and comprehensive engagement with stakeholders. The Plan provides a clear framework for this future work by identifying a set of actions that will be undertaken to deliver each commitment within a program logic framework.

5.2.9 THEME 9: DOES THE PLAN FACILITATE ADAPTATION TO CLIMATE CHANGE?

The extent and nature of the impacts of climate change on specific biodiversity values is difficult to predict. There is a lack of information about how specific matters are likely to respond to climate change, and there is debate and uncertainty over how to best facilitate adaptation. Given this, the analysis was undertaken in two main ways:

- A qualitative evaluation using a set of broad principles derived from the scientific literature on how to best manage the impacts and facilitate adaptation of biodiversity to climate change
- A quantitative evaluation using recent modelling by Macquarie University on changes to future habitat suitability on the Cumberland Plain for some Commonwealth listed species under several climate change scenarios

The analysis concluded that the Plan has taken adequate steps to consider climate change. In particular, the SCAs have been designed consistent with key principles commonly recommended by scientists and practitioners to facilitate adaptation of biodiversity to climate change, including:

- Ensuring representativeness and replication
- Protecting the largest and most viable patches
- Maintaining and improving habitat connectivity
- Reducing the impacts of other threats
- Managing uncertainty through adaptive management

5.3 OVERALL CONCLUSION

The Assessment Report concludes that the Plan is likely to deliver substantial conservation outcomes for the Cumberland subregion and adequately addresses the impacts of the development on biodiversity values and other protected matters under NSW and Commonwealth biodiversity legislation.

The Plan is broadly consistent with the principles of Ecologically Sustainable Development (ESD), has achieved substantial avoidance outcomes for biodiversity values, and includes a set of commitments that adequately address the biodiversity values being impacted, as well as manage key landscape threats in the Cumberland subregion.

In concluding that the Plan adequately addresses the impacts of the development, it is important to note that the Plan's commitments are not driven solely by meeting the biodiversity credit requirements of the BAM, which is a key part of the definition of 'no net loss' under the BAM. This is consistent with the BC Act. For strategic biodiversity certifications such as the Plan, the Act does not require the value of commitments be calculated in terms of credits.

This recognises that strategic biodiversity certification provides significant opportunities to maximise benefits to biodiversity and address landscape scale conservation challenges that are not provided by site-by-site assessment processes. The key commitments under the Plan have been developed in recognition of these benefits, including:

- Focusing the conservation program, including offsets, on the areas of the landscape considered most likely to be viable in the long-term and maximise ecological function and connectivity across the landscape
- Addressing ecological function and landscape-scale ecological processes through improving habitat connectivity and undertaking ecological restoration in priority parts of the landscape
- Implementing programs to manage threats at a landscape scale that can benefit multiple species and TECs
- Consolidating offsets into larger patches that are likely to be more viable in the long term

Furthermore, modelling work undertaken as part of the Assessment Report that looked at trends in native vegetation extent and condition in the subregion (see Supporting Document D in the Assessment Report) demonstrated that the existing level of landscape threats is significant and is likely to lead to substantial declines in native vegetation over time unless action is taken. The Plan's commitments will help to address this ongoing decline by ensuring large areas in the landscape are secured and managed in perpetuity and through programs to manage landscape threats.

A key implication of the modelling work for the Plan is that offsets should be established as early as possible to help reverse the trend of decline. This is addressed to a large extent under the Plan through the NSW Government committing to fund the first five years of implementation of the Plan and prioritising the establishment of three new reserves (the Georges River Koala Reserve, the Gulguer Reserve Investigation Area, and the Confluence Reserve Investigation Area) to deliver early strategic offsets to protect TECs and species habitat.

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Appendix A: Biodiversity values most at risk

Table 5: Commonwealth listed threatened ecological communities most at risk under the Plan

Name	Status	SAII entity*	Description of key impacts	Offset target

Shale Sandstone Transition Forest	CE	Yes	The Plan may lead to the loss of 191.8 hectares of the TEC in the urban capable lands within the nominated areas, and potentially an additional 40 hectares within avoided lands due to essential infrastructure. It is not considered likely that this will threaten the long-term viability of the TEC because:
			• The majority of the remaining areas of higher viability TEC in the nominated areas have been avoided and are not impacted by the Plan, including:
			  ○ 1,141 hectares avoided for biodiversity purposes
			  ○ 205 hectares avoided for other purposes
			• The majority of impacts are to lower viability areas of the TEC:
			  ○ 0.6 per cent of higher viability TEC in the Plan Area
			  ○ 2 per cent of higher viability TEC in the nominated areas
			• The impacts are unlikely to increase the level of fragmentation
			The offset for this TEC will provide a substantial addition to the level of protection of the TEC and will support a key high priority action in the Conservation Advice to increase the area of larger, high quality patches of TEC that is secured and managed for conservation
				715 hectares

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	CE	Yes	The Plan may lead to the loss of 154.7 hectares of the TEC. It is not considered likely that this will threaten the long-term viability of the TEC because:
			• The scale of impacts are relatively minor when considering the mapped extent across the Plan Area (less than 1.6 per cent)
			• The majority of impacts are to lower viability areas of the TEC:
			  ○ Less than 0.3 per cent of higher viability TEC in the Plan Area
			  ○ About 3.7 per cent of higher viability TEC in the nominated areas
			• The impacts are unlikely to increase the level of fragmentation
			• The offset for this TEC will provide a substantial addition to its level of protection and address a key threat identified in the Conservation Advice around its current low level of protection
				575 hectares

Name	Status	SAII entity*	Description of key impacts	Offset target
Coastal floodplain eucalypt forest of eastern Australia (subject to listing)	-	No	This ecological community (EC) is currently being assessed for listing under the EPBC Act. While the Plan will result in the loss of 210.2 hectares of this, this is not expected to influence the long-term viability of the EC because: • The mapping of the EC is based on PCT 835 which provides an over-estimate of both impacts and conservation actions for what might be the listed TEC • Although the Plan authorises the clearing of 210.2 hectares (approximately 3 per cent of the remaining EC), most of this is in thinned and scattered condition. 28.6 hectares occurs in intact condition • The majority of impacts are to small patches, or to the edges of patches • Transport projects will apply future efforts to avoid impacts to the EC • The Plan commits to protecting and managing 575 hectares of PCT 835 as a surrogate for the future listed TEC. These areas will occur in the SCAs as part of the Plan's conservation program. Securing high conservation value EC directly supports a key high priority action in the Draft Conservation Advice to conserve remaining areas of the EC	575 hectares
Cooks River Castlereagh Ironbark Forest	CE	Yes	The Plan may lead to the loss of 26.3 hectares of the TEC. The impacts in WSA are not expected to threaten the long-term viability of the TEC because: • Impacts are to a number of smaller already fragmented patches • Of the 7.0 hectares impacted, only 0.2 hectares is in intact condition and none is mapped as higher viability • The impacts are unlikely to increase the level of fragmentation of the TEC The impacts in GPEC are more complex because: • Impacts from the Outer Sydney Orbital fragment the TEC in the Wianamatta Regional Park • Of the 19.3 hectares to be impacted, 10.8 hectares is mapped as higher viability. This represents 1.8 per cent of the higher viability TEC in the Strategic Assessment Area (592 hectares) It is noted that the Plan commits (Commitment 3) to avoid and minimise impacts to the TEC due to the construction of the Outer Sydney Orbital in GPEC. It will be critical that this process avoids and minimise impacts as far as possible to reduce the scale of impacts The offset for this TEC will provide a substantial contribution to the area of the TEC that is protected within the Strategic Assessment Area (an additional 13.3 per cent), and supports a number of high priority actions in the Conservation Advice. As part of this commitment, the Plan is also prioritising restoration of up to 25 per cent of the offset target for the TEC. Restoration provides the potential for substantial improvements in the	105 hectares

Name	Status	SAII entity*	Description of key impacts	Offset target
			long-term viability of the TEC The timing of offsetting will be critical for the TEC. Offsets should be provided early during the implementation of the Plan and ideally be in place before construction of the Outer Sydney Orbital	

* 'SAII entities' are TECs or species that may be subject to serious and irreversible impacts. SAII entities are identified in the basis of a set of principles under the Biodiversity Conservation Regulation 2017. The Assessment Report identifies the NSW and Commonwealth listed SAII entities that may be subject to serious and irreversible impacts and that are potentially impacted by the development under the Plan. NSW listed SAII entities are assessed in Chapter 25 and Commonwealth listed SAII entities are assessed in Chapters 29 to 31

Table 6: NSW listed threatened ecological communities most at risk under the Plan

Name	Status	SAII entity*	Description of key impacts		Offset target
			Area impacted	No. of ecosystem credits needed to offset impacts	
Cumberland Plain Woodland	CE	Yes	1,014.5 hectares	20,476 credits	3,170 hectares
Shale Sandstone Transition Forest	CE	Yes	487.7 hectares	13,393 credits	1,540 hectares
River-Flat Eucalypt Forest	E	No	165.1 hectares	4,939 credits	450 hectares
Shale Gravel Transition Forest	E	No	52.2 hectares	1,218 credits	150 hectares
Cooks River Castlereagh Ironbark Forest	E	Yes	36.9 hectares	809 credits	110 hectares

* 'SAII entities' are TECs or species that may be subject to serious and irreversible impacts. SAII entities are identified in the basis of a set of principles under the Biodiversity Conservation Regulation 2017. The Assessment Report identifies the NSW and Commonwealth listed SAII entities that may be subject to serious and irreversible impacts and that are potentially impacted by the development under the Plan. NSW listed SAII entities are assessed in Chapter 25 and Commonwealth listed SAII entities are assessed in Chapters 29 to 31

Table 7: Commonwealth and NSW listed threatened species most at risk under the Plan

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
Cynanchum elegans	E	E	No	**EPBC Act assessment for Plan Area** The Plan will lead to: • Loss of 19.6 hectares of potential habitat within the transport corridors • Potential fragmentation of population 14 due to the development of the Outer Sydney Orbital at Cobbitty The risk of residual adverse impacts to this species is medium It is considered likely that the Outer Sydney Orbital will result in internal fragmentation of a population of the species near Cobbitty, which is the key driver for this risk rating. While there is some uncertainty about the accuracy of the records, the population is of moderate size comprising up to 19 plants. It is likely that this population is important to the ongoing viability and recovery of the species, as this species is endangered The offsets for this species will add to the existing level of protection for this species in NSW and contribute to its long-term preservation The Plan also includes a broader set of commitments and actions which are likely to benefit the species. The SCAs contain approximately 1,502 hectares of mapped potential habitat for *Cynanchum elegans*. It is very likely that areas of potential habitat in addition to the 2 offset locations will be protected within these SCAs as part of offset commitments for other matters under the Plan Overall, the direct and indirect impacts to this species are not expected to threaten the long-term viability of the species	2 offset locations
Dillwynia tenuifolia	-	V	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 175.6 hectares No. of species credits needed to offset impacts: 3,407 credits	3 offset locations
Epacris purpurascens var. *purpurascens*	-	V	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 87.6 hectares (this equates to an estimated number of individuals of 1,589, as required by the BAM) No. of species credits needed to offset impacts: 2,384 credits	1 offset location
Grevillea juniperina subsp. *juniperina*	-	V	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 457.8 hectares No. of species credits needed to offset impacts: 6,851 credits	3 offset locations

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
Hibbertia fumana	-	CE	Yes	**BC Act assessment for nominated areas** Area of habitat directly impacted: 37.5 hectares No. of species credits needed to offset impacts: 1,466 credits	1 offset location
Hibbertia puberula	-	E	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 41.6 hectares No. of species credits needed to offset impacts: 1,039 credits	1 offset locations
Koala	V	V	No	**EPBC Act assessment for Plan Area** ***Impacts to habitat*** The Plan will lead to the loss of 260.6 hectares of important habitat for Koalas within GMAC and Wilton. This equates to 1.8 per cent of the mapped important habitat for the Southern Sydney population The Plan commits to protecting and managing a minimum of 610 hectares of important Koala habitat, and to protecting and managing a minimum of 1,885 hectares of land within the Georges River Koala Reserve (contains 1,595 hectares of important habitat), and restoring approximately 200 hectares of cleared land, which significantly exceeds the 610 hectares offset target for Koala The action to restore land is consistent with Principle 3 of Conserving Koalas in Wollondilly and Campbelltown LGAs (OEH, 2018d). These commitments also support several priority actions in the Conservation Advice ***Impacts to habitat connectivity*** The Plan will not result in the loss of primary or secondary habitat corridors in Wilton or GMAC due to clearing. However, habitat connectivity has the potential to be impacted by the development Both EES (2018) and Biolink (2018) discuss the importance of the north-south primary corridor to the east of Appin Road. This will be protected (as a new reserve) and improved (through restoration) under the Plan East-west connectivity through Douglas Park (between the Wilton and GMAC nominated area boundaries) is also recognised for its importance to connectivity. This area will not be impacted by the Plan and parts of it are included in the SCAs which are targeted for offsets under the Plan The main risk to connectivity occurs to the east-west connections through GMAC. These are all secondary corridors and are currently compromised in various ways. Biolink (2018) suggests the most important of these connections are the Woodhouse – Menangle and Ousedale corridors. In	610 hectares of important habitat

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
				developing the Plan, the Department investigated the viability of these corridors for Koala movement and the Plan commits to further investigations of these areas to determine how a permanent corridor can be implemented The Plan provides a strong framework for addressing risks to Koala. Given the long timeframes associated with implementation of the Plan, there is uncertainty about the ultimate effectiveness of these measures. It will be critical that the Plan's monitoring, evaluation and adaptive management measures are effective in addressing this uncertainty	
				BC Act assessment for nominated areas Area of habitat directly impacted: 260.6 hectares No. of species credits needed to offset impacts: 7,757 credits	
Marsdenia viridiflora subsp. *viridiflora*	-	E	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 412.3 hectares No. of species credits needed to offset impacts: 9,564 credits	1 offset locations
Meridolum corneovirens	-	E	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 736.4 hectares No. of species credits needed to offset impacts: 18,819 credits	3 offset locations
Persoonia nutans	E	E	No	**EPBC Act assessment for Plan Area** The Plan will lead to: • Direct impacts to a known population (population 63) • Loss of approximately 41 hectares of potential habitat • Potential fragmentation of habitat in one location The risk of residual adverse impacts to this species is medium The likelihood of potential impacts to population 63 due to the development of the Outer Sydney Orbital within Wianamatta Regional Park is the key driver for this risk rating. There is a high level of confidence that the population is extant, as the population was detected on site during surveys. It is likely that this population is important to the ongoing viability and recovery of the species as the species is endangered. The Plan commits (Commitment 3) to avoid and minimise impacts to *Persoonia nutans* due to the construction of the Outer Sydney Orbital in GPEC. It will be critical that this process avoids and minimise impacts as far as possible to reduce the scale of impacts	2 offset locations

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
				The offsets for this species will add to the existing level of protection for this species in NSW and contribute to its long-term preservation, and is consistent with a performance criterion in the species' recovery plan, which aims to increase the level of protection for this species through conservation planning and land use decisions The Plan also includes a broader set of commitments and actions which are likely to benefit the species. The SCAs contain approximately 1,617 hectares of mapped potential habitat for *Persoonia nutans*. It is very likely that areas of potential habitat in addition to the 2 offset locations will be protected within these SCAs as part of offset commitments for other matters under the Plan Overall, the direct and indirect impacts to this species are not expected to threaten the long-term viability of the species	
				BC Act assessment for nominated areas Area of habitat directly impacted: 40.7 hectares No. of species credits needed to offset impacts: 870 credits	
Pimelea spicata	E	E	No	**EPBC Act assessment for Plan Area** The Plan will lead to: • Direct impacts to a known population (population 532) • Loss of approximately 956 hectares of mapped habitat within the nominated areas and transport corridors • Potential fragmentation of habitat in two locations The risk of residual adverse impacts to this species is high The likelihood of potential impacts to population 532 within the urban capable lands in GMAC is the key driver for this risk rating. There is a high level of confidence the population is extant given the locational accuracy, reputable observer and date of observation. The population is of a moderate size comprising up to 160 plants. It is likely that this population is important to the ongoing viability and recovery of the species Based on this assessment, it is recommended that the Plan adopt an additional species-specific commitment for *Pimelea spicata* to retain some or all of population 532 within GMAC during detailed precinct planning. This recommendation has developed too late in the assessment process to be adopted in the draft version of the Plan for public comment. It is likely the recommendation will be adopted prior to finalising the Plan The offsets for this species will provide a substantial addition to the level of protection for the	3 offset locations

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
				species which is currently under-represented in protected areas. Furthermore, in situ protection of *Pimelea spicata* is a fundamental component of the species' recovery plan The Plan also includes a broader set of commitments and actions which are likely to benefit the species. The SCAs contain approximately 2,296 hectares of mapped potential habitat for *Pimelea spicata*. It is very likely that areas of potential habitat in addition to the 3 offset locations will be protected within these SCAs as part of offset commitments for other matters under the Plan Overall, the direct and indirect impacts to this species are not expected to threaten the long-term viability of the species	
				BC Act assessment for nominated areas Area of habitat directly impacted: 847.8 hectares (note that 839.18 hectares of this impact is associated with native vegetation removal and this determines the resultant species credit requirement. The remaining 8.6 hectares of impact associated with non native vegetation and has been assessed in the Assessment Report as a prescribed impact) No. of species credits needed to offset impacts: 10,556 credits	
Pultenaea parviflora	V	E	No	**EPBC Act assessment for Plan Area** The Plan will lead to: • Direct impacts to 6 populations, including the loss of one important population (population 127) and impacts to records to two important populations (population 118 and 119) • Loss of approximately 188 hectares of potential habitat within the nominated areas and transport corridors • Potential fragmentation of habitat in one location The risk of residual adverse impacts to this species is high The likelihood of the loss of population 127 as a result of the development of the Outer Sydney Orbital in Wianamatta Regional Park in GPEC is the key driver for this risk rating. There is a high level of confidence that the population is extant as it was detected during species surveys. The population is of a moderate size comprising 83 plants. The Plan commits (Commitment 3) to avoid and minimise impacts to *Pultenaea parviflora* due to the construction of the Outer Sydney Orbital in GPEC. It will be critical that this process avoids and minimise impacts as far as possible The offsets for this species will add to the existing level of protection for this species in NSW and contribute to its long-term preservation, and supports a priority action in the Conservation Advice The Plan also includes a broader set of commitments and actions which are likely to benefit the	2 offset locations

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
				species. The SCAs contain approximately 1,371 hectares of mapped potential habitat for *Pultenaea parviflora*. It is very likely that areas of potential habitat in addition to the 2 offset locations will be protected within these SCAs as part of offset commitments for other matters under the Plan. For example, two of the proposed reserves in the Plan contain mapped habitat for the species (including 120 hectares in the Georges River Koala Reserve) Overall, the direct and indirect impacts to this species are not expected to threaten the long-term viability of the species	
				BC Act assessment for nominated areas Area of habitat directly impacted: 74.3 hectares No. of species credits needed to offset impacts: 1,744 hectares	
Pultenaea pedunculata	-	E	No	**BC Act assessment for nominated areas** Area of habitat directly impacted: 207.7 hectares No. of species credits needed to offset impacts: 4,482 credits	1 offset locations
Southern Myotis	-	V	No	**BC Act assessment for nominated areas** Area of habitat (hectares) directly impacted: 745.2 hectares No. of species credits needed to offset impacts: 16,968 credits	2 offset locations
Swift Parrot	CE	E	No	**EPBC Act assessment for Plan Area** The Plan will lead to clearing of 1,285 hectares of potential foraging habitat for Swift Parrot. Some of this clearing will be mitigated by the retention of large trees (≥50cm DBH) during precinct planning. Despite this, the scale of clearing presents a medium risk of residual adverse impacts to the species Clearing of potential foraging habitat is unlikely to lead to fragmentation of connectivity for the species given it is highly mobile and the availability of potential foraging resources throughout the landscape. Furthermore, the loss of potential habitat does not affect any of priority sites in the National Recovery Plan and focuses on the poorer condition woodlands, with intact vegetation comprising only 12 per cent (154 hectares) of the impacted areas The offset areas for the Swift Parrot within SCAs will focus on the best condition vegetation strategically located to provide an improved conservation outcome within the subregion The Plan also includes a broader set of commitments and actions which are likely to benefit the species. The SCAs contain 17,403 hectares of potential foraging habitat for the species. It is very likely that areas of suitable foraging habitat for this species in addition to the 4,470 hectares offset	4,470 hectares of potential foraging habitat

Name	Status		SAII entity*	Description of key impacts	Offset target
	Cth	NSW			
				will be protected within these SCAs as part of offset commitments for other matters under the Plan Overall, the direct and indirect impacts to this species are not expected to threaten the long-term viability of the species	
				BC Act assessment for nominated areas Area of habitat (hectares) directly impacted: 1,113 hectares No. of species credits needed to offset impacts: N/A as credits for this species are accounted for through ecosystem credits	

* 'SAII entities' are TECs or species that may be subject to serious and irreversible impacts. SAII entities are identified in the basis of a set of principles under the Biodiversity Conservation Regulation 2017. The Assessment Report identifies the NSW and Commonwealth listed SAII entities that may be subject to serious and irreversible impacts and that are potentially impacted by the development under the Plan. NSW listed SAII entities are assessed in Chapter 25 and Commonwealth listed SAII entities are assessed in Chapters 29 to 31

Appendix B: Types of indirect impacts

Table 8: Indirect impact types and nature, extent and duration of indirect impacts associated with the Plan

Indirect impact type	Development types relevant to the indirect impact				Nature of indirect impact	Extent/general location of indirect impact and/or high risk areas	Duration of indirect impact
	Urban and industrial	Infrastructure	Agribusiness	Transport corridors			
Hydrological/ soil disturbance	✓	✓	✓	✓	Changes to surface water and groundwater flows and quality	Waterways, wetlands, flood-prone areas within or downstream of development	Short term to long-term
Ground settling or subsidence				✓	Settlement/subsidence of ground in the vicinity of transport tunnels due to the tunnel void or groundwater removal, which may cause disturbance to the land surface	Land within or in vicinity of the transport tunnels	Long-term
Spread of infection/disease	✓	✓	✓	✓	Spread of pathogens from contaminated clothing and equipment or surface water runoff	Native vegetation retained within or adjacent to development	Likely long-term
Spread of weeds	✓	✓	✓	✓	Spread of invasive species due to edge effects, surface water run-off, or changed fire regimes	Native vegetation retained within or adjacent to development	Likely long-term
Predation/ competition by pest/domestic fauna	✓		✓	✓	Increased predation and competition of species by pest/domestic fauna	Habitat retained within or adjacent to development including well-connected habitat corridors	Likely long-term
Altered fire regimes	✓		✓	✓	Altered fire regimes as a result of increased burns for asset protection or reduced ability to burn due to risk to surrounding urban areas	Native vegetation retained within or immediately adjacent to development, particularly asset protection zones	Long-term
Disturbance from increased public access to natural areas	✓				Trampling of species or habitat, removal of wood or bushrock, damage from mountain-biking and four-wheel driving	Publicly accessible natural areas retained within or immediately adjacent to development	Short term to permanent

Indirect impact type	Development types relevant to the indirect impact				Nature of indirect impact	Extent/general location of indirect impact and/or high risk areas	Duration of indirect impact
	Urban and industrial	Infrastructure	Agribusiness	Transport corridors			
Fauna mortality, displacement and barriers to movement	✓	✓	✓	✓	Potential for mortality of threatened fauna species by vehicle strike and reduced movement and connectivity between habitat areas from barriers	Habitat intersected by roads	Long-term
Fauna disturbance due to noise, dust or light	✓	✓	✓	✓	Noise, dust or light created by equipment during construction or by new structures during operation	Habitat retained within or immediately adjacent to development	Short-term to long-term
Inadvertent impacts on adjacent habitat or vegetation	✓	✓	✓	✓	Damage to adjacent habitat during construction activities or during ongoing management	Native vegetation immediately adjacent to development	Short-term to long-term