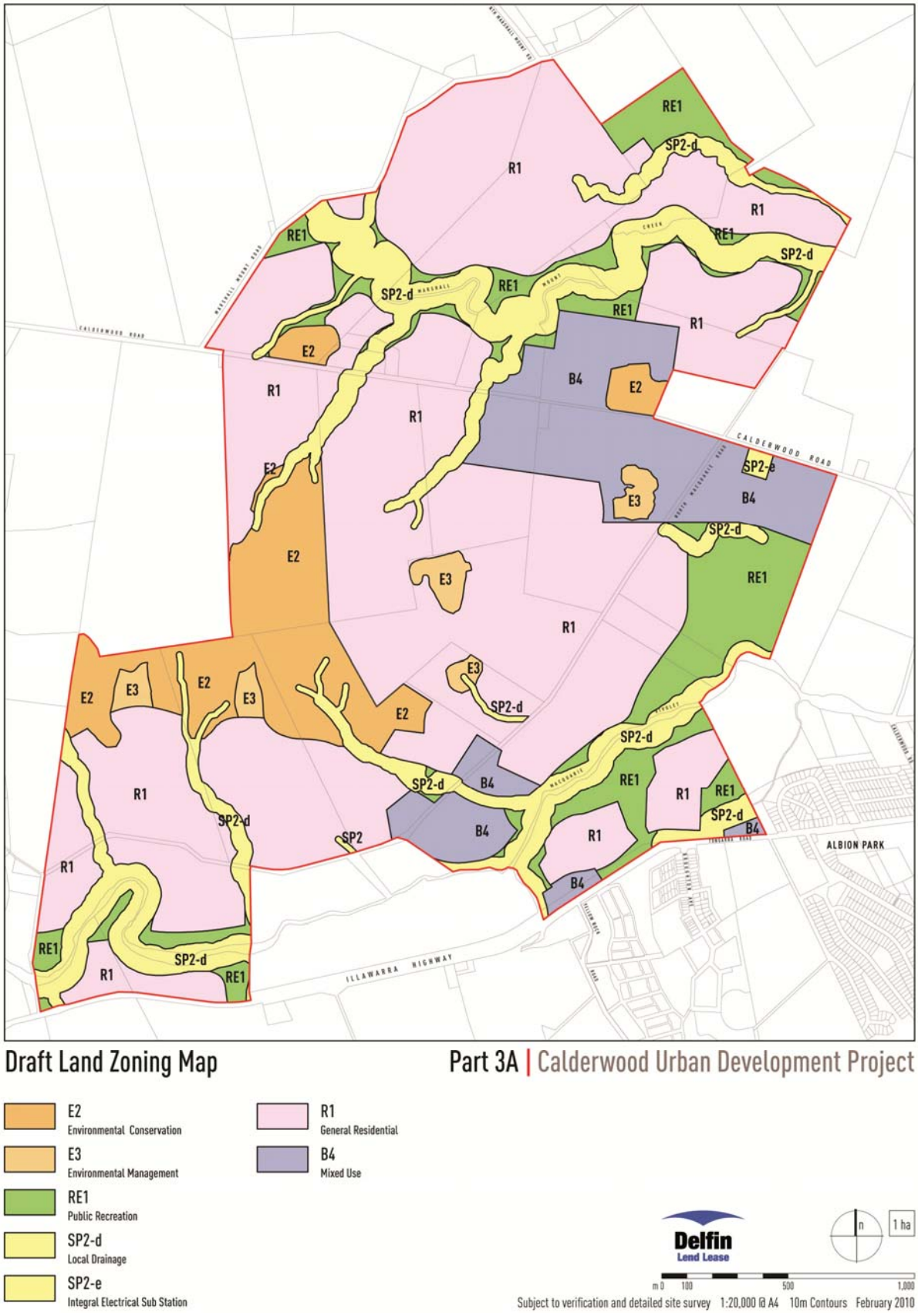

Figure 59 – Draft Land Zoning Map

Table 17 – Draft Land Zoning Table

Zone	Purpose (as per DoP guidelines)	Permissible[1]	Prohibited
R1 General Residential	This zone is generally intended to provide for a variety of residential housing types and densities, including dwelling houses, multi-dwelling housing, residential flat buildings, boarding houses and seniors housing. The zone also provides for additional uses that provide facilities or services to residents, including neighbourhood shops and child care centres.	1 Objectives of zone to provide for the housing needs of the community, to provide for a variety of housing types and densities, to enable other land uses that provide facilities or services to meet the day to day needs of residents. 2 Permitted without consent Home occupations 3 Permitted with consent Attached dwellings; Boarding houses; Child care centres; Community facilities; Dwelling houses; Eco-tourism facilities; Food and drink premises; Group homes; Health consulting rooms; Home based child care; Home businesses; Home industries; Hostels; Kiosks; Markets; Multi dwelling housing; Neighbourhood shops; Places of public worship; Residential flat buildings; Roads; Semi-detached dwellings; Seniors housing; Shop top housing; Any other development not specified in item 2 or 4. 4 Prohibited Agriculture; Air transport facilities; Amusement centres; Biosolid waste applications; Boat repair facilities; Boat sheds; Business premises; Bulky goods premises; Canal estate development; Caravan parks; Charter and tourism boating facilities; Correctional centres; Crematoria; Depots; Entertainment facilities; Extractive industries; Forestry; Freight transport facilities; Highway service centres; Home occupations (sex services); Industrial retail outlets; Industries; Manufactured home estates; Marinas; Mining; Moveable dwellings; Office premises; Passenger transport facilities; Port facilities; Public administration buildings; Recreation facilities (major); Research stations; Restriction facilities; Restricted premises; Retail premises; Rural industries; Service stations; Sex services premises; Storage premises; Transport depots; Vehicle body repair workshops; Vehicle repair stations; Vehicle sales or hire premises; Waste or resource management facilities; Wholesale supplies	
B4 Mixed Use	This zone is generally intended for use where a wide range of land uses are to be encouraged, including retail, employment, residential, community and other uses	1 Objectives of zone to provide a mixture of compatible land uses, to integrate suitable development in accessible locations so as to maximise public transport patronage and encourage walking and cycling, 2 Permitted without consent Home occupations. 3 Permitted with consent Boarding houses; Business premises; Child care centres; Community facilities; Educational establishments; Entertainment facilities; Function centres; Hotel or motel accommodation; Information and education facilities;	

[1] Note development identified in red text is additional to Std Template mandated development

		Office premises; Passenger transport facilities; Recreation facilities (indoor); Registered clubs; Retail premises; Seniors housing; Shop top housing; Any other development not specified in item 2 or 4. 4 Prohibited Agriculture; Air transport facilities; Biosolid waste applications; Boat repair facilities; Boatsheds; Caravan parks; Cemeteries; Correctional centres; Crematoria; Depots; Extractive industries; Forestry; Freight transport facilities; Hazardous storage establishments; Heavy industries; Home occupations (sex services); Liquid fuel depots; Manufactured home estates; Mines; Moveable dwellings; Offensive storage establishments; Restricted premises; Restriction facilities; Rural industries; Sex services premises; Transport depots; Waste or resource management facilities
E2 Environmental Conservation	This zone is generally intended to protect land that has high conservation value. A number of land uses considered to be inappropriate for this zone have been mandated as prohibited uses. This zone is for areas with high ecological, scientific, cultural or aesthetic values outside national parks and nature reserves. The zone provides the highest level of protection, management and restoration for such lands whilst allowing uses compatible with those values.	1 Objectives of zone • To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage or otherwise have an adverse effect on those values. 2 Permitted without consent Nil 3 Permitted with consent Drainage; Earthworks; Eco-tourism facilities; Electricity transmission or distribution networks; Environmental facilities; Environmental protection works; Flood mitigation works; Information and education facilities; Kiosks; Recreation areas; Roads; Sewerage systems; Signage; Stormwater management systemsl Telecommunications facilities; Waterbodies; Water supply systems; Waterway foreshore management activities. 4 Prohibited Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Recreation facilities (major); Residential flat buildings; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3
E3 Environmental Management	This zone is for land where there are special ecological, scientific, cultural or aesthetic attributes or environmental hazards / processes that require careful consideration/ management and for uses compatible with these values.	1 Objectives of zone • To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values. • To provide for a limited range of development that does not have an adverse effect on those values. 2 Permitted without consent Home occupations 3 Permitted with consent

	The mandatory zone objectives focus on protecting, managing and restoring areas with special ecological, scientific, cultural or aesthetic values and to provide for a limited range of development that does not have an adverse effect on those values.	Animal boarding or training establishments; Bed and breakfast accommodation; Building identification signs; Business identification signs; Cellar door premises; Community facilities; Dwelling houses; Eco tourism facilities; Electricity generating works; Electricity transmission or distribution networks; Environmental facilities; Environmental protection works; Farm buildings; Farm stay accommodation; Home occupations; Home based child care; Home businesses; Home industries; Information and education facilities; Kiosks; Neighbourhood shops; Recreation areas; Roads; Roadside stalls; Rural workers dwellings; Sewerage systems; Signage; Stormwater management systems; Telecommunications facilities; Waterbodies; Water supply systems; Waterway foreshore management activities. 4 Prohibited Industries; Multi dwelling housing; Residential flat buildings; Retail premises; Seniors housing; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3
SP2 Infrastructure (local drainage / local road / classified road etc)	This zone is generally intended to cover a wide range of physical and human infrastructure uses such as transport (eg roads and railways), utility undertakings and works, community uses, educational establishments and hospitals. Land zoned SP2 Infrastructure must be included on the Land Reservation Acquisition Map	**1 Objectives of zone** • To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure. **2 Permitted without consent** Nil **3 Permitted with consent** The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose; Drainage; Earthworks; Electricity transmission or distribution networks; Environmental facilities; Environmental protection works; Flood mitigation works; Kiosks; Recreation areas; Recreation facilities (outdoor); Roads; Sewerage systems; Stormwater management systemjs; Telecommunications facilities; Water supply systems; Waterbodies; Waterway foreshore management activities **4 Prohibited** Any development not specified in item 2 or 3
RE1 Public recreation (local open space / regional open space etc)	This zone is generally intended for a wide range of public recreation areas and activities, including local and regional open space. Councils may generally permit typical public recreation uses in this zone. A range of land uses compatible with the recreation use of the land should be permitted.	**1 Objectives of zone** • To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes. • To cater for the development of a wide range of uses and facilities within open spaces for the benefit of the community.

	Land zoned RE1 Public Recreation must be included on the Land Reservation Acquisition Map.	**2 Permitted without consent** Nil **3 Permitted with consent** Building identification signs; Business identification signs; Child care centres; Community facilities; Drainage; Earthworks; Electricity transmission or distribution networks; Environmental facilities; Environmental protection works; Flood mitigation works; Information and education facilities; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Restaurants; Sewerage systems; Stormwater management facilities; Telecommunications facilities; Roads; Water supply systems; Waterbodies; Waterway foreshore management systems. **4 Prohibited** Any development not specified in item 2 or 3

6.6 Exempt and Complying Development

Environmental Planning Policy (Exempt and Complying Development Codes) 2009, *State Environmental Planning Policy (Infrastructure 2007)* and *State Environmental Planning Policy No. 64 (Advertising and Signage)* apply and will continue to apply to the site establishing a range of exempt and complying development.

It is proposed that no further exempt and complying development provisions be incorporated within the proposed SEPP Amendment. The exempt and complying development provisions of the relevant SEPPs will be supplemented at a later stage by the gazettal of the draft comprehensive LEPs by Wollongong and Shellharbour Councils.

6.7 Principal Development Standards

It is intended that the SEPP Amendment will contain principal development standards for:

- Minimum lot sizes in the R1 General Residential Zone, and
- Maximum height of buildings in the R1 General Residential, E3 Environmental Management and B4 Mixed Use Zones.

A draft Minimum Lot Size Map and a draft Height of Buildings Map are included at **Figures 60 and 61**.

The draft Minimum Lot Size Map establishes a general minimum lot size of 300 m2 in the RE1 General Residential Zone.

To allow for, and to encourage, the provision of the broadest possible range of dwelling product type within this zone, it is proposed to allow subdivision to a minimum lot size of 125 m2 in locations that are within 200 metres of a bus stop, public open space or the B4 Mixed Use Zone Boundary. This minimum lot size will apply to a range of detached, attached, semi detached and dual occupancy product in the R1 Zone.

It is proposed that the SEPP Amendment include a special provision to this effect.

No minimum lot size is proposed for the B4 Mixed Use or E3 Environmental Management Zones. A maximum density of 10 dwellings per hectare is proposed for those areas of E3 zoned land that are to be retained in private ownership.

The maximum proposed height of buildings is 6.5 metres in the E3 Environmental Management Zone, 9.5 metres within the R1 General Residential and 18 metres within the B4 Mixed Use Zone.

It is proposed that Standard LEP Template *Clause 4.1 – Minimum subdivision lot size*, *Clause 4.3 – Height of buildings* and *Clause 4.6 Exceptions to development standards* be included.

In addition to Clause 4.6 Exceptions to development standards from the Standard LEP Template, it is proposed to include a similar provision that allows the same flexibility with respect to development to be applied in the assessment and determination of applications under Part 3A of the EP&A Act as has been used in other Schedule 3 amendments.

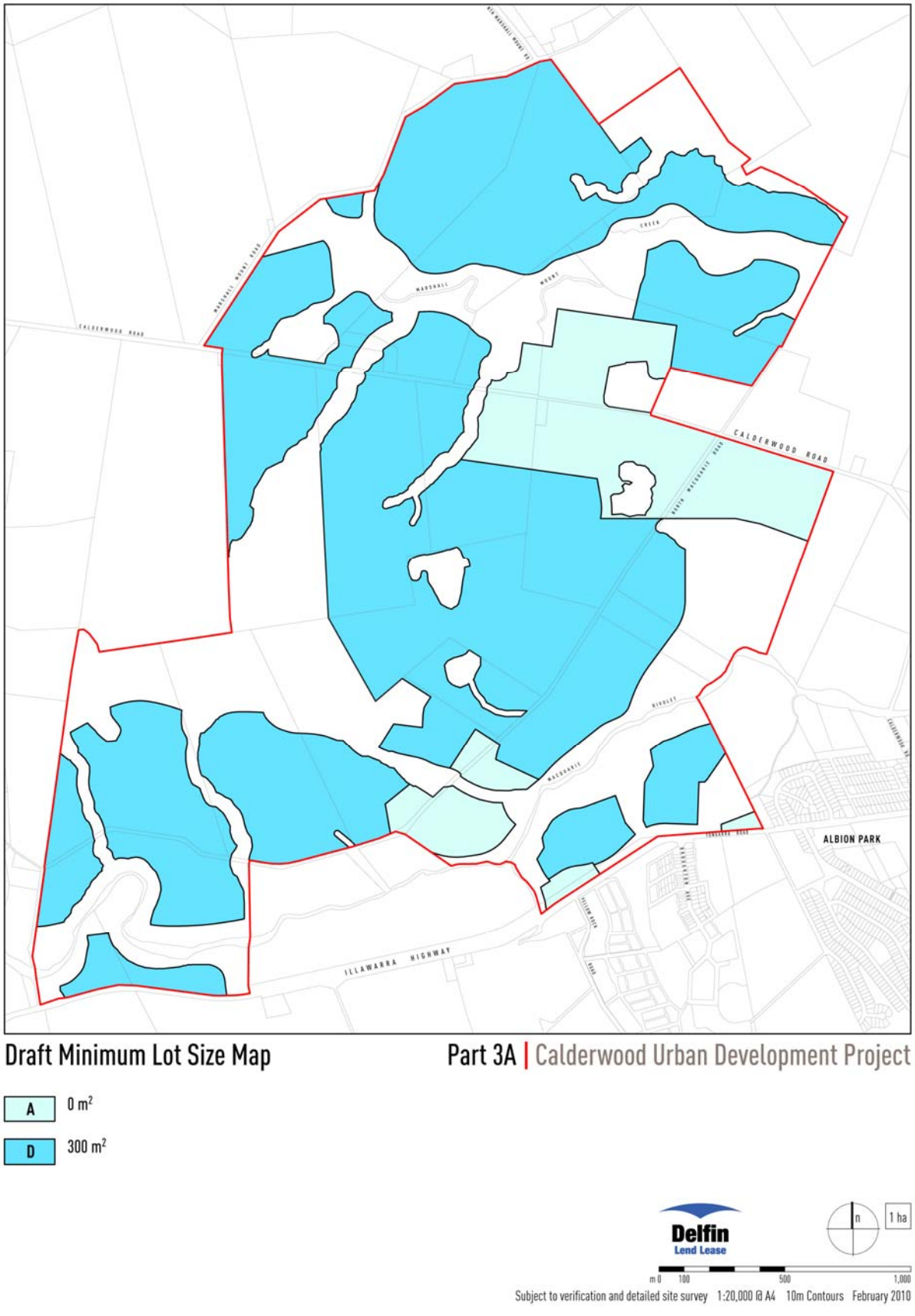

Figure 60 – Draft Minimum Lot Size Map

Figure 61 – Draft Maximum Height of Buildings Map

6.8 Land Reservation and Acquisition

The proposed SEPP Amendment will reserve land exclusively for a public purpose via the establishment of the proposed RE1 Public Recreation Zone and SP2 Infrastructure Zone.

The SEPP Amendment will therefore need to make provision for the acquisition of this land and it is proposed to include Standard LEP Template *Clause 5.1 – Relevant Acquisition Authority* for this purpose.

Land to be included on the Land Reservation Acquisition Map is shown at **Figure 62**.

The relevant acquisition authority of the land that is subject to acquisition is identified in **Table 15** below.

It is noted that the Outline VPAs (refer to Section 5) propose to dedicate all land that is zoned SP2 Infrastructure and RE1 Public Recreation to the relevant council, and therefore compulsory acquisition will not actually be triggered, although it is necessary to include this clause.

It is noted that the Concept Plan proposes other land outside the RE1 Public Recreation and SP2 Infrastructure Zones to be delivered into public ownership, including some areas of E2 Environmental Conservation and E3 Environmental Management. This land is not shown on the Land Reservation Acquisition Map due to its underlying land use zone.

Table 18 – Relevant acquisition authority

Type of land shown on map	Authority of the State
RE1 Public Recreation	Council
SP2 Infrastructure (Local drainage)	Council

6.9 Heritage

It is proposed to include Marshall Mount House and Barn and the Marshall Mount Methodist Cemetery as items of environmental heritage under the SEPP Amendment.

A proposed Heritage Map is included at **Figure 63**. It is proposed to include Standard LEP Template *Clause 5.10 – Heritage Conservation* in relation to the identified item.

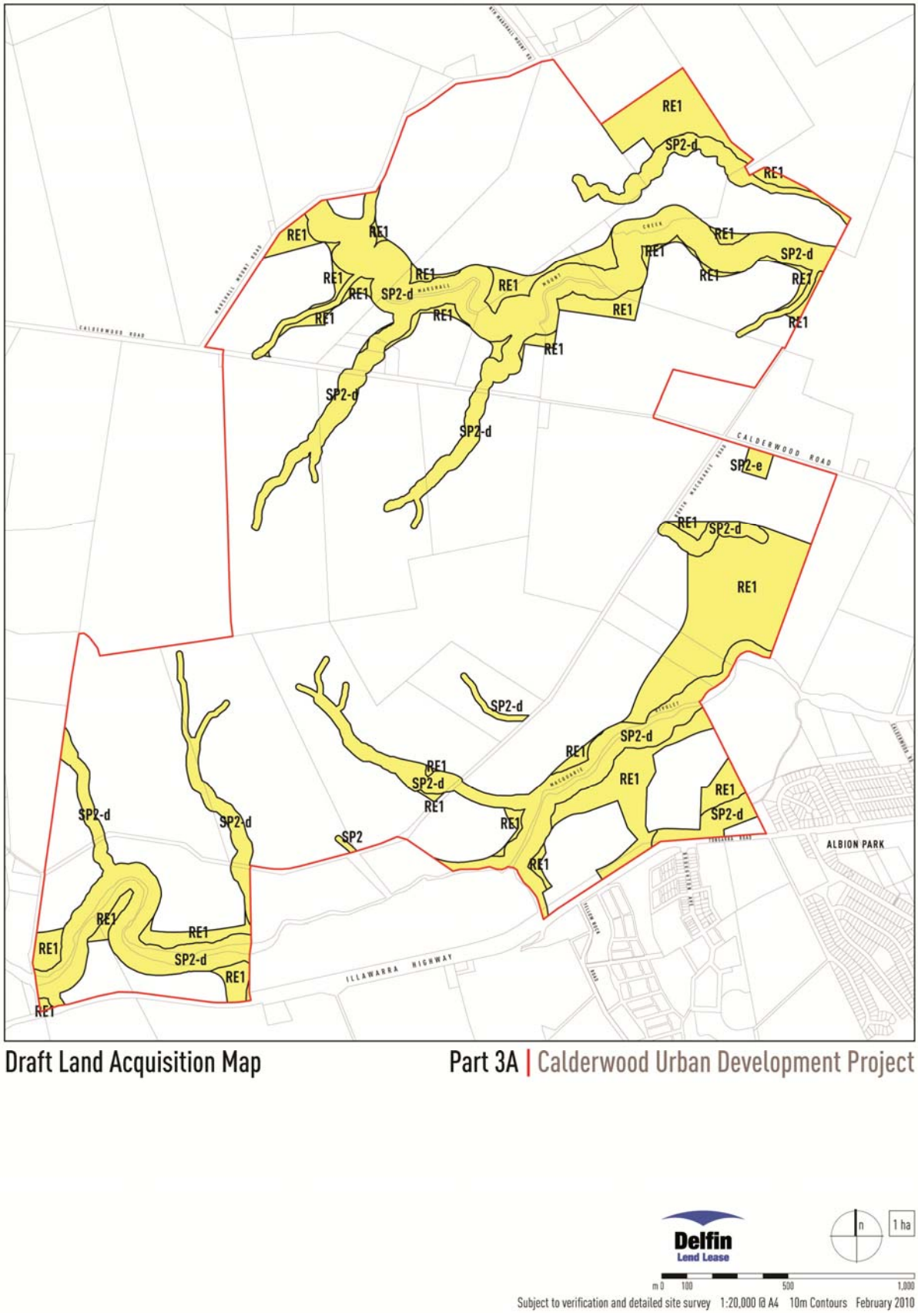

Figure 62 – Draft Land Reservation Acquisition Map

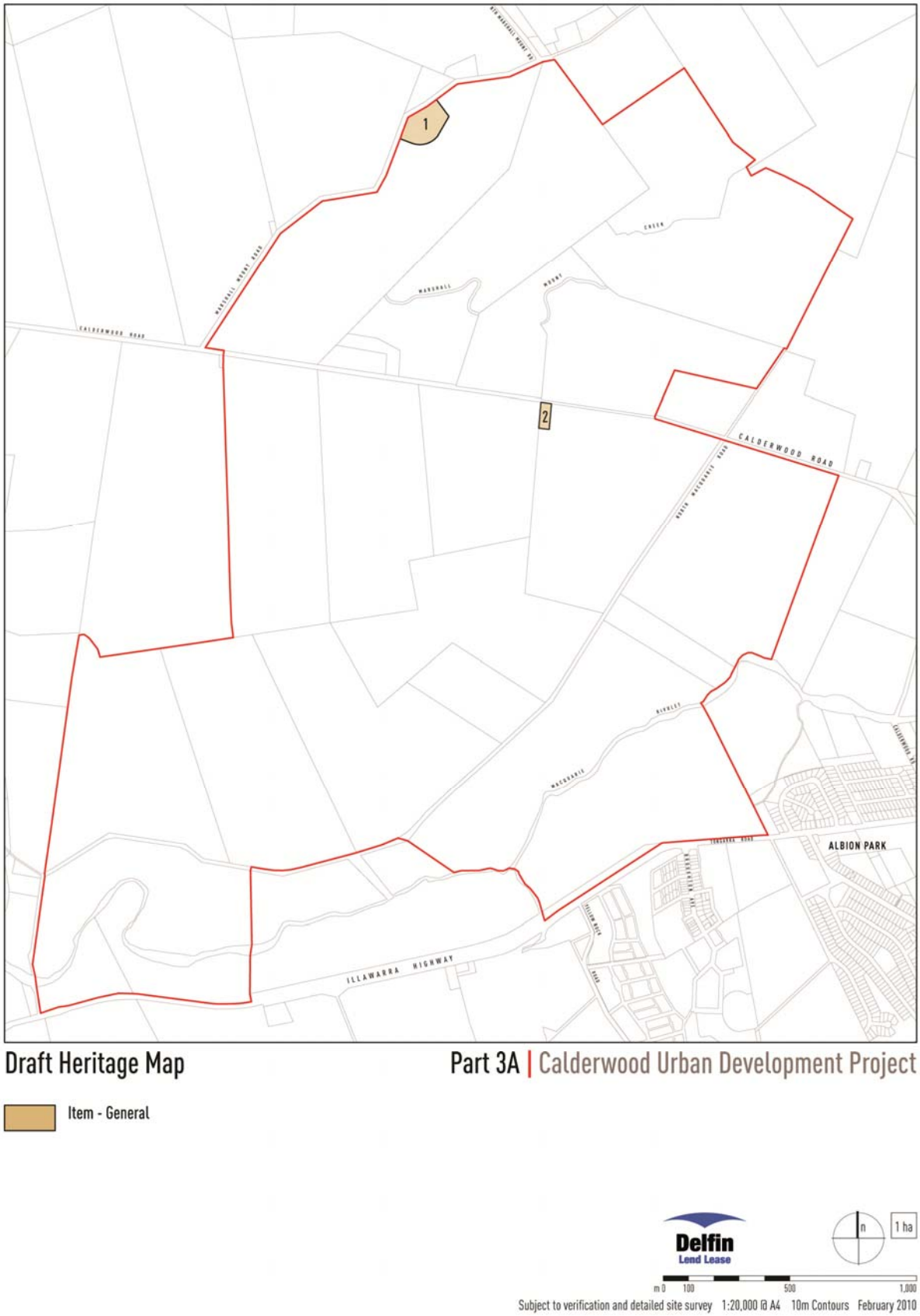

Figure 63 – Draft Heritage Map

6.10 Environmentally Sensitive Lands

It is proposed to protect the majority of significant habitat on site via the proposed E2 Environmental Conservation and E3 Environmental Managment land use zoning and an Environmentally Significant Lands (ESL) layer. The ESL layer is shown at **Figure 64**.

The ESL overlay will incorporate areas of identified significant existing vegetation that are located in the E2 Environmental Conservation, E3 Environmental Management and SP2 Infrastructure (Local drainage) Zones, as well as some areas of vegetation in the R1 and B4 Zones. The relationship of the ESL layer to the underlying land use zoning is shown at **Figure 65**.

Some significant native vegetation within the riparian corridors will be zoned SP2 Infrastructure (local drainage). Similarly, some small areas of significant vegetation is proposed to be retained within the R1 and B4 zones. These are not a zone which would normally see conservation of existing native vegetation. The ESL layer will provide an additional layer of protection to the significant vegetation within these areas.

The ESL layer has been developed to ensure that the native vegetation of the highest conservation significance is protected.

A special provision is proposed to be included in the SEPP that establishes heads of consideration to be taken into account prior to determination of future applications. Draft wording of an appropriate clause to ensure the appropriate level of environmental protection has been developed by Ecological as follows:

Objectives

- *to identify environmentally significant land, and*
- *to maintain biodiversity, and*
- *to retain and enhance the natural functions of riparian corridors, and*
- *to provide for controlled pedestrian and bicycle access to,, and sensitively integrated fire trails on, such land, and*
- *to protect items of Aboriginal heritage significance.*

Controls

Before granting consent, the consent authority must be satisfied that the development:

- *would substantially retain existing native vegetation, and*
- *would not adversely affect to a significant extent:*
  - *the ecological value of the existing vegetation, or*
  - *native fauna*

Before granting consent, the consent authority must consider whether;

- *the locality has high biological diversity*
- *the locality contains:*
  - *a disjunct population of native species or a species that is neat the limit of its geographical range, or*
  - *riparian vegetation, or*
  - *vegetation associated with wetlands, and*
- *the land has connective importance as, or as part of , a corridor of native vegetation forming a connection that allows for the potential passage of species of flora or fauna between two or more areas of native vegetation, and*
- *the vegetation is adequately represented on land in the general locality, and*
- *the land is important as a site along a migratory route for wildlife, and*

- *the land functions as an important drought refuge for wildlife, and*
- *clearing of the land would be likely to contribute significantly to:*
  - *soil erosion, or*
  - *salinisation of soil or water, or*
  - *acidification of soil, or*
  - *landslip, or*
  - *deterioration in the quality of surface or ground water, or*
  - *increased flooding, or*
- *there is any need to conserve all or some of the native vegetation because:*
  - *of its unusually good condition or its significance as a sample of its type, or*
  - *the development will increase the perimeter of the native vegetation, and so the ratio of the boundary to the area of the native vegetation, making it more vulnerable to negative impacts, or*
  - *there is an archaeological site that has Aboriginal heritage significance on the land.*

6.11 Miscellaneous Standard Provisions

It is proposed that the following provisions from the Standard LEP Template and / or Model Local Clauses be included :

Standard LEP Template

- 2.6 - Subdivision consent requirements
- 5.2 – Classification and reclassification of public land
- 5.3 - Development near zone boundaries
- 5.4 – Controls relating to miscellaneous permissible uses
- 5.6 – Architectural roof features
- 5.8 - Conversion of fire alarms
- 5.9 - Preservation of trees or vegetation
- 5.11 - Bush fire hazard reduction
- 5.12 - Infrastructure development and use of existing buildings of the Crown.

Model Local Clauses

- 1.8A – Savings provision relating to development applications
- 1.9A – Suspension of covenants, agreements and instruments
- 2.6A – Demolition requires consent
- 2.6B – Temporary use of land

It is not proposed that other provisions from the Standard LEP Template or Model Local Clauses be included in the SEPP Amendment on the basis that they establish development controls that are not considered to be of direct relevance to this proposal.

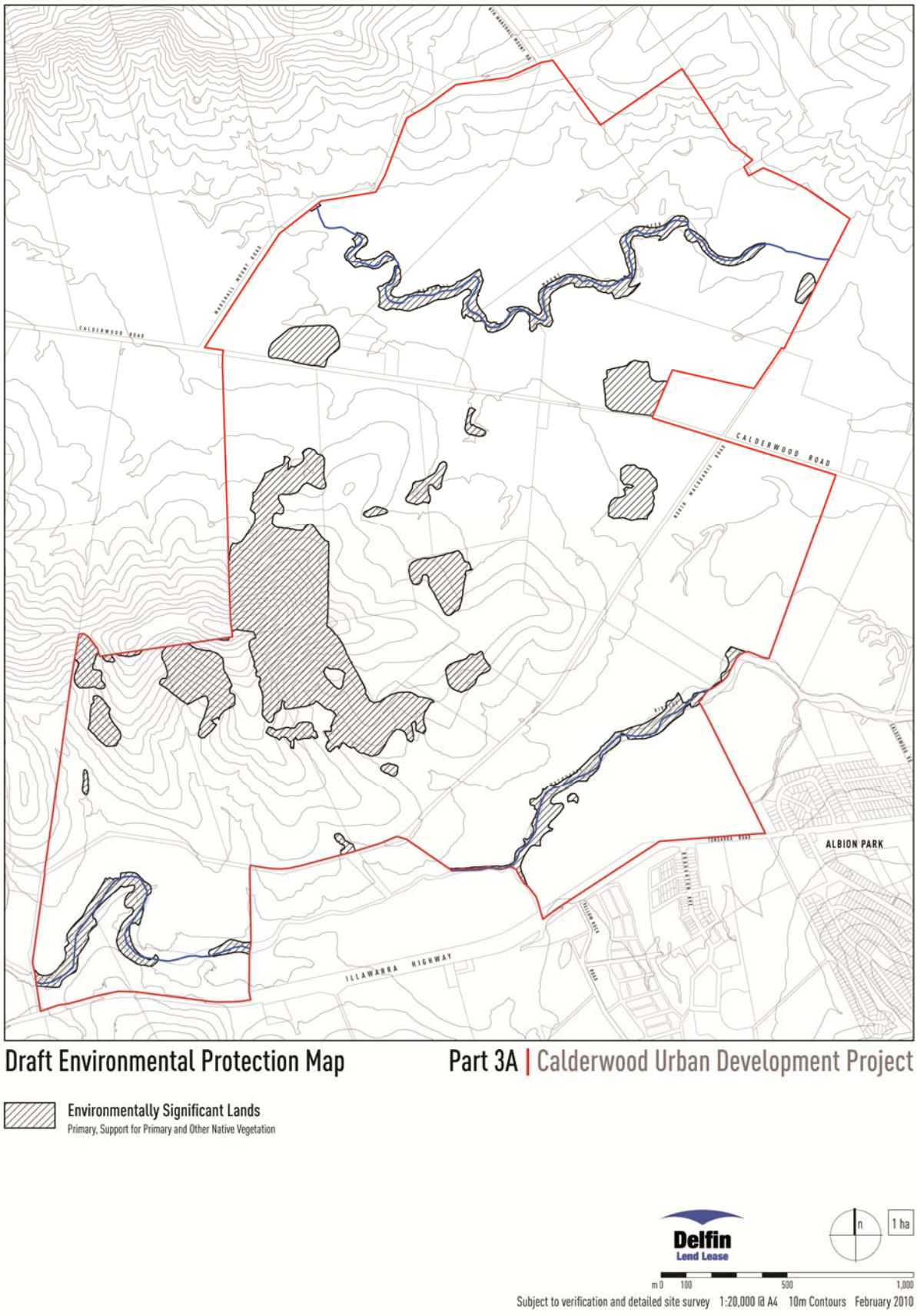

Figure 64 – Draft Environmentally Sensitive Land Map

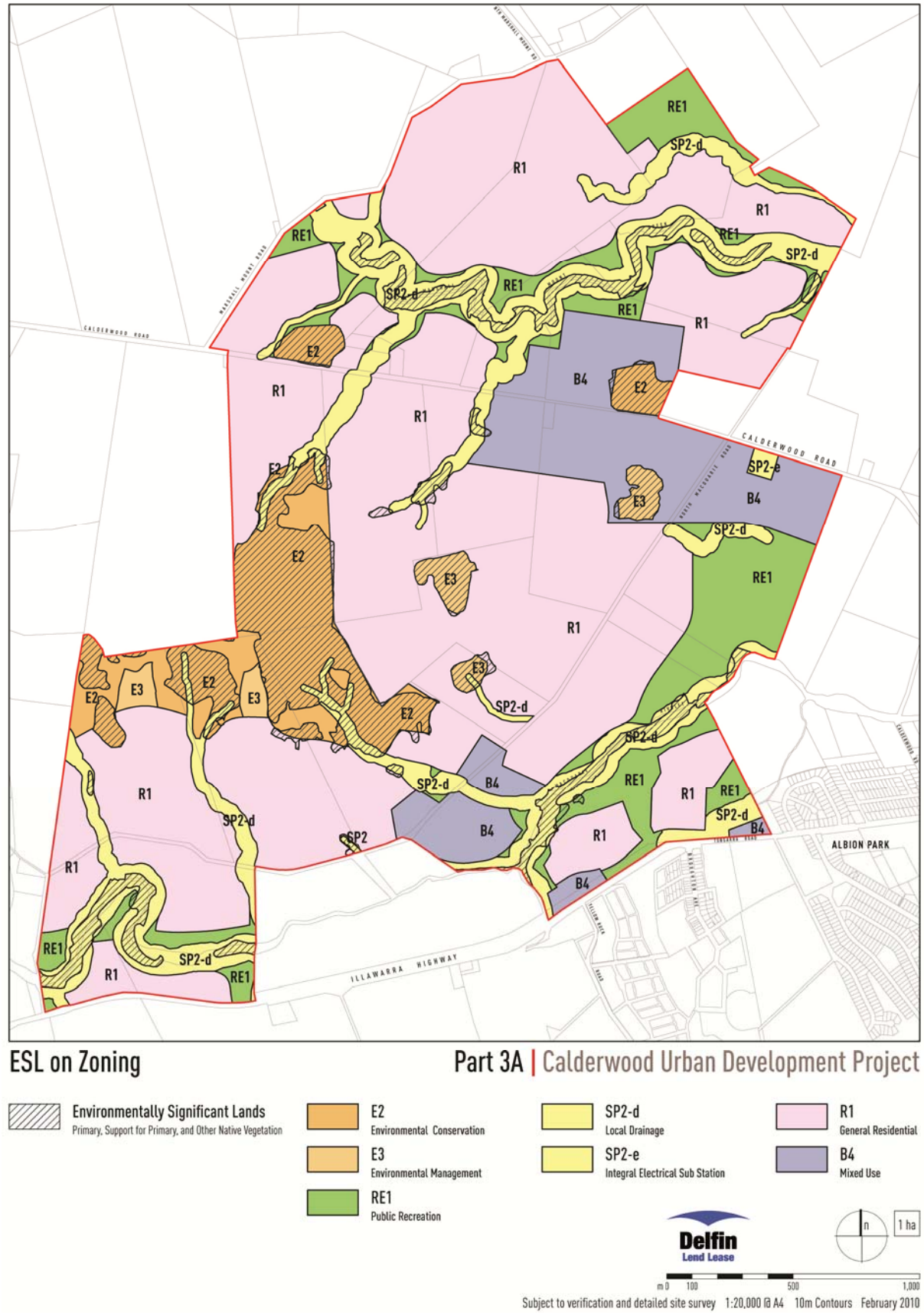

Figure 65 – Relationship of ESL layer to underlying land use zoning

7.0 Environmental Assessment

This section of the report assesses and responds to the following with respect to both the Concept Plan and the SSS proposal:

- Environmental Protection and Biodiversity Conservation Act.
- Other State environmental legislation.
- Environmental planning instruments and development control plans.
- Section 117 Ministerial Directions.
- Transport and accessibility.
- Biodiversity.
- Flood impact, including consideration of potential climate change impacts.
- Riparian corridor network and consistency with the Riparian Corridor Management Study 2004.
- Drainage and stormwater management, including consideration of potential climate change impacts.
- European heritage impact.
- Aboriginal cultural heritage impact.
- Bushfire risk assessment.
- Utilities infrastructure.
- Social and community planning needs and impact assessment.
- Contamination assessment.
- Land stability.
- Acid sulphate soils.
- Erosion.
- Ground water impacts.
- Landscape and visual impact.

An assessment of the following environmental assessment matters, each of which is of relevance to assessment of the Concept Plan and consideration of the SSS listing proposal is contained within the Strategic Justification for the Project documented at Section 2, and has not been repeated in this Section:

- Consistency with the Illawarra Metropolitan Development Program and Illawarra Regional Strategy, including the Sustainability Criteria at Appendix 1 of that Strategy.
- Housing affordability.
- Residential land supply.
- Economic growth.
- Employment.
- Retail impact.
- Infrastructure and servicing implementation and delivery.
- Impact on the West Dapto Release Area (both land supply and infrastructure servicing).
- Impact on agricultural practices and regional food production.

- Sustainability initiaves and outcomes.
- Consideration of alternative land uses.
- Public benefit.

The Site Analysis at Section 3 provides a comprehensive documentation of existing site conditions, based on technical investigations and assessments undertaken by a range of specialist disciplines. It also analyses linkages, synergies and potential impacts of the project with respect to existing and proposed urban development adjoining the site.

This Environmental Assessment draws upon the Site Analysis, which justifies the configuration of the proposed development and the land use zones proposed.

The draft Statement of Commitments at Section 8 complements the findings of this section.

Appendix C provides a detailed summary of each the individual matters listed in the DGRs and identifies where each of these requirements has been addressed in this report and the accompanying technical studies. It demonstrates that the documentation presented in the combined SSS Study and Environmental Assessment meets the requirements that have been issued by the Director General.

7.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, it is necessary to obtain an approval from the Federal Minister for the Environment and Heritage to carry out a 'controlled action' where it is likely to have a significant impact on a ‘matter of national environmental significance’.

Under the Act, matters of National Environmental Significance include listed threatened species, ecological communities and migratory species.

The Flora and Fauna Assessment prepared by Ecological identifies various species that are listed as species under the EPBC Act – see Section 3 and **Appendix Q**. Therefore, the site and the proposed development are subject to the provisions of the EPBC Act. It is noted that none of the existing site vegetation communities listed are on the EPBC Act.

A referral to the Federal Minster for the Environment and Water Resources has been made.

The referral concludes that the development is unlikely to lead to significant impacts on NES matters given that:

- No matters of NES have been recorded on site.
- All measures have been undertaken to retain, improve and management important vegetation on site, including the vast majority of good condition vegetation that may potentially provide habitat to listed threatened species.
- There will be no loss of connectivity across the site and in a regional context.

7.2 Other State Environmental Legislation

A range of State environmental legislation governs the development of the Calderwood site. This includes, of particular relevance, the following:

- Heritage Act 1977 in relation to potential European archaeological relics;
- National Parks and Wildlife Act 1971 in relation to Aboriginal archaeological resources;
- Native Vegetation Act 2003 with respect to clearing of native vegetation;
- Rural Fires Act 1998 with respect to planning for bushfire hazard;
- Water Management Act 2000 with respect to use, management and impact on water resources; and
- Roads Act 1993 with respect to future road works.

The EP&A Act sets out the manner in which this legislation will be applied to future detailed applications relating to the implementation of the Concept Plan, whether they are to be determined under Part 3A or Part 4.

Approval of the Concept Plan will provide the statutory planning framework with which the assessment of detailed proposals must comply with respect to:

- Flood mitigation measures;
- Road layout and road hierarchy;
- Use and management of riparian corridors, including CRZs;
- European and Aboriginal archaeological resource management;
- Bushfire asset protection zone establishment and management;
- Water cycle management.

7.3 Environmental Planning Instruments and DCPs

7.3.1 State Environmental Planning Policies

Table 1 at **Appendix EE** identifies existing State Environmental Planning Policies (SEPPs) that are relevant to the Calderwood Urban Development Project.

As of 1 July 2009, regional environmental plans (REPs) are no longer part of the hierarchy of environmental planning instruments in NSW. All existing REPs, are now deemed SEPPs.

Illawarra Regional Environmental Plan No.1 (IREP 1), which applies to the Calderwood Urban Development Project Site, is therefore a deemed SEPP. The key provisions of IREP 1 are identified at **Appendix EE**.

Table 1 at **Appendix EE** demonstrates that the Concept Plan is consistent with the requirements of all relevant SEPPs. Under the proposal for amendment to the Major Development SEPP (refer to Section 6) all SEPPs, except for IREP1, are proposed to continue to apply to the site. Future development will therefore be required to comply with all relevant SEPP requirements. No issues arise.

7.3.2 Existing LEP & DCP provisions

The existing zoning of the land under Wollongong and Shellharbour LEPs is detailed at Section 3. The site is the subject of a SSS proposal. Listing of the site at Schedule 3 of the Major Development SEPP will repeal the existing Wollongong and Shellharbour LEPs applying to the land.

This Study and EAR provides a comprehensive assessment and justification of the proposed land use change (refer to Section 2), and the new statutory development provisions are proposed to be applied to the land (refer to Section 6). The proposed new land use zone boundaries have been determined on the basis of this site analysis.

A Development Control Strategy accompanies the Concept Plan (refer **Appendix BB**).

The Development Control Strategy incorporates suggested new controls and urban design guidelines to regulate the development, including the subdivision pattern, lot sizes, development controls and management arrangements. Following approval of the Concept Plan, the Development Control Strategy will work with the terms of the Concept Plan Approval and the statutory provisions included in the SEPP as the basis for assessment of future applications for subdivisions and residential built form.

During consultation with Shellharbour Council, a preference was expressed by Council officers for DLL to propose new development controls for the Project as part of the Concept Plan rather than deferring to or relying upon Council's existing DCP provisions that would otherwise apply to the site.

The Council is currently in the process of reviewing key existing DCPs as part of the preparation of a new comprehensive DCP for the site, and many of its existing DCP provisions that would otherwise be of relevance to the Calderwood Urban Development Project are likely to change in the future.

Council officers have therefore expressed a desire to DLL to consider new and innovative site specific development control provisions as part of the Project. They see the Project as providing an opportunity to ensure that improved urban outcomes are delivered within the LGA in the future.

A single Development Control Strategy is proposed for the land within both the Wollongong and Shellharbour LGAs to ensure consistency in future development and approvals.

Existing DCPs applying to the Calderwood Urban Development Project site are identified in the Table included as part of the Development Control Strategy for the site at **Appendix BB**. **Appendix BB** also identifies which of these DCPs may continue to be of relevance to future development on the site in addition to the proposed Development Control Strategy.

7.3.3 Section 117 Ministerial Directions

The Minister for Planning, under section 117(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) issues directions that relevant planning authorities such as local councils must follow when preparing planning proposals for new LEPs. The directions cover the following broad categories:

- employment and resources;
- environment and heritage;
- housing, infrastructure and urban development;
- hazard and risk;
- regional planning;
- local plan making.

Although not technically relevant to a SEPP Amendment, the DGRs require consideration of relevant s.117 Directions.

The Section 117 Ministerial Directions listed in **Table 2** at **Appendix EE** are considered to be of key relevance to the proposed development. The proposal's response to each relevant s.117 Direction is also included in the Table.

As demonstrated at **Appendix EE**, the proposal is consistent with, or is justified in terms of the consistency criteria specified within each of the relevant s.117 Directions.

7.4 Transport and Accessibility

A Transport and Accessibility Study and Transport Management Plan (TMAP) to support the proposed Concept Plan and SSS Study has been prepared by Cardno and is included at **Appendix T**. The TMAP:

- Considers the traffic constraints of the site and surrounding locality.
- Demonstrates a strategy for providing linkages to regional transport networks.
- Demonstrates that there is the ability for sites located within the release area, but not within the proponent's control, to connect to infrastructure.
- Provides detailed traffic modelling to determine level of infrastructure needed plus annual traffic growth/approved development (including Delmo Albion Park).
- Identifies the required timing/delivery/scope of local and regional road infrastructure.
- Presents network modelling for impacts on Illawarra Highway, Princes Highway/Southern Freeway, Tongarra Road, Marshall Mount Road, Yallah Road and the future Southern Freeway corroder between Yallah and Oak Flats.
- Presents modelling using SIDRA, for junctions likely to be impacted by the development as identified in the network modelling, including AM and PM peaks, from the occupation of the Stage 1 development to the completion of the full development of the Concept Plan site.
- Identifies infrastructure including road, pedestrian and cycling infrastructure to ameliorate the impacts of the development.
- Presents measures to promote public transport usage and reduce car usage.
- Identifies various Travel Demand Management (TDM) measures that will optimise the opportunity provided by the project sites proximity to public transport.

- Provides a road network plan identifying the proposed road hierarchy including cycleways, footpaths and car parking.

The TMAP has been prepared in accordance with the Ministry of Transport's Draft Guidelines for TMAPs and has the following objectives:

- Manage the transport impacts of the development.
- Help reduce growth in overall VKT generated by the project, both by cars and by commercial vehicles.
- Help reduce reliance on the private car.
- Maximise the use of public transport, walking and cycling.

The TMAP identifies key transport opportunities for the project as follows:

- An opportunity to create a master planned community with key sustainable transport principles included within its planning and design from the outset.
- The planning of a regional road network sufficient to resolve the currently experienced significant peak period congestion at key intersections and mid-block sections, e.g. Princes Highway/Illawarra Highway intersection.
- The progressive upgrading of the existing low-demand, rural local road network to provide road capable of providing an acceptable condition with safe and efficient operation to benefit all road users within the local and strategic context.
- The opportunity to remove the high car dependence due to the regions current poorly integrated public transport, low service levels, irregular low-density urban development and dispersed trip origins and destinations.
- An ultimate transport network suitable to accommodate other significant urban development planned at nearby Tallawarra, Yallah/Marshall Mount and West Dapto.

7.4.1 Road network upgrades

The TMAP includes comprehensive traffic modelling to determine the road link and intersection upgrades that will be required.

The extent of the road network over which the existing transport network deficiencies and the proposed transport demands associated with the proposed development should be assessed was agreed with the RTA prior to preparation of the TMAP.

The regional land use planning growth assumptions (land use changes) that have been used in the traffic assessment were also agreed with the RTA and DoP for inclusion within the future years traffic modelling. These growth assumptions are identified at Section 3.5 of this report.

To assess road network operation an iterative set of traffic modelling runs were performed to test the effects of a range of assumptions on road infrastructure provision and modal transfer targets, both with and without the proposed development.

A post development mode share target was established to be 10% shift away from car based transport following the implementation of a range of sustainability measures to increase non-car mode share.

The following road infrastructure upgrades were tested within assessments:

- F6 Freeway extension: Yallah to Oak Flats.
- Tripoli Way (Albion Park Bypass).
- North-facing ramps at Tallawarra interchange.

The assessment of the future road network upgrades detailed in the TMAP identifies:

- Road network upgrades required to ameliorate the impact of base 2031 future development excluding the proposed development.
- Additional road network upgrades required to ameliorate the impact of full 2031 future development, including the proposed development.

The TMAP summarises key points from the traffic model assessments without the Project as follows:

- North-facing ramps at Tallawarra interchange were not required. It is noted that the future stage of the West Dapto Release Area beyond 2031 may indicate the need for the north facing ramps at Tallawarra interchange.
- F6 Freeway extension: Tallawarra to Oak Flats was required to address existing deficiencies.
- Tripoli Way (Albion Park Bypass) stages 1-3 were required including north and south facing ramp connections to the F6 Freeway extension (including the planned intersection upgrades along its length and at its terminal ends).
- Princes Highway between Mount Brown Road and Southern Freeway northbound offload ramp would need to be duplicated (including intersection upgrades along the duplicated section).
- Princes Highway between the Southern Freeway northbound offload ramp and Yallah Bay Road would require and additional southbound lane.
- The Southern Freeway northbound off load ramp and the southbound on load ramp would need to be duplicated with associated merge diverge improvements undertaken on the Southern Freeway.
- Marshall Mount Road & Yallah Road would need to be upgraded to a suitable two lane-two way standard.

Road network improvements that have been identified as being required to address existing deficiencies without the proposed development proceeding are identified in **Tables 19** and 20 below.

The TMAP summarises key points from the traffic model assessments with the proposed development as follows:

- Upgrade the priority controlled Marshal Mount Road / Yallah Road intersection to a roundabout.
- Upgrade Calderwood Road to the east of the CUDP boundary to a suitable two lane-two way standard.
- Provide the CUDP north-south sub-arterial road and intersection upgrades at its terminal ends.

The road network improvements required to satisfactorily accommodate forecast traffic demands with the proposed development are identified at **Table 21** below.

The overall package of road upgrades includes the provision of the Calderwood Urban Development Project north-south sub-arterial road on the basis of its strategic benefits to the wider road network.

It is noted that in order to test the sensitivity of the future road network (2031) to potential increased yields within the Calderwood Urban Development Project, two model scenarios were run – one with an additional 10% and one with an additional 15% dwelling yield. Detailed results (mid block volumes and carriageway / intersection level of service for the worst case scenario of +15% additional dwellings are provided at Appendix 7L of the TMAP.

Timing of road network upgrades

To determine the required timing for the road network upgrades, traffic modelling has been undertaken for intermediate assessment years of 2016, 2021 and 2026. The intermediate assessment years adopted for the assessment are consistent with planning timelines.

Timings of upgrades have been identified and assumed to be implemented within the next assessment year.

Due to the extent of planning, design and construction time required to implement the F6 freeway extension, it has been assumed in the modelling that this would be complete within the period 2017 to 2021.

Figure 66 identifies the location of all recommended road network upgrades as identified in **Tables 19, 20, 21** and **22**.

Table 19 – Proposed road network improvements to address existing deficiencies (Source: TMAP, Cardno, 2010)

Upgrade Number	Location	Proposed Network Improvement
Road Link Upgrades		
Upgrade 1	F6 Extension from Tallawarra Interchange to Tripoli Way Interchange	Construction of a four-lane divided carriageway to freeway standard
Upgrade 2	F6 Extension from Tripoli Way Interchange to Croome Road Interchange	
Upgrade 3	F6 Extension from Croome Road Interchange to Oak Flats Interchange	

Table 20 – Proposed F6 Extension complimentary road network improvements (Source: TMAP, Cardno, 2010)

Upgrade Number	Location	Proposed Network Improvement
Road Link Upgrades		
Upgrade 4	F6 Extension Tripoli Way North Facing Ramps	Single lane ramps on all approaches with double roundabouts and single central structure
Upgrade 5	F6 Extension Tripoli Way South Facing Ramps	
Upgrade 6	Tripoli Way extension from Illawarra Highway (East) to F6 Extension	Construct divided two way-four lane carriageway with minimum 3.5m lane widths with kerb and gutter.
Upgrade 7	Tripoli Way extension from F6 Extension to Tongarra Road	
Upgrade 8	F6 Extension Croome Road Ramps	Single lane ramps
Upgrade 9	F6 Extension Complimentary Measures	Install LATM treatments along Princes Highway between F6 extension limits
Intersection Upgrades		
Upgrade 10	Tripoli Way/Illawarra Highway	New signalised intersection
Upgrade 11	Tripoli Way/Tongarra Road	New signalised intersection

Table 21 – Proposed road network improvements to address future base deficiencies (Source: TMAP, Cardno, 2010)

Upgrade Number	Location	Proposed Network Improvement
Road Link Upgrades		
Upgrade 12	F6 northbound off-ramp at Tallawarra	Provide additional off-ramp lane and associated freeway diverge upgrades
Upgrade 13	F6 southbound on-ramp at Tallawarra	Provide additional on-ramp lane and associated freeway merge upgrades
Upgrade 14	Tripoli Way from Illawarra Highway/ Broughton Avenue to Calderwood Road	Construct undivided two way-two lane carriageway with minimum 3.5m lane widths with kerb and gutter.
Upgrade 15	Tripoli Way from Calderwood Road to Illawarra Highway (East)	
Upgrade 16	Tripoli Way Complimentary Measures	Install LATM treatments along Illawara Highway/ Tongarra Road between Tripoli Way limits
Upgrade 17	Princes Highway from Mount Brown Road to Huntley Road	Provide additional northbound traffic lane
Upgrade 18	Princes Highway from Mount Brown Road to Huntley Road	Provide additional southbound traffic lane
Upgrade 19	Princes Hwy from Huntley Road to F6 Off-ramp	Provide additional northbound traffic lane
Upgrade 20	Princes Hwy from Huntley Road to F6 Off-ramp	Provide additional southbound traffic lane
Upgrade 21	Princes Highway from F6 Off – Yallah Bay Road	Provide additional southbound traffic lane
Upgrade 22	Marshall Mount Road from CUDP North-South Route to Yallah Road	Upgrade road to undivided two way-two lane carriageway with minimum 3.5m lane widths and sealed shoulders
Upgrade 23	Marshall Mount Road from Yallah Road to TAFE	
Upgrade 24	Marshall Mount Road from TAFE to Huntley Rd	

Upgrade Number	Location	Proposed Network Improvement
Upgrade 25	Yallah Road from Marshall Mount Road to Haywards Bay Drive	Upgrade road to undivided two way-two lane carriageway with minimum 3.5m lane widths and sealed shoulders
Intersection Upgrades		
Upgrade 26	Princes Highway/Huntley Road	Signalise existing priority controlled intersection
Upgrade 27	Princes Highway/F6 southbound off-ramp	Signalise existing priority controlled intersection
Upgrade 28	Princes Highway/Cormack Avenue	Signalise existing priority controlled intersection
Upgrade 29	Illawarra Highway/Broughton Avenue	Additional northern leg for Calderwood collector road
Upgrade 30	Tripoli Way/Calderwood Road	New roundabout intersection
Upgrade 31	Illawarra Highway/Terry Street	Minor signal alterations

Table 22 – Proposed road network improvements to address full Calderwood Urban Development Project deficiencies (Source: TMAP, Cardno, 2010)

Upgrade Number	Location	Proposed Network Improvement
Road Link Upgrades		
Upgrade 32	Calderwood Road from CUDP to Tripoli Way	Upgrade road to undivided two way-two lane carriageway with minimum 3.5m lane widths and sealed shoulders
Upgrade 33	North-South Route – southern section	Construct undivided two way-two lane carriageway with minimum 3.5m lane widths with kerb and gutter.
Upgrade 34	North-South Route – central section	
Upgrade 35	North-South Route – northern section	
Intersection Upgrades		
Upgrade 36	Marshall Mount Road/Yallah Road	Upgrade existing T-intersection to a roundabout
Upgrade 37	Illawarra Highway/Yellow Rock Road	Upgrade existing T-intersection to a four-arm roundabout

7.4.2 Apportionment of road network upgrades

The Calderwood Urban Development Project, if considered in isolation, does not specifically identify the need for the significant range of road upgrades required.

Detailed traffic modelling has also therefore been undertaken to determine the required timing for the road network upgrades, and the reasonable apportionment of costs to all parties benefiting from the works.

Apportionment procedures are technical calculations used to determine a total contribution for all proposed network upgrades from individual development sites such as the Calderwood Urban Development Project. Once the value of the total contribution has been estimated, the allocation of funds towards individual upgrade projects is expected to be rationalised. The technical apportionment methodologies are detailed at Chapter 11 of the TMAP.

As detailed in the TMAP (refer to Section 11 of that report) the purpose of establishing the apportionment of trips on various road sections and throughintersections is to assist in determining an appropriate contribution for all proposed network upgrades from individual development sites such as the Calderwood Urban Development Project.

It is noted that the costs to rectify an existing deficiency are not to be borne by those parties developing land.

The F6 extension has been identified as required to address an existing deficiency, furthermore the roadworks are strategic in nature. Accordingly the apportionment of trips on the F6 extension have been excluded from the apportionment calculations.

However, the associated F6 extension complimentary road network improvements (such as freeway ramps, access roads and intersection improvements at access points) have been included in the apportionment calculations. It could be argued that these works are required to provide access to the F6 extension and as such are works required to address existing deficiencies and therefore the costs should not be borne by those parties developing land. It is considered more appropriate and reasonable that these works should be funded (according to the appropriate apportionment) by the regional development in the areas.

The cost apportionments and potential staging of works is identified at Chapter 11 of the TMAP and has been accounted for in the Infrastructure, Services and Delivery Proposal and has been incorporated into the VPA (refer to Section 4 and to the Outline VPA included at **Appendix CC**). **Tables 23** and **24** reproduced below from the TMAP provide a summary of the cost apportionments that have been applied.

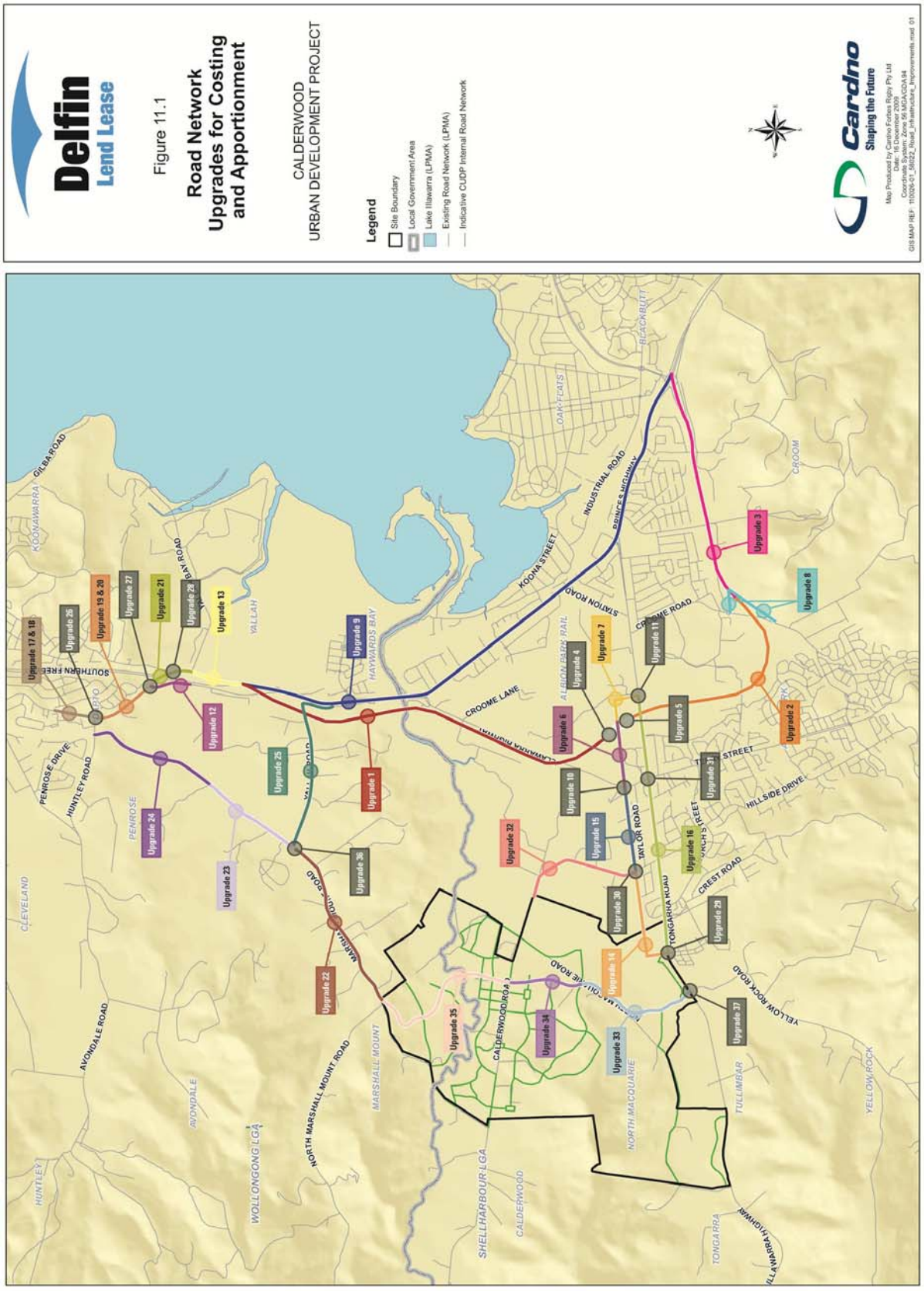

Figure 66 – Road network upgrades for costing and apportionment (Source: TMAP, Cardno, 2010)

Table 23 – Technical apportionment for intersection upgrades (Source: TMAP, Cardno 2010)

Intersection	Funding Road Classification[2]	Timing	Cost Apportionment			
			CUDP	Other Dev. Sites	Govt.	Total
Tripoli Way/ Illawarra Highway (Upgrade 10)	State	2017 - 2021	68%	32%	0%	100%
Tripoli Way/ Tongarra Road (Upgrade 11)	State	2017 - 2021	18%	31%	52%	100%
Princes Highway/ Huntley Road (Upgrade 26)	Regional	2017 - 2021	7%	93%	0%	100%
Princes Highway/ F6 southbound off-ramp (Upgrade 27)	State	2017 - 2021	4%	96%	0%	100%
Princes Highway/ Cormack Avenue (Upgrade 28)	Regional	2017 - 2021	3%	97%	0%	100%
Illawarra Highway/ Broughton Avenue (Upgrade 29)	State	2017 - 2021	57%	33%	10%	100%
Tripoli Way/ Calderwood Road (Upgrade 30)	Local	2027 - 2031	59%	41%	0%	100%
Illawarra Highway/ Terry Street[3] (Upgrade 31)	State	2017 - 2021	-	-	-	-
Marshall Mount Road/ Yallah Road (Upgrade 36)	Local	2027 - 2031	47%	44%	9%	100%
Illawarra Highway/ Yellow Rock Road (Upgrade 37)	State	2009 - 2016	66%	22%	12%	100%

[2] Based on main road classification

[3] Minor works to upgrade signal timings and phases – no costs associated

Table 24 – Technical apportionment for road upgrades (Source: TMAP, Cardno 2010)

Section of Road	Funding Road Classification	Timing	Cost Apportionment			
			CUDP	Other Dev. Sites	Govt.	Total
F6 Extension Tripoli Way North Facing Ramps (Upgrade 4)	State	2017 - 2021	32%	19%	49%	100%
F6 Extension Tripoli Way South Facing Ramps (Upgrade 5)	State	2017 - 2021	19%	14%	68%	100%
Tripoli Way from Illawarra Highway (East) to F6 Extension (Upgrade 6)	State	2017 - 2021	36%	19%	45%	100%
Tripoli Way from F6 Extension to Tongarra Road (Upgrade 7)	State	2017 - 2021	0%	25%	75%	100%
F6 Extension Croome Road Ramps (Upgrade 8)	State	2017 - 2021	0%	3%	97%	100%
F6 Extension Complimentary Measures (Upgrade 9)	State	2017 - 2021	7%	20%	74%	100%
F6 northbound off-ramp at Tallawarra (Upgrade 12)	State	2022 - 2026	4%	94%	2%	100%
F6 southbound on-ramp at Tallawarra (Upgrade 13)	State	2017 - 2021	3%	97%	0%	100%
Tripoli Way from Illawarra Highway/ Broughton Avenue to Calderwood Road (Upgrade 14)	Local	2017 - 2021	34%	40%	26%	100%
Tripoli Way from Calderwood Road to Illawarra Highway (East) (Upgrade 15)	Local	2017 - 2021	64%	19%	17%	100%
Tripoli Way Complimentary Measures (Upgrade	Local	2017 - 2021	34%	44%	23%	100%
Princes Highway from Mount Brown Road to Huntley Road (Northbound) (Upgrade 17)	Regional	2017 - 2021	9%	91%	0%	100%
Princes Highway from Mount Brown Road to Huntley Road (Southbound) (Upgrade 18)	Regional	2017 - 2021	15%	85%	0%	100%
Princes Highway from Huntley Road to F6 Off-ramp (Northbound) (Upgrade 19)	Regional	2017 - 2021	4%	96%	0%	100%
Princes Highway from Huntley Road to F6 Off-ramp (Southbound) (Upgrade 20)	Regional	2017 - 2021	3%	97%	0%	100%

Section of Road	Funding Road Classification	Timing	Cost Apportionment			
			CUDP	Other Dev. Sites	Govt.	Total
Princes Highway from F6 Off-ramp to F6 On-ramp (Southbound) (Upgrade 21)	Regional	2017 - 2021	3%	97%	0%	100%
Marshall Mount Road from CUDP North-South Route to Yallah Road (Upgrade 22)	Local	2017 - 2021	25%	74%	0%	100%
Marshall Mount Road from Yallah Road to TAFE (Upgrade 23)	Local	2017 - 2021	50%	13%	37%	100%
Marshall Mount Road from TAFE to Huntley Road (Upgrade 24)	Local	2017 - 2021	42%	27%	31%	100%
Yallah Road from Marshall Mount Road to Haywards Bay Drive (Upgrade 25)	Local	2017 - 2021	0%	63%	37%	100%
Calderwood Road from CUDP to Tripoli Way (Upgrade 32)	Local	2027-2031	98%	2%	0%	100%
North-South Route – southern section (Upgrade 33)	Local (on-site)	2009 – 2016	84%	12%	4%	100%
North-South Route – central section (Upgrade 34)	Local (on-site)	2017 – 2021	66%	19%	14%	100%
North-South Route – northern section (Upgrade 35)	Local (on-site)	2022 - 2026	67%	24%	9%	100%

7.4.3 TMAP Measures to reduce car dependency

A fundamental element of the TMAP is the adoption of a 10% modal shift target. DLL is committed to implementing sustainability initiatives / transport measures and urban design that encourage the uptake of non car mode transport and reduce the dependence on the private motor vehicle.

The current transport mode share across the total Wollongong and Shellharbour LGA's stands at around 90% car based trips, according to the 2006 Journey to Work data provided by the TDC. The remaining 10% consists of 5% public transport trips and 5% other trips which are assumed to be predominantly active transport trips, such as cycling and walking.

Based upon the experience of DLL in successfully implementing master planned communities which included a range of sustainable transport initiatives it is expected that a mode shift of 10% away from private vehicle use is likely to occur in the Project.

The TMAP sets out a range of measures which, if implemented in a timely and co-ordinated fashion, can achieve a shift in mode share. Key infrastructure links will be constructed from the outset to ensure that policy measures aimed at changing travel behaviour can be supported by viable alternatives to car travel.

As well as changing the mode split of person trips, DLL is also committed to reducing the actual need to travel long distances at all. With the implementation of the National Broadband Network and other advances in technology relating to home shopping and telecommuting the number of trips made per residence will also reduce.

The proposed measures to reduce car dependency, as set out in the TMAP are as follows:

Proposed travel demand management measures

Measure 1: Timely Provision of Facilities and Services
Timely provision of facilities for the CUDP - including community, retail, learning, employment and recreation facilities. The delivery of these essential services and facilities early in the life of the project ensures that residents have access to services and facilities when they need them, thus establishing a more sustainable walking, cycling and public transport usage behaviour for residents.

Measure 2: Fibre to the Home (FttH) and National Broadband Network
Incorporate FttH in the delivery of homes to provide opportunities for residents to work from home and facilitate communication between businesses without needing to travel outside the development. Consistent with the principles of the national broadband network.

Measure 3: Website/Community Portal
Establish community website/portal to facilitate promotion of public transport information, initiatives, events and activities for residents and workers. The website could provide links to local service providers as appropriate.

Measure 4: Resident Kits
Incorporate public transport information, including public transport route maps and timetables, hike and bike trail maps, fitness trail maps and sustainable community initiatives as part of Resident Kits. Sustainable community initiatives to be investigated may include car pooling, bike pooling, bike hire schemes, etc as appropriate. Kits are distributed to households as they move into the development.

Measure 5: Promotions
Promotion of public transport initiatives via Community Portal, Resident Kits, Community Events and Activities. Promotion of significant relevant sustainable transport events eg. 'cycle to work' day.

Measure 6: Public transport incentives
Investigate with State Government and local transport providers (Premier Illawarra) public transport incentive schemes to encourage resident and worker take up of public transport.

Measure 7: Land Use/Transport Interaction

A mixed-use approach to all areas of the project built within a street and pedestrian framework based on a modified grid. The following key elements support this measure:

- Walking and cycling networks designed to provide for both commuter and recreation users linking key amenities within the Calderwood project as well as providing access to existing neighbouring facilities.

- A diversity of land uses and housing types across the project to accommodate a diverse population.
- Engaging and active streets that provide a positive experience for the users particularly along primary pedestrian and cycle corridors.
- Crime Prevention Through Environmental Design (CPTED) principles applied to provide a greater sense of safety through passive surveillance of streets, parks and other areas of open space.
- Establish a sub network of lit paths to provide for safer walking and cycling after dark.
- Locate key amenities to maximise walkable access.
- Holistic approach to the design of the street network, carefully balancing the needs for vehicle movement with the needs of pedestrians and cyclists. This has to be considered at all levels of the design from parking requirements and intersection function down to the detail of path materials and kerb radii to ensure the whole movement system supports a balanced approach.

Active transport principles

Measure 8: Local Access Street Design
A holistic approach will be taken to balance all users of the local streets and will include sufficient space to provide a high level of pedestrian amenity. This will include appropriate pavement designs, traffic calming, signage and speed limits as well as built-form controls on adjacent parcels to create a cohesive and robust environment. On some streets with high pedestrian volumes, further measures will be incorporated to enhance the pedestrian environment through the landscape treatment, driveway access controls and other measures to encourage pedestrian priority.

Measure 9: Pedestrian and Cycle Hierarchy
The network established for Calderwood will link all areas of the project with key amenities including open spaces, schools and the facilities in the Town and Village Centres. A hierarchy of paths will be used to create enhanced corridors providing a greater level of amenity for both pedestrians and cyclists. The path network will make extensive use of the open space areas, linkage corridors (including the linear riparian corridors), collector and arterial roads, and pedestrian priority streets. After dark usage will also be facilitated on key paths to further encourage the safe usage of this network.

Measure 10: Wayfinding Signage
The way-finding strategy will be designed to complement the interpretive strategy and will be implemented progressively as the project is built. The signage needs to indicate access routes for the amenities in the project as well as facilities in neighbouring areas. The signage system needs to be clear and co-ordinated and present information on distances, times and accessibility where relevant.

Measure 11: Parking Strategies
Parking in the Town and Village Centres will be co-ordinated and where possible shared across uses. This, along with possible time restrictions and extensive on-street parking, will create more walkable centres. The establishment of a shared parking district could also be considered in the Town Centre to further reduce the parking requirements and to encourage a park once attitude when undertaking multiple activities in the Town Centre.

Measure 12: Safety Elements for Network
Crime Prevention Through Environmental Design (CPTED) principals will be applied where possible to all trails and paths in the network. A sub network of lit paths will be provided to encourage after-dark pedestrian and cycle access. Other amenities will be considered as part of the network including water supply, seats, bike racks, and shade structures where appropriate.

Measure 13: Bicycle Parking
To facilitate cycle usage throughout the project, bicycle parking will be provided in close proximity to the schools and sports ovals, in the Town and Village Centres and will be encouraged as part of the development of employment and other commercial uses. Other areas of key Open Spaces will also have bicycle parking.

Public transport principles

Measure 14: Bus Network Provision
A hierarchy of bus routes should be developed and implemented.

Measure 15: Service levels that meet and exceed NSWTI's Outer Metropolitan Service Planning Guidelines
The public transport network should be operated with service levels which meet and exceed NSWTI's guidelines.

Measure16: Early bus service provision
Work with State Government and local transport providers (Premier Illawarra) to enable provision of early bus services for the development. Bus services to the CUDP should as a minimum be available from date of first resident moving in, with staging of the development designed to facilitate efficient bus services at all times, subject to negotiations with NSWTI and premier Illawarra.

Measure17: Branding and Publicity
A clear map identifying the proposed bus route hierarchy and indicative stop locations should be made available to purchasers. DLL should make representations to NSWTI and Premier Illawarra to urge the development of a branding strategy based on public transport levels of service.

Measure18: Bus Stop Infrastructure
A hierarchy of bus stops should be developed and implemented.

Measure19: Bus Network Infrastructure
Bus queue jumps should be provided on approach to all signalised intersections within the Projecy, where appropriate. Calderwood town centre should be designed to provide buses with priority access through the centre, including the bus interchange. Bus priority measures should be provided along the Strategic Bus Corridor.

Public Transport Provision

The TMAP details the public transport principles and a network concept developed for bus services to integrate the site within the wider bus network at both strategic level and a district level.

As identified in the TMAP, a strategic bus corridor is proposed to route to the north of the CUDP along Marshall Mount Road, Huntley Road and Princes Highway to Dapto and Wollongong. To the east of the site, it is proposed the route proceeds eastwards along Illawarra Highway, Tongarra Road and Princes Highway to Oak Flats interchange and then Shellharbour CBD.

Two lower order routes (classed as 'district routes)' would link the remainder of the site with Calderwood Town Centre and Albion Park for onward connections to local and regional rail services.

The proposed bus services and associated bus stop infrastructure provide a satisfactory level of coverage for the CUDP to in accord with the coverage targets set out in the *Outer Metropolitan Service Planning Guidelines*.

A two tier bus stop hierarchy is proposed with higher order facilities (for strategic bus services including shelters/plinth to NSWTI standard) based around the sub-arterial north-south road with and the second order district services providing stops with timetable information. The proposed public transport nodes are located to maximise the opportunity for provision of higher density land uses clusters around the facilities in line with the desired urban design principles and sustainable transport objectives.

Recommendations

The TMAP recommendations for road network improvements and TMAP measures for reducing car dependency have been incorporated as relevant.

Road network improvements required as a director consequence of the Calderwood Urban Development Project are included in the proposed VPAs.

The Infrastructure, Services and Facilities Implementation and Delivery Proposal at **Appendix G** demonstrates the staging / timing of delivery of road network improvements, and how this will integrate with the delivery of other necessary physical and human services infrastructure.

The proposed VPAs incorporate apportionment of road network improvements to the Calderwood Urban Development Project (refer to Section 5 and Outline VPA included at **Appendix CC**). The apportionment methodology applied by Cardno as part of the TMAP has identified the appropriate contribution towards road network improvements that should be made by the proposed development.

The Concept Plan proposes an internal road layout and hierarchy based on the recommendations made by Cardno. Specifically, the north south road linking the Illawarra Highway and Marshall Mount Road, the new intersection connections to those roads, and the upgrade of Calderwood Road as proposed by the Concept Plan accords with the recommendations of the TMAP.

Specific street design standards, including reservation widths, carriageway widths, verge widths and parking bay allowance, for each proposed street type are included in the Development Control Strategy at **Appendix BB**. The detailed design of all future streets within the development is to be consistent with the street design standards.

7.5 Biodiversity

A Flora and Fauna Assessment prepared by Ecological is included at **Appendix Q**.

The Flora and Fauna Assessment is a key body of work that has directly informed the Concept Plan:

- Urban capable land footprint;
- Landscape and Open Space Master Plan;
- Riparian Corridor Network;
- Identification of areas of significant vegetation to be retained within the future development (the 'Environmentally Significant Land'); and
- The selection of appropriate land use zones and development control provisions under the SEPP Amendment proposal.

The findings, conclusions and recommendations of the Flora and Fauna Assessment have also been integrated into the Water Cycle Management Strategy and Flood Mitigation Plan presented in the Concept Plan proposal.

In addition, the SEPP Amendment proposes the use of the E2 Environmental Conservation, E3 Environmental Management and ESL vegetation protection provision as statutory mechanisms to respond to the conclusions and recommendations of Ecological.

The Flora and Fauna Assessment provides a strategic biodiversity assessment including a flora and fauna study, an analysis of ecological values and identification and high quality mapping of areas of high, moderate and low ecological value. It:

- addresses the impact of the proposed Concept Plan and SSS Listing on existing native flora and fauna and their habitats, including identified threatened species having regard to the Threatened Species Assessment Guidelines,
- recommends offset measures to avoid or mitigate impacts on threatened species and their habitat,
- evaluates the ecological values of Johnston's Spur and Yallah-Calderwood Regional Habitat Corridor on the site (including any road upgrades),
- identifies the ecological attributes of the lands proposed for dedication and how the environmental land offsets scheme will mitigate the impacts of the development, and
- discusses the development of ecological corridors to link flora and fauna corridors both on and adjoining the site.

Existing vegetation communities and their conservation status, threatened species and populations and riparian and aquatic values are detailed in the Site Analysis at Section 3.

The Concept Plan and SSS proposal has responded to the findings and conclusions of the assessment of existing vegetation communities and their significance undertaken by Ecological.

The conservation areas recommended by Ecological (refer to **Figures 23** and **24** at Section 2) have formed a fundamental element of the development of the Concept Plan, the proposed Riparian Corridor Network, and the proposed Open Space Master Plan and have assisted in the determination of the new land use zone boundaries.

Measures to avoid, mitigate and offset impacts

The Flora and Fauna Assessment prepared by Ecological identifies that the proposal has incorporated significant actions to maximise the avoidance of impacts to existing native flora and fauna from development within the Calderwood site. The Assessment identifies these as follows:

Concept Plan

The Concept Plan retains the core ecological values of the site. These core ecological values include Johnston's Spur, Marshall Mount Creek and Macquarie Rivulet as well as smaller pockets of good quality remnant native vegetation. With the retention of these key areas of remnant native vegetation there will not be a significant impact to threatened ecological communities, threatened species or their habitat.

The Concept Plan has incorporated significant terrestrial habitat connectivity both within the site (north south) and most importantly with offsite areas to the east and west, ensuring that the regional corridors linking the escarpment to the coast are maintained and improved.

Zoning and ESL

The majority of habitat on site is protected via the land use zoning proposal, and an Environmentally Significant Lands (ESL) layer which will serve as an additional consent requirement for any works proposed therein. These protective mechanisms will also be supported by the proposed future public ownership of E2 and SP2 zones.

E2 Environmental Conservation zones have been placed over Johnston's Spur and the highest value remnants stands. This zone is intended to protect land that has high conservation value. A number of land uses considered to be inappropriate for this zone have been mandated as prohibited uses.

Passive recreation will be permissible in these areas and will principally involve walking paths and picnic tables in already open areas. Prior to construction of any such facilities, detailed seasonal field survey will be undertaken in these areas to locate potential threatened plants.

E3 Environmental Management zones have been placed over native vegetation which have been found to be of lesser conservation value, or cleared areas within Johnston's 's Spur to protect the E3 areas from edge effects. The mandatory zone objectives focus on protecting, managing and restoring areas with special ecological, scientific, cultural or aesthetic values and to provide for a limited range of development that does not have an adverse effect on these values.

The native vegetation within the riparian corridors will be zoned SP2 Infrastructure (local drainage etc). This zone allows a number of uses that could impact on ecological values. Thus Environmentally Significant Lands (ESL) layer will provide an additional layer of protection to the vegetation within this zone.

The ESL layer has been developed to ensure that native vegetation of high conservation significance is protected. The ESL layer comprises the majority of vegetation in good condition which is of Primary, Support for Primary and Other Native Vegetation significance as found by the conservation significance assessment.

The ESL is proposed within the SEPP as well as the Concept Plan and identifies areas of ecological significance across the site and incorporates a special provision in the SEPP that establishes heads of consideration to be taken into account prior to determination of future development.

Further protection is also afforded to this zone through the mandatory acquisition requirements of the SP2 zone. Ultimately, this land will be owned by the relevant local council.

Ownership

The proposed ongoing ownership plan for the site is to handover all E2, SP2 and RE1 (Public Recreation) to council. In addition, some of the E3 Environmental Management land is proposed to go into public ownership. DLL will rehabilitate these areas to a suitable condition prior to handover.

Open Space Management

The open space management plan for the site incorporates bushland and passive uses for sensitive areas of the E2 zones, adjacent E3 zones and parks and reserves.

Passive uses have been located to avoid impact to existing native vegetation communities wherever possible, and where potential threatened plant habitat may be impacted detailed, seasonal field survey will be required prior to works being undertaken. As discussed above, it is proposed that open space areas will be owned and managed by local council.

Summary

The design of the Concept Plan retains the core biodiversity areas within the site and incorporates both east-west and north-south habitat connectivity. In conjunction with the concept plan, the additional measures proposed through the zoning, ESL provisions, public ownership of environmental and open space zonings and requirements of the Statement of Commitments will ensure that significant impacts are avoided and the ecological values of the site are improved or maintained into the future.

In this context, the loss of a limited amount of poorer quality vegetation, much of which is isolated paddock trees, is considered acceptable and does not warrant amelioration or offset measures.

Impact Assessment

The impact assessment contained within the Flora and Fauna Assessment includes quantification of impacts on threatened species and their habitat through calculations of vegetation disturbance/loss based on the proposed zoning for the site. The assessment is summarised as follows:

Calculation of vegetation loss

96.4% of Good Condition vegetation will be retained across all CSA classes reflecting the emphasis of this project on protecting areas of high habitat values.

Overall, approximately 71.39% (88.04 ha) of all native vegetation will be retained on site as part of the proposed rezoning. At least 87% of the good condition vegetation within each community type is to be retained.

The highest losses will occur from the Lowland Woollybutt-Melaleuca Forest and Coastal Grassy Red Gum Forest communities (sub-communities of the EEC Illawarra lowlands grassy woodland in Sydney Basin), will experience a total loss of 7.52 (43.77%) and 22.65 (43.93%) hectares respectively. The vast majority of the loss of each community type is restricted to paddock trees that do not possess a native understorey. The highest value paddock trees will be assessed and integrated into urban design.

The remainder of the communities will experience minimal overall loss as part of the proposed rezoning. Lowland Dry-Subtropical Rainforest will see a loss of approximately 0.14ha (3.73%) of poor condition vegetation and Riparian River Oak Forest will see a loss of approximately 3.36 ha (12.99% of which only 0.88ha is currently in good condition. Moist Box-Red Gum Foothills Forest will experience a loss of only 0.73ha (6.87%) with the vast majority of the community being retained in conservation reserves (93.13%).

It is noted that the assessment of vegetation loss assumes that all vegetation within areas of the site that are proposed for land re-shaping as part of the Flood Mitigation Plan is removed. However, it is possible that during the detailed design stages of the development some, or all of this vegetation may be able to be appropriately retained. This will depend upon the precise final boundaries of earthworks, and finished landform. Ecological has therefore assumed a 'worst case' scenario in its assessment.

Threatened species assessments

The Flora and Fauna Assessment prepared by Ecological uses the *Draft Guidelines for Threatened Species Assessment* (DEC & DPI 2005) to evaluate state significant ecological impacts in accordance with the DoP Director-Generals requirements.

For the threatened fauna species assessed as being likely or having the potential to occur on or use habitat within the site, it was found that the loss of habitat present in and around the project site, will be minimal. Along with several areas of preferred habitat located in the surrounding areas, the impact is considered likely to be low or negligible and acceptable.

For the threatened flora species assessed as having the potential to occur on site it was found that for most species the impact on habitat is considered to be low or negligible and acceptable. One species is considered to require additional detailed surveys in an appropriate season to determine if the species is present, prior to development due to their cryptic nature combined with proposed clearing of their habitat on site.

No matters of National Environmental Significance (NES) have been identified as known on site; however NES matters which have been assessed as potential or likely to occur on site are identified. These matters have been addressed in accordance with the DEWH impact assessment requirements and it is considered that all potential impacts are unlikely to be significant.

Recommendations

Ecological has recommended the following:

- Vegetation management plans to be prepared for all works on land that has been identified at Environmentally Significant Land (refer to Concept Plan Figure 47) and within the Riparian Corridor Network (refer to Concept Plan Figure 45) generally in accordance with the latest DECCW guidelines.
- Detailed seasonal survey for threatened flora be undertaken prior to any works commencing within areas that have been identified as potential habitat in accordance with Table 11 of the Flora and Fauna Assessment.

- Remnant habitat trees are to be individually assessed prior to detailed design in the area identified in Figure 7 of the Flora and Fauna Assessment. High value trees are to be retained and incorporated into urban design.

These recommendations have been incorporated into the Statement of Commitments at Section 8.

7.6 Flooding

Parts of the site are flood prone (refer to Section 3).

Definition of the existing extent of flooding has been determined from independent detailed modelling undertaken by Rienco (2009).

Assessment of existing site flood conditions and determination of an appropriate floodplain management strategy for the Project has formed a fundamental component of the site constraints and opportunities analysis and the determination of the urban capable footprint of the site.

The Concept Plan proposal includes a Floodplain Mitigation Strategy and Flood Mitigation Plan recommended by Cardno to mitigate and manage potential flood impacts (refer to Section 4). The Flood Mitigation Plan comprises:

- Optimisation of floodplain hydraulics through reshaping areas of the floodplain;
- Construction of bridges throughout the development;
- Measures for dealing with revegetation of riparian corridors.

The Concept Plan Flood Mitigation Plan accords with the recommendations contained within the Floodplain Risk Management Study prepared by Cardno (refer to **Appendix R)**.

The proposed R1 General Residential / B4 Mixed Use Zone boundaries have been determined such that the urban developable areas of the site are above the 1:100 yr flood levels following implementation of the Flood Mitigation Plan.

As a large landholding in single control, the existing flood conditions on the site are able to be managed in an holistic and integrated manner. There are opportunities to undertake strategic re-shaping of the flood plain in a manner that is not readily achieved in release areas involving fragmented land ownership.

To determine the optimum flood mitigation measures for the Project, including re-shaping of the floodplain, a number of design iterations were undertaken and modelled by Cardno.

The final design iteration and subsequent identification of appropriate flood mitigation measures creates an optimal balance between the extent of works required and the resulting reduction in flood related impacts.

The final measures proposed will mitigate the potential impacts of flooding across the site, ensure no significant off site impacts arise, and also, wherever possible, improve flood affectation external to the site.

The proposed Floodplain Mitigation Strategy and Flood Mitigation Plan has been integrated with the recommendations of the Flora and Fauna Assessment (refer to Section 7.5 above) and with the development of both the proposed Concept Plan Riparian Corridor Network (refer to Section 7.7) and Concept Plan Landscape and Open Space Master Plan (refer to Section 4). The Flood Mitigation Plan identifies areas within the riparian corridor network where vegetation roughness may be increased through the selective planting of select species within CRZs where it can be demonstrated that no adverse impact on flood levels will result.

The Concept Plan Water Cycle Management Strategy (refer to Section 4) will ensure that peak flows entering the site riparian system will not increase as a result of the development, and this has been included in the flood impact modelling.

Impact assessment

The Floodplain Risk Management Study details the modelling undertaken to test the performance of the identified flood mitigation measures. The modelling work compares the pre-development scenario and the post development scenario with the works identified as being required to offset the flood impacts of the proposed development.

The modelling and adopted Floodplain Risk Management principles and outcomes are strictly in accordance with relevant local and State government guidelines and policies.

Flood modelling and impact assessment has incorporated an appraisal of climate change flood risk on the project in accordance with DECCW's published Floodplain Risk Management Guideline Practical Consideration of Climate Change dated 25/10/07 which takes into account climate change predications by the UN Intergovernmental Panel on Climate Change and the CSIRO, and proposes a methodology for assessment climate change impacts through modelling sensitivity analysis.

The post development scenario flood levels for the 1% AEP flood event without and out climate change are shown at **Figures 67** and **68**.

The results of modelling under the adopted climate change parameters show that for the 1% AEP flood event, the average increase in flood levels across the existing site are approximately 300 mm. For the PMF event, the average increase in flood levels across the existing site is approximately 200 mm.

In the case of the proposed development, the effects of climate change are relatively minor. None of the lots are affected by ocean inundation under even the most extreme climate change scenario. As the proposed lots can be created at any level deemed appropriate by the assessment, the potential impacts of climate change can be readily taken into account.

The post development flood impact for the 1% AEP flood event is shown at **Figure 69**. This shows the impact arising as a consequence of the proposed development only – it does not show potential climate change impacts that may arise elsewhere on the floodplain irrespective of the proposed development.

The Floodplain Risk Management Study concludes that with implementation of the proposed Flood Mitigation Plan:

- The modelling undertaken to support the proposed development shows that the impacts on adjoining property are acceptable in all events up to and including the 1% AEP flood event.
- During the 1% AEP event, there are no increases of flood levels off site due to the proposed works. Increases within the Calderwood site boundary occur only within existing riparian land. There is some affectation of private property upstream of the site, however this is caused by increased vegetation within the riparian corridors rather than the development itself.
- The highly flood prone section of the Illawarra Highway just west of Yellow Rock Creek will have a lower flood level, and decreased duration of overtopping in the 1% AEP flood event as a result of the development. Flood levels, and duration of overtopping, are key factors in road safety and the subsequent increase in road safety on the Illawarra Highway is a key benefit of the flood mitigation strategy.
- There is a significant proportion of the development site, and the surrounding areas, that will experience a decrease in flood levels due to the proposed development. Moreover, the decreases in flood levels occur outside of riparian land and within existing development, which is highly flood prone currently.
- In the PFM event, increases in flood levels can be seen immediately upstream of the proposed Macquarie Rivulet bridge. This affected area is predominantly rural land. It is not unreasonable to expect that for such a rare flood event, any works on the floodplain would have an impact.
- The proposed Macquarie Rivulet Bridge is economically feasible, and offers a real social benefit by providing guaranteed access in the 1% AEP flood event to the site and adjoining lands. On balance, there is no net impact on flooding in the PMF when considering triple bottom line outcomes.
- The cumulative impacts of continued filling on the floodplain are negligible.
- The effects of climate change are relatively minor. None of the lots are affected by ocean inundation under even the most extreme climate-change scenario. The impacts of climate change can be readily mitigated for the proposed development.
- A 1% AEP flood level (incorporating the climate change scenario) plus 500 mm free board has been adopted as the Flood Planning Levels (FPL) for the project. The FPL have been determined in a manner that is wholly consistent with the principles of the FPDM and the Section 117 Direction.
- The majority of the site will be located on land above the PMF and as such will not be subject to flood related planning controls or located on flood prone land. Where development cannot be located on flood free land, safe evacuation routes will be available in the 1% AEP flood event.
- No occupants will be isolated by any flood event (including the PMF). All new bridge decks will be located above the 1% AEP flood level and will allow uninterrupted road traffic throughout the development (and beyond) during events up to and including the 1% AEP flood. All major spine roads within the development are set at or above the PMF level.
- The requirements of the SES for evacuation are wholly provided for by the Concept Plan proposal. Occupants of the developed site can safely wait out the short duration of flood in site in PMF free dwellings, or they can self evacuate at any time to nearby Calderwood Town Centre via a largely PMF free road network.

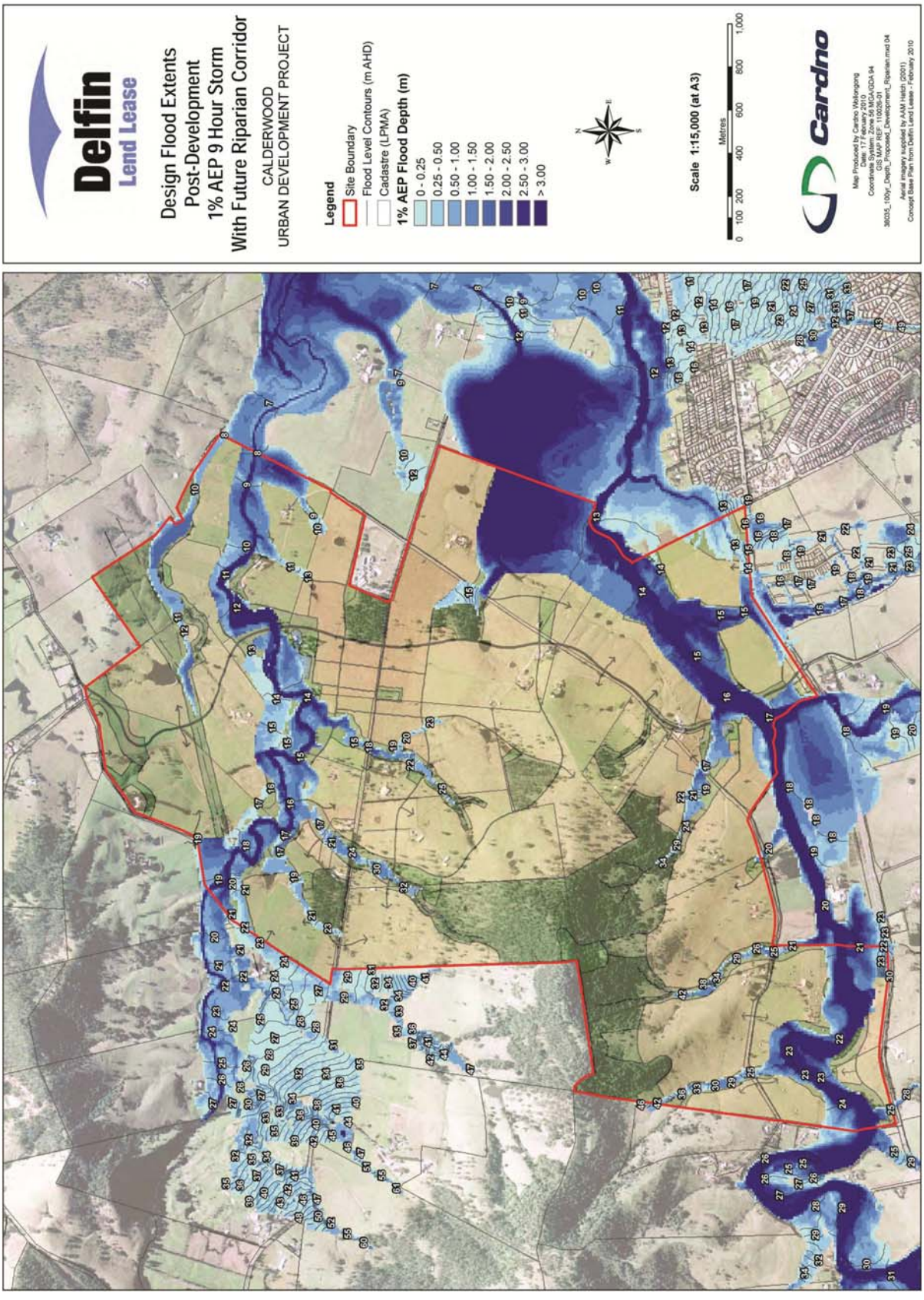

Figure 67 – Post development 1% AEP with proposed Riparian Corridor Network (Source: Floodplain Risk Management Study, Cardno, 2010)

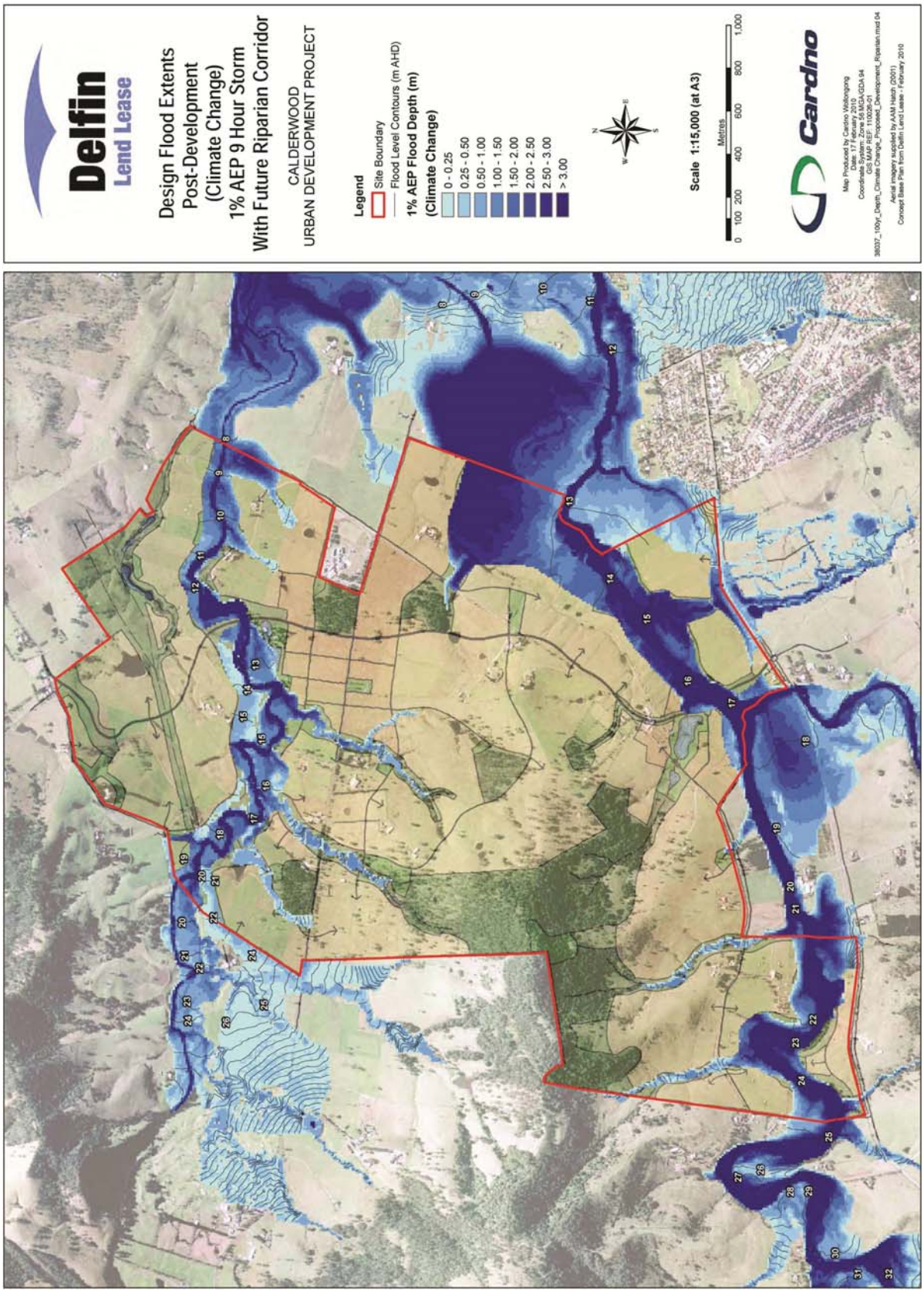

Figure 68 – Post development 1% AEP with proposed Riparian Corridor Network and Climate Change (Source: Floodplain Risk Management Study, Cardno, 2010)

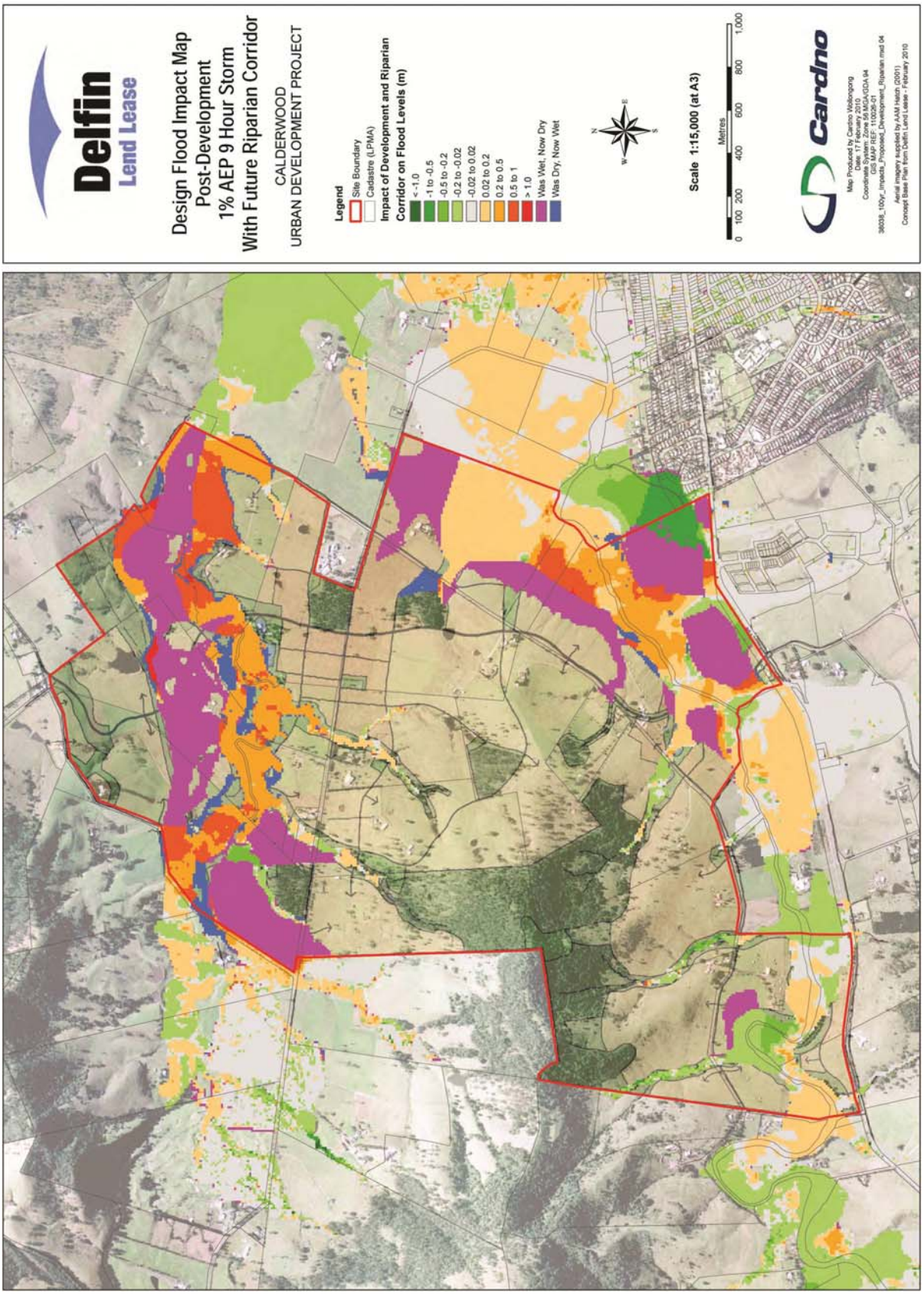

Figure 69 – Post development design flood impact (Source: Floodplain Risk Management Study, Cardno, 2010)

7.7 Riparian Corridor Network

The proposed Concept Plan Riparian Corridor Network is identified at Section 4.

The proposed Riparian Corridor Network has been determined on the basis of detailed analysis and classification of the existing site water courses. The Concept Plan approaches riparian corridors as an holistic and interrelated planning issue that links closely with environmental protection, open space and recreational uses, bushfire protection, water quality treatment and general amenity.

The proposed Riparian Corridor Network is fully integrated with the proposed Concept Plan:

- Landscape and Open Space Master Plan.
- Flood Mitigation Plan.
- Water Cycle Management Plan.

The proposed Riparian Corridor Network also responds specifically to the Flora and Fauna Assessment (**Appendix Q**), the Geomorphology Assessment (**Appendix M**) and the Groundwater Assessment (**Appendix S**).

Consistency with RCMS

During consultation with DECCW a preference was identified for the development to maintain consistency with the Riparian Corridor Management Study (RCMS) prepared by the then Department of Infrastructure, Planning and Natural Resources (DIPNR 2004). DECCW requires any deviations to the RCMS to be identified and justified.

A Riparian Consistency Report has been prepared by Eco Logical Australia and is included at **Appendix P**.

The Riparian Consistency Report considers the site in the context of the existing RCMS and the published riparian corridor guidelines under the *Water Management Act, 2000*.

Since publication of the RCMS in 2004 multiple changes in statutory and strategic planning have occurred that impact on approaches to riparian corridors. The key changes include:

- Gazettal of the Water Management Act, 2000 and repeal of the Rivers and Foreshores Improvement Act, 1948;
- Publication of Guidelines for controlled activities - Riparian corridors (DWE, 2008);
- Exclusion of riparian corridors from Section 94 contributions;
- Potential re-inclusion of riparian corridors into development contributions (DoP Policy Statement December 2009); and
- Gazettal of Part 3A of the Environmental Planning and Assessment Act, 1979 which for state significant development removes the triggers for Integrated Development and provides state agencies outside of the Department of Planning with a consultation role rather than an approval role.

As detailed in the Site Analysis at Section 3, existing watercourses have been classified according to the Strahler categorisation system consistent with the guidelines published under the WM Act. These provide an objective methodology for the categorisation of watercourses.

All watercourses on the site have been ground thruthed, including assessment as part of the Geomorphology Report included at **Appendix M**.

As requested by DECCW, this assessment has been compared to the output of the RCMS (DIPNR, 2004).

Whilst lacking the objective approach of the Strahler method, the RCMS methodology incorporates the strategic objectives of environmental corridors and linkages from the ocean to the escarpment and importance of categorising riparian corridors based on their relative level of importance.

As the limit of the RCMS boundary is Marshall Mount Creek, the DECCW unpublished internal mapping for Macquarie Rivulet was used as a surrogate for the RCMS within the Macquarie Rivulet Catchment. It is worthwhile noting that there is a clear divergence in approach between the published RCMS data and the unpublished internal DECCW data particularly in relation to watercourses flowing from Johnston's Spur. The unpublished data identifies all watercourses from Johnston's Spur as category 3, whereas the published data identifies a variety of categories. This highlights a main limitation of the RCMS methodology.

Conversely, the WM Act guidelines provide a more prescriptive approach to riparian categorisation with the option to include a merit based assessment.

As detailed in the Riparian Consistency Report:

- 18 mapped stream segments (segments 1, 7, 8, 15, 18, 23, 26, 24, 32, 33, 34, 35, 40, 42, 44, 45, 46 and 48) are proposed to be consistent with the RCMS;
- 10 mapped stream segments (2, 17, 27, 28, 29, 36, 37, 43, 47, 49) are proposed to be a higher category than the RCMS;
- 6 first order drainage lines 3, 5, 6, 9 and 10 and second order stream 4 shown on **Figure 19** are proposed to have a lower categorisation than the RCMS;
- 13 small ephemeral first order drainage lines 11-14, 16, 19, 20, 22, 25, 30, 31, 38 and 39 shown on **Figure 19** are proposed to be removed as part of the proposal.

When compared to the output of the RCMS, the proposed approach for the site identifies a greater area of land for inclusion in riparian and environmental corridors than that provided by the RCMS methodology.

The Concept Plan includes approximately 113 hectares of land within the Core Riparian Zones of the proposed Riparian Corridor Network. By comparison, categorisation of streams under the RCMS methodology would result in approximately 96.5 hectares of riparian land.

In addition to the approximately 113 hectares of Core Riparian Zone land, there are extensive areas of public open space that are proposed to immediately adjoin the CRZs. These areas of public open space substantially increase the environmental outcomes beyond the area afforded through the riparian strategy alone.

This has been achieved through application of the following strategic goals which integrate with the strategic conservation goals for the site:

- Retention of all riparian corridors that have a requisite hydrological function. This is largely a reflection of the size of the catchment and the associated volume of water that will move through these systems (see Geomorphology Assessment, **Appendix M**)
- Assigning a minimum CRZ of 92 metres to Marshall Mount Creek and Macquarie Rivulet.

- Consistent with the recognition of a series of lesser habitat areas, assigning a minimum CRZ of 48 metres total width to streams extending from the main valley floor environmental corridors to Johnston's Spur.
- Assigning a minimum CRZ of 24 metres total width to first order streams
- Providing additional terrestrial habitat values in E2, E3 and RE1 zones, often immediately adjacent to riparian corridors.
- Incorporation of the Vegetated Buffer into the above E2, E3 and RE1 zones.

The strategy for the site is considered to be consistent with the RCMS methodology, this entails:

- Provision of regional linkages from the Ocean to the Escarpment via Marshall Mount Creek and Macquarie Rivulet
- Identification of a series of secondary corridors from the regional linkages to Johnston's Spur reflecting their relative importance as riparian corridors
- Provision of a sufficient CRZ for remaining riparian corridors to provide for bed and bank stability

In terms of outcomes for the site, the major differences relate to the approach to Johnston's Spur. The RCMS identifies the majority of drainage lines as category 3 with a single category 1. Reflecting the Strahler approach, and the relative importance of these drainage lines across the catchment, it is proposed that the bulk of these primarily second order streams are allocated a 48 metre CRZ. In addition to the CRZ, there is an extensive area of open space proposed that substantially increases the environmental outcomes in the area beyond that afforded through the riparian strategy alone.

Revegetation within riparian corridors

The Flood Mitigation Plan has been developed based on modelling that assumes potential revegetation may occur within the existing riparian corridors within nominated locations as shown on **Figure 53**. Selective planting of carefully selected vegetation species may occur within the locations identified on **Figure 53** subject to demonstration that no adverse impact on flood levels results.

Conclusion

The Riparian Consistency Report prepared by Ecological identifies that majority of differences between the RCMS and Strahler based methodologies, when applied to the Project, require increases in riparian corridor widths.

The majority of the inconsistencies between the two methodologies occur on Johnston's Spur and significant inconsistencies between the published RCMS data for the northern side of Johnston's Spur and the unpublished DECCW data for the southern side of the Spur are apparent.

This highlights how the RCMS methodology can be applied inconsistently and the benefits of using the more objective Strahler based methodology as a starting point for riparian corridor assessment.

Notwithstanding, Ecological has concluded that the strategic approach to riparian corridor management adopted for the Calderwood Urban Development Project is consistent with the RCMS.

Principally, this involves the provision of two main riparian corridors along Marshall Mount Creek and Macquarie Rivulet, providing for connectivity between the ocean and the escarpment.

These primary corridors are supported by a series of secondary corridors extending from the valley floor to Johnston's Spur, recognising the relative importance of these corridors within the catchment.

A small number of drainage lines are proposed to be removed, whilst the remainder will have narrow corridors (24 metres) to provide for bed and bank protection.

The Concept Plan and proposed Amendment to SEPP Major Development places significant areas of E2 Environmental Conservation, E3 Environmental Management and RE1 Public Recreation land immediately adjacent to the identified riparian corridors.

This land is provided in addition to the minimum CRZ identified for the Order 1, 2 and 3 water courses. It will contribute to the achievement of riparian outcomes as part of an integrated urban environment.

Ecological concludes that the eventual outcome for the site is likely to see a substantial improvement in geomorphology, biodiversity and water quality.

7.8 Drainage and Stormwater Management

A Water Cycle Management Study to support the Concept Plan and SSS Study has been prepared by Cardno and is included at **Appendix N**.

The Water Cycle Management Study investigates a range of WSUD features that could be suitably incorporated into the project. Existing water quality is investigated and compared to water quality expected once the development is complete. A future climate change scenario is also considered.

The Water Cycle Management Plan for the Concept Plan proposal is detailed at Section 4 (**Figure 51**). The Concept Plan Water Cycle Management Plan incorporates the WSUD features and proposed water quality treatment measures recommended in the Water Cycle Management Study.

The proposed Water Cycle Management Plan has been integrated with the Concept Plan:

- Flood Mitigation Plan;
- Riparian Corridor Network Plan; and
- Landscape and Open Space Master Plan.

The Concept Plan Water Cycle Management Plan adopts:

- A principal objective to ensure that post development peak stormwater runoff flows do not exceed pre-development peak flows.
- A principal water quality objective to maintain water quality within receiving water bodies at pre-development levels.

The Water Cycle Management Study concludes the following:

- The WSUD components proposed by the Concept Plan Water Cycle Management Plan can ensure that post development peak stormwater flows do not exceed pre-development peak flows.
- Preliminary modelling indicates that the proposed wetland sizing is appropriate to achieve desired water quality targets and treatment train effectiveness during current climate and future climate change scenarios.

- Modelled concentrations of stormwater discharge from the site show that in all the Macquarie Rivulet and Marshall Mount Creek catchments the mean concentrations are below the ANZECC trigger values for lowland rivers.
- Water quality treatment devices have been sized to ensure that post development mean annual loads are not in excess of pre development levels.
- On site detention may be provided as a distributed facility within the site or in a more centralised facility at the point of discharge into the mainstream network.
- Potential impacts arising from the proposed development on long term ground water base flows are likely to be negligible. The cumulative contribution to base flow provided by existing groundwater systems upstream of the site are far greater than those occurring directly opposite the site. These upper systems will remain unchanged by the proposed development and will therefore continue to support base flows.
- The potential risk of pollution of groundwater from untreated stormwater will be appropriately managed through provision of adequate surface water controls.
- The proposed development will improve stormwater quality for water originating from the site. The pollutant load reduction also meets the normally required based load reduction of 90%, 45%, 45% TSS, TP and TN respectively from urban developed areas.
- The proposed dual use ponds serving detention purposes as well as enhanced water quality functionality are well suited to the Concept Plan layout and the morphology of the site and Calderwood Valley.

Recommendations

The Water Cycle Management Study makes the following recommendations:

- A combination of proprietary litter/sediment traps, and water quality control ponds / artificial wetlands be provided for stormwater quality management, located in ways sympathetic to the other environmental constraints of the site.
- NSW Government BASIX criteria be adopted for water supply management.
- At the detailed design stages of the development, a soil and water management plan be prepared to outline the methods through which stormwater runoff is controlled throughout the construction phase. This may include the use of the proposed wetlands as temporary sediment basins (where possible) and the provision of rock check dams and filter fabric fencing (above and below the works are respectively).
- During detailed design the longevity of proposed water bodies be assessed with detailed water balance modelling. The potential for algal growth is also to be assessed during detailed design and the likelihood for algal growth reduced through incorporation of suitable hydraulic residence times (ie increased water body turnover) and incorporation of suitable subsurface macrobytes.

The Water Cycle Management Strategy that forms part of the Concept Plan proposal incorporates the strategic elements of the above recommendations.

Under the proposed Amendment to the Major Development SEPP, SEPP BASIX will apply to future development on the site. All future development will therefore be required to meet BASIX requirements.

Other specific recommendations have been incorporated into the Statement of Commitments at Section 8.

7.9 European Heritage

An Heritage Impact Statement to support the Concept Plan and SSS Study has been prepared by Paul Davies Pty Ltd and is included at **Appendix U**.

The Heritage Impact Statement has been prepared in accordance with the Australia ICOMOS Burra Charter, the guidelines of the NSW Heritage Manual and with 2001 Assessing Heritage Significance and the 2002 version of the guidelines published by the Heritage Branch of the NSW Department of Planning. It assesses the impacts of the application on the heritage significance of the area, and any significant components of the site.

The existing European heritage items within the site and in the vicinity of the proposal are identified and described at Section 3 of this EAR.

A detailed assessment of the heritage significance of existing items (both on site and in the vicinity of the site) is provided at Section 8 of the Heritage Impact Statement and summarised at Section 3 of this EAR.

Impact assessment

Specific elements of the heritage impact assessment are summarised below.

Built heritage

- The proposed Concept Plan does not, in itself, involve demolition or removal of the identified heritage items, built and landscape items within Marshall Mount House and the Cemetery. Any archaeological remains within the identified curtilage of each site will not be impacted by the concept plan.
- Due to the immense transformation which will be bought to the area, it is important to emphasise that Mount House and Barn as well as the Methodist Cemetery should be retained and protected. This is best achieved when the sites are owned, occupied, used and the owners have a stake in the future and well-being of the sites ensuring they are secured, repaired and maintained.

Landscape heritage

- The current assessments of significance for the sites do not identify cultural landscape plantings. At Marshall Mount, documentary research for this report shows that a few trees have featured for some time including the Moreton Bay Fig and the Oak. Although there is no evidence who planted the Moreton Bay Fig and if the tree was planted deliberately, it still contributes to the item's setting and character. The Oak may be a survivor from the 1840s when the Thomas family planted three oak trees.
- At the Methodist Cemetery the pairing of the Bunya pines indicates that they are a deliberate planning and their height in the flat open paddocks has meant that they have been a local landmark for some time. The Concept Plan does not affect the trees. However, development and changes to the local environment precipitated by development is likely to impact on the health of the trees affecting the ground conditions and drainage.

Subdivision

- The proposed Concept Plan will involve future subdivision and development within the Lot 2 DP 2534 which contains Marshall Mount House and Barn. The extent of the current lot does not demonstrate heritage significance in itself as it is only one small portion of the original Henry Osborne grant which was subdivided into smaller farms in the 1890s. Accordingly, it is not important to retain the extent of the existing lot to demonstrate the site's significance.
- The proposed concept plan will not involve subdivision of the Methodist Cemetery.

Marshall Mount House and Barn

- Marshall Mount House is an important and very rare example of Colonial architecture in a rural setting. The item also has significance as a group for its landscape value. Historical research and documentation undertaken for this report indicates that current landscape around Marshall Mount House reflects over 160 years of European pastoral land management in the area and the current rural landscape makes the house's historic function as a farm residence legible.
- Marshall Mount House and Barn feature significant and evocative views. The house is impressively sited on the prominence, 'house on the hill', below Marshall Mount, viewable from most of the valley below. There are two views out from the house. The view to the south is from the front of the 1830s single storey house and the more grand view to the east is from the front of the 1840s section.
- The Concept Plan will precipitate suburban development and infrastructure south and east of the house which will substantially alter the current setting and the views to and from the house. This assessment recognises the practical issues that bear on the site. It is acknowledged that the Calderwood Valley has long been recognised by Government as a location for future urban development. It is not recommended that the open rural setting be fixed to demonstrate the item's significance. The setting only tells part of the site's story as the house is particularly intact and its presentation, layout, fixtures and fittings still clearly demonstrate the history and the quality of life of the former residents. In addition, the historic functional connection between the house and its rural context and the pastoral industry is vanishing.
- Marshall Mount House does not have a clear wider curtilage identified by an original grant boundary, surviving farm workings and outbuildings, particularly gatehouses, which clearly define an historic boundary. The most legible historic curtilage is a smaller area which includes the house, the barn and the home garden on top of the knoll. Nevertheless, some material evidence of the existing open rural setting should be conveyed to the future. Therefore, a balance needs to be struck between closely integrating the site into the future development and pushing development away from the site separating the house and barn from its new context.
- Under the concept plan two hectares are proposed to be retained for the house. This will encompass the house and garden, scribing a line outside the existing trees and bushes, including some of the grassed slope. At this concept stage, the retention of this curtilage will be sufficient to protect the item itself and its significance.

Methodist Cemetery

- The character of the cemetery is open, surrounded by open pasture on flat ground with views to the nearby hills and the escarpment in the distance. Calderwood Rd provides the termination of the cemetery's formal axis. This seems to be the character of the cemetery since it was established in 1880.
- Under the concept plan a Town Centre is proposed around the cemetery. This will fundamentally alter the current setting from open pastoral environment to a built-up urban setting. As with Marshall Mount House, this assessment recognises the practical issues that bear on the site due to the long held plans for urban development in the valley. The assessment does not propose that the open rural setting should be retained to demonstrate the item's significance as the statement of significance for the site focuses on the cemetery as a functioning place supported by its significant contents.
- At a concept level, it is recommended that buildings should stand away the Cemetery to retain, as much as possible, an atmosphere of contemplation and peacefulness appropriate to a memorial place either by placing the cemetery in a park or allowing the cemetery to share the private open space of adjacent properties.
- A sense of the open dome of sky should be maintained. However, it is acknowledged that this feature may not be easy to maintain if the Trustees of the Cemetery decided to increase plantings within the Cemetery. Views or view corridors to the hills and the escarpment should also be established as part of the detailed design to present these visual links into the future.

Heritage items in the vicinity

- The Marshall Mount School, Residence and Progress Hall are adjacent to the north east corner of the development area but outside the affected area. The Concept Plan will not in itself involve demolition or impacts on the fabric or setting of the sites.
- However, a north south road corridor is proposed exiting at the intersection of Marshall Mount Road, Marshall Mount Road North. Increased residents and traffic movements in the development area, precipitated by the concept plan, will most likely fundamentally alter the current settings and, along with the proposed north south road, mostly likely result in a substantial upgrade of Marshall Mount Road, Marshall Mount Road North and the intersection. This activity is likely to have a significant impact on the setting of the existing sites, with the school building vulnerable as it is located directly on the road alignment. The impacts can be managed and mitigated by careful detailed design of the roads and intersection within and outside of the development area.

Non Indigenous archaeology

- Pastoral activity commenced in the area in the mid nineteenth century and has continued until now. However, due to the low intensity of the pastoral use of the area since the 1830s particularly for dairying, it is predicted that substantial state significant archaeological remains are unlikely to exist. Few remains in themselves are likely outside the immediate surrounds of Marshall Mount Homestead and Barn, The Cemetery and Oak Farm, other than evidence of land management. As the area was farmed from the early nineteenth century, surviving evidence would have some local research value as it would contribute to an understanding of the European use of the area. However, any remains are unlikely to be state significant under the relic provisions of the NSW Heritage Act and a case for insitu retention is unlikely.

Recommendations

To respond to the assessment of heritage impact, the Heritage Impact Statement recommends the following with respect to future detailed design and development within the site:

- A two hectare parcel incorporating the Marshall Mount House and Barn and its garden, scribing a line outside the existing trees and bushes, including some of the grassed slope be retained and protect.
- Open space be provided to the east of the house to retain the view from Marshall Mount Road to the house, including the existing Oak Tree.
- The Moreton Bay Fig and the Oak Tree within the garden curtilage of Marshall Mount House and Barn be inspected and assessed by an aborist with a view to ensuring their retention and protection.
- The detailed design of residential development at the southern and eastern interface of Marshall Mount House and Barn take into consideration height and lot size to provide a sense of openness evoking the historic rural context of the House and view sharing.
- Future detailed subdivision design should consider the use of radial streets in the vicinity of Marshall Mount House to create view corridors down the hill side, and deep setbacks to dwellings fronting Marshall Mount Road to open views to and from the east.
- The Marshall Mount Methodist Cemetery should be situated within a park or surrounded by a private open space buffer to retain, as much as possible, an atmosphere of contemplation and peacefulness appropriate to a memorial place. Any new buffer between the cemetery and new development should not cur the cemetery off from the new community that will form around it.
- Future detailed subdivision design adjoining the Methodist Cemetery should consider opportunities to provide visual links from the cemetery towards Johnston's Spur and the escarpment.
- Should any European historical archaeology be discovered during any site excavation works, the required steps under the relics provisions of the NSW Heritage Act and contacts should be followed.

As recommended, the Concept Plan retains Marshall Mount House and Barn. Open space is proposed to be provided to the east of the item. Mount Methodist Cemetery is retained within an open space setting to provide a buffer between the cemetery and new development in a manner that retains integration.

The SSS Listing proposes the identification of Marshall Mount House and Barn and the Marshall Mount Methodist Cemetery as heritage items. Provisions are proposed to be incorporated into the SEPP amendment to ensure the ongoing protection of these items.

The requirement for further detailed assessment of heritage impact under the SEPP will ensure that the future detailed design of development around the sites appropriately refines the interface between the heritage items and the adjacent development having regard to the above.

The Heritage Impact Statement recommends the following to mitigate the potential impacts of the development on heritage items in the vicinity of the site, namely Marshall Mount School, Residence and Progress Hall:

- The detailed design of any road works/ upgrading works required to be undertaken to Marshall Mount Road, Marshall Mount Road North and / or the new intersection of Marshall Mount Road and Marshall Mount Road North is to ensure an appropriate curtilage and setting is provided between Marshall Mount School, Residence and Progress Hall and the roadway.

The listing of these items under Wollongong LEP requires any adjacent development to have regard to heritage impact. This will ensure that the above is appropriately considered at the time of any future detailed application.

7.10 Aboriginal Cultural Heritage

An Aboriginal Archaeological and Cultural Heritage Assessment to support the Concept Plan and SSS Study prepared by Austral Archaeology Pty Ltd is included at **Appendix V**.

Existing Aboriginal archaeological sites and areas of cultural significance that have been identified within the site.

Archaeological significance assessment

The Aboriginal Archaeological and Cultural Heritage Assessment assesses the significance of the sites that have been identified as follows:

Research Potential

The research and educational potential of the sites and areas of potential archaeological deposit identified in the field assessment is based on the amount of new information which might be obtained from more detailed investigation of the site; the representativeness or ability of the site to demonstrate a type of site or deposit; and, the rarity or distinctiveness of the site in relation to other sites.

Due to the disturbed context in which they were found and the lack of potential for associated subsurface material, the isolated finds are considered to offer low potential for new information, representativeness and rarity and therefore have low research potential. CP-IF-11, a large core of banded red silcrete, is rated moderate representativeness as a good example of a core due to the seven distinct flake scars and the large size of the core. However, it was found in the severely disturbed context of a dam exposure and so it still offers low potential for new information; the large number of cores found in CP-S-14/CP-PAD-05 means that CP-IF-11 is also of low rarity for the site. As a result the overall research potential of CP-IF-11 is considered to be low.

The recorded scatters represent different levels of research potential. The majority were considered to be of low potential due to the disturbed context, the lower potential of the area in which they were located based on past land use and condition as observed during the Field Assessment, and the number and variety of associated artefact type and raw material. CP-S-13 was ascribed low to moderate potential for subsurface archaeological deposit based on the landform where the dam exposure is located. However, the overall research potential is still considered to be low in comparison with other sites.

There are 4 open artefact scatters considered to have high potential for intact subsurface deposit (CP-S-14/CP-PAD-05), moderate to high potential (CP-S-06/CP-PAD-02, CP-S-09/CP-PAD-03), moderate potential (CP-S-11/CP-PAD-04).

CP-S-14/CP-PAD-05 is considered to offer high potential for providing additional information for past Aboriginal activity in the Marshall Mount Creek catchment area. Based on the surface assemblage it is considered possible that the area could represent a primary knapping location, due to the relatively high number of cores present. An open artefact scatter of this size, and with potential to be a primary knapping location, may be both representative and rare within the site and also in the immediate vicinity. The site has been given a representativeness rating of moderate to high, as it is not known whether the site definitely represents a primary knapping location – test excavation will be necessary to determine this. The site has been given a rarity rating of high due to its rarity in comparison to other sites found on the site and also in the immediate vicinity.

CP-S-06/CP-PAD-02 and CP-S-09/CP-PAD-03 are considered to offer moderate to high potential for intact archaeological deposit, and corresponding potential to offer new information. As they are located on different landform units to CP-S-14/CP-PAD-05, they have potential to offer additional information on past Aboriginal activities and the effect of past land use and taphonomic processes on the archaeological record in areas further away from major streams.

Based on the surface material, CP-S-06/CP-PAD-02 is considered to have potential to represent a secondary flake reduction location, however further testing would be required to confirm this; therefore it has been ascribed a representativeness rating of moderate. CP-S-09/CP-PAD-03 has also been ranked as being of moderate representativeness based on its landform location. A rarity rating of moderate to high has been ascribed to both scatters and their associated PADs based on comparison to other sites.

Educational Potential

The educational potential of a study area is best considered in light of its value to the general public, the Aboriginal stakeholders, and other researchers: those people whom the archaeologist has a duty to inform. Therefore the educational is directly linked to its research potential: what can be learnt from further archaeological investigation, and whom will that knowledge benefit?

The educational value of a site to the general public is the most important criterion. The educational potential must be linked to something that can add to the public's knowledge of the Aboriginal past of a particular area.

The educational value of the study area is low to moderate. The variety of surface sites and their distribution across different landforms has potential to provide an overview of past Aboriginal land use across the site.

However, the sites of highest archaeological potential are those large open artefact scatters with associated PAD. The concept of 'archaeological potential' is neither tangible nor accessible to a public audience and would be unlikely to excite considerable interest.

Exceptions would occur should direct evidence of contact era archaeology (i.e. glass or ceramic artefacts modified by past Aboriginal people and/or relatively intact artefact deposits in areas directly associated with historic Aboriginal camps) be uncovered during subsequent archaeological excavations. This is likely to increase the public's interest in the archaeology of the site. It is emphasised that as yet no such evidence has been noted.

The perspective of Aboriginal stakeholders is likely to differ from that of the archaeologist and that of the general public: the archaeological record is a component of Aboriginal oral history and prehistory. As a non-Aboriginal person, the consultant is unable to offer such a valuation as has been provided in consideration of the general public or other researchers.

What can be offered in terms of considering educational value and Aboriginal stakeholders is that which has been offered before in this consideration of overall potential. That is, that the information from the current study area is unlikely to shed new light on Aboriginal people's use of landscape in times past, and may also be assessed as low. However it is appreciated that perspectives do differ and unlike the general public or other researchers, Aboriginal stakeholders may see the compilation of further archaeological data of the same type as a confirmation of their story, which may be of high educational value to them.

Lastly, the open artefact scatters and associated PADs which have been identified as being of moderate to high and high research potential were designated as such based on their potential to offer additional archaeological information pertaining to the site and the surrounding Coastal Plain physiographic region. Therefore the educational value of the current study area for other researchers is considered to be moderate.

Taking these three perspectives into consideration, the overall educational value of the current study area is considered to be low to moderate. The educational value would be increased should excavation be necessary and identifiably Contact-era artefacts be uncovered.

Aesthetic Significance

Professional archaeologists view aesthetic significance as an attribute that can only be culturally determined by Aboriginal stakeholders. The concept of aesthetic significance deals with the response that people have to a particular place. This criterion differs from the other two in that it is not so readily quantifiable but takes into account a subjective or emotive response to a place as opposed to providing comment upon a tangible item (such as an Aboriginal artefact) or an issue of research relevance (such as an area of PAD).

The criteria that deal with research and educational significance are almost wholly concerned with the archaeological or 'scientific' significance. These are values that are determined by archaeologists. However this report must also take into account the Aboriginal cultural heritage value of a site or study area. It is this criterion that is utilised to such an end. Only members of the local Aboriginal community can advise of the cultural significance of an area or place.

Cultural heritage assessment

To gain a determination of cultural significance, consultation has occurred with the identified Aboriginal stakeholders. This is in keeping with the DECCW Aboriginal community consultation guidelines and ethical consultative practice. Each stakeholder organisation was asked to consider the study area from the perspective of the Aboriginal cultural heritage and offer any insights and/or knowledge they may have specific to the study area. The methodology aims to characterise the Aboriginal cultural values of the study area in a culturally appropriate way.

Both of the Aboriginal stakeholder organisations consulted for the Aboriginal archaeological and cultural heritage assessment of the Calderwood Project study area – namely ILALC and WNDAC – expressed a contemporary link with the local area and the archaeological record contained within.

Both the ILALC and WNDAC have expressed a cultural interest in the Calderwood Project area. ILALC has indicated that the area is significant. WNDAC has indicated that several members of WNDAC "have a strong cultural connection to the Illawarra/Shellharbour area and may have cultural information that is relevant to the Calderwood project".

Cultural information provided by ILALC Site Officers is included at Appendix A.3 of the Aboriginal Archaeological Assessment.

In addition to the 34 new Aboriginal archaeological sites, natural resources including paperbark, wild yams/native potatoes, eels and freshwater mussels were observed during the field assessment.

In general terms, the cultural information provided by ILALC Site Officers shows that a cultural connection remains between these representatives of the Aboriginal community and the Calderwood Project area. Cultural information has been passed on to the Site Officers from older relatives and other members of the community. This information can relate to everyday activities that would have taken place in the Calderwood Project area, such as identifying good places to camp or bathe children, and collecting natural resources. This information can also relate to specific historic events, including skirmishes which took place in the vicinity of the Calderwood Project area, between Yallah and Albion Park. In addition, cultural beliefs relating to burial can relate to specific landscape features – although none were located within the Calderwood Project area. Certain animal species with associated traditional roles were also observed during the field assessment. Aboriginal walking tracks which pass near to the Calderwood Project area were also pointed out by Site Officers during survey.

An ILALC Site Officer indicated that Johnston's Spur / Mount Johnston would have been called *Merrigong*, which means "barter": as it was a striking landscape feature, people would have gathered there for trade and other meetings. No archaeological sites were identified in association with cultural areas or features.

Conclusion and recommendations

The Aboriginal Archaeological and Cultural Heritage Assessment includes the following recommendations arising as a result of the Phase 2 Field Assessment and assessment of significance:

- 1. No further archaeological investigation is deemed necessary for sites CP-IF-01, CP-IF-02, CP-S-01, CP-S-02, CP-IF-03, CP-S-03, CP-IF-04, CP-IF-05, CP-S-04, CP-IF-06, CP-IF-07, CP-IF-08, CP-S-05, CP-IF-09, CP-IF-10, CP-IF-11, CP-IF-12, CP-S-07, CP-IF-13, CPS-08, CP-IF-14, CP-IF-15, CP-IF-16, CP-S-10, CP-S-12, CP-S-15, CP-IF-17 and CP-IF-18, or the area of low potential PAD CP-PAD-01.
- 2. Salvage through collection and relocation of surface artefacts is recommended for CP-IF-01, CP-IF-02, CP-S-01, CP-S-02, CP-IF-03, CP-S-03, CP-IF-04, CP-IF-05, CP-S-04, CPIF-06, CP-IF-07, CP-IF-08, CP-S-05, CP-IF-09, CP-IF-10, CP-IF-11, CP-IF-12, CP-S-07, CP-IF-13, CP-S-08, CP-IF-14, CP-IF-15, CP-IF-16, CP-S-10, CP-S-12, CP-S-15, CP-IF-17 and CP-IF-18 if they are to be impacted by development for the Calderwood Project.
- 3. The development and implementation of a programme of test excavation and reporting is required to clarify the archaeological potential of CP-S-09/CP-PAD-02, CP-S-09/CP-PAD-03, CP-S-11/CP-PAD04 and CP-S-14/CP-PAD-05, if they are to be impacted by development for the Calderwood Project.
- 4. The development and implementation of a programme of salvage excavation and reporting is recommended for CP-S-09/CP-PAD-02, CP-S-09/CP-PAD-03, CP-S-11/CPPAD04 and CP-S-14/CP-PAD-05, if it is warranted by the results of the test excavation programme.

- 5. The development and implementation of a Care and Control of artefacts strategy, devised through consultation with ILALC and WNDAC, is recommended for all collected and excavated archaeological material retrieved during the abovementioned surface collection, testing and/or salvage excavation works. Such a strategy should be agreed and finalised with the Aboriginal stakeholders prior to any archaeological site works commencing.
- 6. Two properties located at 269 North Macquarie Road and 342 Calderwood Road were not accessible during the archaeological survey. If they are to be impacted by development for the Calderwood Project it is recommended that they be assessed for their archaeological potential.
- 7. If additional unrecorded Aboriginal archaeological material is encountered during development, works must cease immediately to allow an archaeologist to make an assessment of the finds, as all Aboriginal artefacts (known and unknown) are protected under Section 90 of the *NP&W Act*. The archaeologist may need to consult with NSW DECCW and registered stakeholder groups concerning the significance of any such material. DECCW must be notified of any such finds as per Section 91 of the *NP&W Act*.
- 8. As required by the *NSW Heritage Act 1977* (amended), in the event that historic relics are encountered, works must cease immediately to allow an archaeologist to make an assessment of the finds. The archaeologist may need to consult with the Heritage Branch Department of Planning concerning the significance of any historic cultural material encountered.
- 9. Restriction of access to Aboriginal archaeological information is recommended, in the event that this report is to go on public exhibition. Consultation with Austral Archaeology Pty Ltd, the registered Aboriginal stakeholders ILALC and WNDAC, DoP and DECCW will be necessary to determine the appropriate level of public release.
- 10. It is recommended that copies of the finalised report be provided to ILALC, WNDAC and NSW DECCW, and that the completed site cards (see Appendix D.3) be provided to the DECCW AHIMS Registrar as per Section 91 of the *NP&W Act*.

Recommendations have been incorporated into the Statement of Commitments at Section 8.

7.11 Bushfire Risk Assessment

Parts of the site are bushfire prone (refer to Section 3).

A Bushfire Planning Assessment to support the Concept Plan and SSS Study prepared by Ecological is included at **Appendix W**. The Bushfire Planning Assessment provides an assessment of the Concept Plan against Planning for Bush Fire Protection 2006 (NSW Rural Fire Service). It includes:

- An assessment of the bushfire hazard (predominant vegetation and effective slopes);
- Recommended Asset Protection Zones for all bushland-development interface locations;
- Recommendations on the management of APZs;
- A guide on the minimum standards for safe access and egress which includes road layout, design and construction standards; and
- A guide on the requirements for services such as water supply for fire fighting.

The location of maximum proposed APZs for the Concept Plan is indicated on **Figure 48** at known areas of bushland/development interface. The actual placement of the APZ will depend on the nature of the specific land use at that particular interface segment.

Ecological has determined that development does not necessarily need to be 'buffered' from the edge of the Principal Open Space 'green' area on the Concept Plan. For example, the 25 m APZ required for residential development adjacent either of the two major riparian corridors could be wholly placed within the outer zones of the corridor if they consist of areas of open space and the APZs do not compromise riparian and other objectives such as public access.

Similarly, perimeter public road reserves and minimum building setbacks within lots can contribute to achieving the APZ. This is a detail to be resolved at the detailed design stage in future subdivision applications.

Recommendations

The Bushfire Planning Assessment recommends bushfire protection measures as required by the Acceptable Solutions of Planning for Bushfire Protection 2006.

The Concept Plan proposal has been designed to accommodate Asset Protection Zones in the location and of the minimum dimensions as recommended in the Bushfire Planning Assessment.

The final location of APZs will depend on the nature of the land use at each particular development interface.

7.12 Utilities Infrastructure

An Engineering Infrastructure & Utility Services Study to support the Concept Plan and SSS Study has been prepared by Cardno is included at **Appendix Y**.

The Engineering Infrastructure & Utility Services Study details supply of water, sewerage, stormwater, gas, electricity and telephone services. It considers technologies to reduce the demand or need for servicing and the supply of sustainable services.

The Engineering Infrastructure & Utility Services Study provides a thorough investigation of existing available infrastructure and services and establishes that the Calderwood Urban Development Project can be provided with all essential services and infrastructure.

The Engineering Infrastructure & Utility Services Study concludes that the proposed development will affect existing utility services, and that all existing services to the area (sewer, water, electricity, telecommunications etc) will require significant upgrade to accommodate the proposed development.

The proposed Infrastructure, Services and Facilities Implementation and Delivery Proposal (refer to **Appendix G**), and the Outline VPAs (**Appendix CC**) sets out in detail the proposal for upgrade and infrastructure service provision in accordance with the Engineering Infrastructure & Utility Services Study.

These documents demonstrate in a comprehensive manner that the Calderwood Urban Development Project site can be serviced independently of the WDRA, and will not adversely impact on infrastructure delivery for that release area. They also demonstrate the contribution towards regional infrastructure upgrades that will benefit other future release areas. This is addressed in further detail at Section 2.

7.13 Social and Community

A Social and Community Planning Assessment to support the Concept Plan and SSS Study prepared by Elton Consulting is included at **Appendix AA**.

The Social and Community Planning Assessment provides detailed information and assessment with respect to:

- Demographic and socio economic characteristics of the existing population in the area surrounding the site;
- Assessment of existing community facilities, human services and open space in the area surrounding the site to identify spare capacity and availability ofr the future Calderwood population;
- Provision of housing diversity and affordability;
- Possible social impacts and measures to ensure social integration with adjacent local communities;
- Requirements for community facilities, human services and open space to meet demand generated by the future residential and workforce populations of the Calderwood project;
- Development contributions for community facilities and open space to inform Voluntary Planning Agreements with state and local government authorities;
- Arrangements for the delivery of social infrastructure and ownership, management and maintenance of public facilities;
- Relevant social initiatives in respect to Ecologically Sustainable Development and climate change impacts; and
- Other general requirements relating to relevant SEPPs, planning instruments, polices and plans.

The Assessment was prepared following consultation with:

- Shellharbour City Council (SCC)
- Wollongong City Council (WCC)
- NSW Department of Education and Training (DET)
- NSW Health (South East Sydney and Illawarra Area Health Service)
- NSW Department of Premier and Cabinet Regional Co-ordinator
- NSW Department of Human Services - Community Services (DOCS)
- NSW Department of Human Services - Ageing, Disability and Home Care (DADHC)
- NSW Police
- NSW Fire Brigade and Rural Fire Service
- The community surrounding the Calderwood site.

Key findings and conclusions of the Social and Community Planning Assessment are summarised below.

Social sustainability

In describing how a socially sustainable community will be created at Calderwood, the Social and Community Planning study has identified the social objectives of the development and a variety of strategies for their achievement. These relate to:

- undertaking integrated planning processes
- promoting diversity, choice and lifestyle
- creating an identifiable town and neighbourhood structure
- creating a healthy, safe and accessible environment
- encouragement for social interaction and active community life
- ensuring access to resources and opportunities in the wider area
- promoting community identity and sense of belonging
- integrating with neighbouring communities, and
- providing a range of quality community facilities, services and open space.

Social infrastructure, community facilities and open space needs assessment

The Social and Community Planning Assessment included at **Appendix AA** provides a detailed analysis of the needs of the future Calderwood Urban Development Project population for social infrastructure, community facilities and open space. The needs assessment is based on:

- Demographic forecasts;
- Assessment of capacity in existing facilities;
- Needs assessment contained in the councils' existing social plans;
- Discussions with both Councils and government agencies;
- The anticipated needs and preferences of the future population.

The future population of the Calderwood Urban Development Project, estimated to be about 12,400 people by 2036, will be large enough to sustain a range of local neighbourhood social and community facilities. However, it will not be large enough to warrant provision of higher order district or regional level facilities, which rely on a larger catchment population.

While the Calderwood site is divided between Shellharbour and Wollongong local government areas, the social infrastructure needs of the population have been considered for the development as a whole, rather than in two separate components. This reflects the ways in which people use facilities and services at the local level, without regard for artificial boundaries. It also recognises that separate facilities for the two local government areas would not be warranted and would not represent efficient and sustainable use of resources

Residents are likely to access most of these services within the Shellharbour LGA, given the greater proximity of Shellharbour facilities and services to the site and anticipated ravel patterns. However, retail, leisure and entertainment facilities within Wollongong may also be utilised, to add variety and choice to those available in Shellharbour.

Some open space and recreational needs will be satisfied by local and district facilities to be provided within Calderwood, while others will be addressed by accessing regional facilities in the wider district.

Social impact assessment

It is anticipated that the Calderwood Urban Development Project will contribute the following real benefits to the region:

- Enhance the supply of housing, including affordable housing, to meet increasing demand associated with population growth in the region, in ways that are consistent with the objectives of the Illawarra Regional Strategy. Matching supply with demand is critical to help maintain housing affordability and to meet the needs of the future community
- Enhance housing choice by providing a diversity of housing types suited to the needs of a range of households across the lifespan, helping to create a balanced and sustainable community with capacity to respond to the varying demands of a changing society
- Improve retail diversity and choice
- Increase local employment opportunities
- Enhance the supply of quality, publicly accessible community facilities and recreation opportunities in the Calderwood area
- Bring potential for better public transport services in the area, with increased population able to support improved local bus services

These benefits are very considerable and will more than offset any negative impacts likely to arise from the development.

In considering possible social impacts of the development on adjacent communities, there will be no significant impacts in terms of social composition, loss of agricultural lands for food production, heritage and neighbourhood safety.

In particular, no concerns have been identified with regard to the potential for social integration with adjacent local communities. Within a context of on-going population growth and change in the region, similarities in the characteristics and composition of the existing and incoming populations will facilitate acceptance of the new population. Social integration will be further enhanced by public access to and wider community utilisation of the facilities, services and recreation opportunities to be developed within Calderwood, and by the proposed community development program.

There will be changes to the character of the area, as it will move from rural to urban uses. However, community concerns about this change will be addressed by developing Calderwood as a quality, masterplanned community development, with a mix of dwelling types and styles, a range of community facilities and a strong focus on landscaping.

There will also be changes in demand for social infrastructure arising from projected population growth. The Calderwood development will include a variety of new local services and facilities that will satisfy local needs, ensuring that existing residents are not disadvantaged in their access to services and facilities, but are also able to enjoy access to the new social infrastructure. In terms of regional human services, there will be some need for additional recurrent funding for extra staffing and programs, commensurate with population growth.

There is limited potential for some negative impacts on some adjoining residents in terms of visual amenity, as existing rural outlooks are replaced by urban development. However, a number of measures have been proposed in the Visual and Landscape Assessment that will minimise these impacts.

Similarly, adequate measures have been proposed in the Transport Management and Accessibility Plan to address any potential traffic impacts.

It is recommended that an on-going program of information to and consultation with the surrounding community be implemented as planning for the site continues. This should include regular updates (for example via a project website) or press articles to keep people informed of progress, and further consultation with key stakeholders around the detailed design of the development.

Recommendations

To respond to the assessment of social impact, and to the identified need for new community facilities, human services and open space to meet the demand of the future population, the Social and Community Planning Assessment recommends the following:

- Delivery by the Department of Education and Training of:
  - two primary schools, along with a special needs unit, and
  - one high school.
- Delivery by the proponent of the following community facilities within the Shellharbour LGA:
  - A large multi-purpose community resource centre to meet the needs of all sections of the population;
  - a temporary community centre top operate until the community resource centre can be constructed in the town centre, and
  - a co-located branch library,
- Adoption of the Shellharbour standard of open space provision of 2.83 hectares of open space per 1,000 people (comprising 1.7ha for sporting fields, 0.33 hectares for local parks, 0.5 ha for district parks and 0.3 ha for city wide parks) across the whole development site.
- Delivery by the proponent of the following open space / recreational facilities:
  - provision and embellishment open space for active and passive recreation within the Shellharbour LGA,
  - provision and embellishment of open space for active and passive recreation within the Wollongong LGA,
- Implementation by the proponent of a Community Development Strategy including:
  - distribution of resident information packages through a welcome program,
  - engagement of a community development worker,
  - establishment of a Community Initiatives Fund to encourage and support community initiatives, programs and activities that will enhance the life of the community and quality of life of its residents.

The Open Space Concept Plan and the Landscape and Open Space Masterplan prepared by Environmental Partnership (refer **Appendix CC**) demonstrate that the Concept Plan accommodates community facilities and open space of the type and quantum, and consistent with the location and design principles identified in Social and Community Planning Assessment (refer to Section 4).

The SEPP Amendment proposal rezones the majority of open space that is to be dedicated to the Council RE1 Public Recreation.

Other recommendations with respect to the requirement to deliver new community facilities and human services and open space infrastructure have been incorporated into the proposed State and local VPA offers (refer to Section 5 and **Appendix DD)**.

The Infrastructure, Services and Facilities Implementation and Delivery Proposal at **Appendix G** incorporates all human services infrastructure and identifies how the staging / timing and coordination of delivery will occur.

A fundamental element of social and community planning for the Project relates to the early provision of community and human services infrastructure at the initial stages of the development. As detailed in the Infastructure, Services and Facilities Implementation and Delivery Proposal, by the time the first resident is living on site, a temporary community centre will be open and a community development worker employed. Early provision of retail facilities within the Village Centre as part of the Stage 1 development will provide for convenience shopping, and assist in the establishment of a sense of place.

Social sustainability is considered further at Section 2. A detailed Schedule of Baseline facilities identifying the requirements for each facility, their notional value and timing of provision is included.

7.14 Geotechnical, Soils and Contamination

Contamination

A Stage 1 Contamination Assessment prepared by Douglas Partners is included at **Appendix FF**.

The contamination investigation identified 40 separate areas of concern across the site. As the land has been proposed for residential development, it is recommended that field based investigations be carried out in each of the identified areas of concern to confirm the suitability for residential land use.

Appropriate scopes of work and sample quality plans should be prepared for each area of concern. Consideration should be given to the engagement of a DECW accredited auditor prior to commencement of fieldwork.

The Contamination Asessment also recommends that due to the site's ownership by multiple individuals for farming purposes, there are a large number of buildings on the property. Well prior to demolition, a Hazardous Materials assessment must be undertaken on all buildings, regardless of the size of the structure. This will allow the creation of a register of hazardous materials, which will directly influence the method of demolition.

Due to the size of the site, it is anticipated that during the course of earthworks or construction that isolated occurrences of contamination may be encountered. In order to deal with such occurrences, an Unexpected Finds Protocol will need to be developed prior to commencement of earthworks.

The above recommendations have been incorporated into the Statement of Commitments included at Section 8.

The Contamination Assessment concludes that considering the low potential for contamination identified at the site, rezoning for the proposed uses is deemed appropriate. Further investigations of the site and AECs will be undertaken and managed in accordance with SEPP 55.

Land Stability

A Geotechnical Investigation prepared to support the SSS and Concept Plan by Douglass Partners is included at **Appendix L**.

The significant majority of the site is stable land with no landslip risk. Small parts of the site have been identified as subject to potential land instability, generally on ridge crests and steep upper slopes. Refer to Section 3.

The Geotechnical Investigation identifies that some minor areas of the land that is proposed for future urban development under the Concept Plan extends into zones of *Less stable land* or *Moderately unstable land*. Instability in these areas may arise if the detailed design of development does not have regard to specific site conditions, with the most likely areas of instability being in gully heads and in areas of thick soil accumulation affected by seepage, especially if excavations for deeper road cuttings are required in areas of deep clay soils. All land proposed for employment and infrastructure development is located in areas that have been assessed to have a very low risk of slope instability.

Future development within residential areas that encroach into zones of potential minor / moderate instability will need to be subject to detailed investigation by appropriately qualified geotechnical practitioners at the time of detailed design.

Potential land instability is a minor site constraint and application of good engineering practice within affected areas will achieve very low or low risk of slope instability.

The Geotechnical Investigation concludes that urban development is feasible within the zones of Less stable land or Moderately unstable land subject to appropriate investigation and construction methodology to result in a low risk of slope instability after development.

The development of the site as proposed is concluded to be feasible provided all work is undertaken with good engineering practice.

The area of the site that will require engineering works as described above is shown at **Figure 17** at Section 2.

The above recommendation has been incorporated into the Statement of Commitments at Section 8.

Acid Sulphate Soils

Acid sulphate soils (ASS) are present on parts of the site at depths of between 2 and 3 metres (refer Section 3).

An Acid Sulphate Soils Assessment to support the Concept Plan and SSS Study prepared by Douglas Partners is included at **Appendix O**.

Cuts of between 3 and 4 metres are likely to be required in some parts of the site to support implementation of the Concept Plan proposal.

The act of disturbing or exposing ASS on the site through construction activity will necessitate the production of an Acid Sulphate Soil Management Plan (ASSMP).

The extent of ASS will require further investigation once final cut and fill levels have been determined for the areas of ASS risk, prior to the creation of an ASSMP.

Specifically, the following will be required:

- Identification of maximum excavation levels on the properties shown on **Figure 18** at Section 3 below.
- Further ASS investigation to the proposed excavation depths in these properties.
- Preparation of an ASSMP based on the findings of the Acid Sulphate Soils Assessment supplemented by the findings of the additional investigations.

Douglas Partners conclude that despite the presence of ASS on the site, ASS will only be a moderate constraint to development, and can be appropriately managed with good engineering practice in accordance with the above recommendations.

These requirements have been incorporated into the Statement of Commitments at Section 8.

Erosion

The Geotechnical Investigation prepared by Douglas Partners to support the Concept Plan and SSS Study and included at **Appendix L** identifies that there are only isolated occurrences of stream and gully bank or bed erosion, mostly resulting from stock movements or concentrated flow from spillways of farm dams or pipe culverts in gently sloping lands, and previous clearing and stock movements in moderately steep to steep land.

The generally well vegetated alluvial flats, stream banks and hill slopes mostly restrict the potential for erosion. Future erosion and bank instability potential is mostly restricted to localised sections of the banks of streams and tributary gullies during flood events.

As the Concept Plan proposal incorporates major creeks and their associated tributary gullies within extensive drainage corridors, it is concluded that the proposed development (including good engineering practice for disposal of stormwater drainage) will have minimal effect on erosion potential of the current stream courses.

Groundwater impacts

A Groundwater Assessment prepared by Douglas Partners to support the Concept Plan and SSS Study is included at **Appendix S**. The groundwater investigation comprised drilling of boreholes and installation of monitoring wells for ongoing monitoring of the water level and testing.

Groundwater levels are in the range of 2.5 – 4.5 metres below ground surface level.

The Groundwater Assessment concludes that in general, groundwater will not be a significant constraint to development across the majority of the site above RL20. Below RL20 groundwater may present itself as a moderate constraint due to its proximity to the ground surface.

Douglas Partners has made the following recommendations with respect to groundwater management:

- Any locations where cuts greater than 2 metres are proposed in areas below RL20 will require further groundwater assessment to establish the groundwater level at the site.
- Locations of detention basins will also require investigation to assess the local groundwater conditions.

These recommendations have been incorporated into the Statement of Commitments at Section 8. In accordance with the Groundwater Assessment, future assessment will utilise the existing network of groundwater bores on the site.

7.15 Landscape and Visual Impact

A Landscape and Visual Assessment to support the Concept Plan and SSS Study has been prepared by Environmental Partnership (refer to **Appendix X**).

Key findings with respect to the existing landscape character of the site are presented in the Site Analysis at Section 3.

Photomontages showing the visual impact of the proposed Calderwood Urban Development Project from a variety of view points are included in the Visual Assessment.

Environmental Partnership has concluded / recommended the following:

Visual impact of urban development

- For the majority of views of the development the Escarpment will remain the dominant visual feature
- For the majority of views Johnston's Spur and the associated ridgeline will remain an important visual feature
- Johnston's Spur is proposed in the concept plan to be retained for open space, environmental conservation and/or management purposes which will lessen the visual impact of development
- Additional tree canopy cover along main roads, the ridgeline and at the interface with Johnston's Spur will lessen the visual impact of urban development within the less visually prominent lowland areas
- The retention of tree canopy cover along the main riparian corridors of Macquarie Rivulet and Marshall Mount Creek will lessen the visual impact of urban development within the less visually prominent lowland areas

Developed areas

Size of lots

- Maximise lot size in visually prominent areas with the aim of reducing massing and optimising landscape opportunities

Building type / character

- Building height and massing to be considered in relation to visually prominent areas - limit impact on existing vegetation and pastoral ridges
- Development type and intensity (eg. residential free standing, terrace, apartments, town centre) to be located in lowland areas that are not visually prominent
- Building colour and materials palette to be considered in relation to visually prominent areas - limit contrast with visual context of existing vegetation and pastoral ridges

Landscape type / character

- Landscape typologies to be selected to promote integration with existing vegetation and pastoral ridges

Private domain landscape

- Encourage complimentary tree planting within private open space

Streetscape

Street alignment

- Street alignments running perpendicular to critical view lines can assist by creating a visual buffer

Public domain landscape

- Optimise early street tree and open space tree Implementation

Open space

Planning / location

- Location of open space in context of development and critical view lines (eg. provide a natural landscape along the ridgelines which are the most sensitive zones for visibility)
- Retain existing stands of trees where possible
- Construct parklands as early as possible
- Colour and materials palette to be considered in relation to views from adjoining areas
- Design to reflect existing pattern of pastoral

8.0 Draft Statement of Commitments

Table 25 provides a Statement of Commitments for the future stages of the development. It is noted that the majority of mitigation measures identified by the various technical supporting documents, and the recommendations made with respect to appropriate management of the environmental impacts of the proposed development have either been incorporated as a fundamental component of the Concept Plan proposal, or are reflected in the land use zoning and development controls that are proposed to be incorporated into the Schedule 3 SEPP Amendment

Table 25 – Draft Statement of Commitments

Subject	Commitments	Responsibility / Timing
Planning Agreement	▪ The proponent will enter into a Voluntary Planning Agreement with the Minister for Planning relating to the provision of land for education and regional road network upgrades generally in accordance with the Outline Voluntary Planning Agreement included at Appendix DD of the SSS Study and Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010.	To be finalised prior to works commencing for the relevant stage of the development
	▪ The proponent will enter into a Voluntary Planning Agreement with Shellharbour City Council for the provision of community infrastructure generally in accordance with the Outline Voluntary Planning Agreement included at Appendix DD of the SSS Study and Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010.	To be finalised prior to works commencing for the relevant stage of the development
	▪ The proponent will enter into a Voluntary Planning Agreement with Wollongong City Council for the provision of community infrastructure generally in accordance with the Outline Voluntary Planning Agreement included at Appendix DD of the SSS Study and Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010.	To be finalised prior to works commencing for the relevant stage of the development
Design	▪ The detailed design of relevant future development will be generally in accordance with the Development Control Strategy included at Appendix BB of the SSS Study and Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010.	To be demonstrated by the proponent at the time of any relevant detailed application

Ecology and riparian	▪ Any proposed revegetation within the retained riparian corridors shown on the Riparian Corridor Network of the Concept Plan is to demonstrate consistency with the Flood Mitigation Plan of the Concept Plan.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ Vegetation Management Plans (VMP)s will be prepared for all works with land that has been identified as Environmentally Significant Land by the Concept Plan and within the Core Riparian Zones shown on the Riparian Corridor Network of the Concept Plan generally in accordance with the latest DECCW guidelines.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ A detailed survey will be carried out in an appropriate season for *Pterostylis* gibbosa (Illawarra Greenwood) prior to any works commencing within potential habitat for that species. Potential habitat for the species is the Moist Box-Red Gum Foothills Forest and Coastal Grassy Red Gum Forest Wollybutt-Melaleuca.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ Mature remnant habitat trees will be individually assessed prior to detailed design in the area identified on Figure 7 of the Flora and Fauna Assessment prepared by Ecological Australia and included at Appendix Q of the SSS Study and Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010. High value trees will be retained and incorporated into urban design.	To be demonstrated by the proponent at the time of any relevant detailed application
Flood mitigation	▪ Future relevant applications will be accompanied by a flood impact statement that verifies that the proposal is consistent with the approved Flood Mitigation Plan.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ The flood impact statement for any future application proposing the staged cut or fill of land within the area of the approved bulk earthworks shown on the approved Flood Mitigation Plan will also verify that the proposal is consistent with approved bulk earthworks strategy and does not introduce unacceptable interim flooding impacts on land outside the Project site boundary.	To be demonstrated by the proponent at the time of any relevant detailed application
Water sensitive urban design	▪ At the detailed design stages of the development, a soil and water management plan be prepared to outline the methods through which stormwater runoff is controlled throughout the construction phase. This may include the use of the proposed wetlands as temporary sediment basins (where possible) and the provision of rock check dams and filter fabric fencing (above and below the works are respectively).	To be demonstrated by the proponent at the time of any relevant detailed application

	▪ During detailed design the longevity of proposed water bodies will be assessed. The potential for algal growth is also to be assessed during detailed design and the likelihood for algal growth reduced through incorporation of suitable hydraulic residence times (ie increased water body turnover) and incorporation of suitable subsurface macrobytes.	To be demonstrated by the proponent at the time of any relevant detailed application
Indigenous Heritage	▪ Salvage through collection and relocation of surface artefacts is recommended for CP-IF-01, CP-IF-02, CP-S-01, CP-S-02, CP-IF-03, CP-S-03, CP-IF-04, CP-IF-05, CP-S-04, CPIF-06, CP-IF-07, CP-IF-08, CP-S-05, CP-IF-09, CP-IF-10, CP-IF-11, CP-IF-12, CP-S-07, CP-IF-13, CP-S-08, CP-IF-14, CP-IF-15, CP-IF-16, CP-S-10, CP-S-12, CP-S-15, CP-IF-17 and CP-IF-18 if they are to be impacted by development.	To be carried out by the proponent prior to the commencement of any relevant works
	▪ The development and implementation of a programme of test excavation and reporting is required to clarify the archaeological potential of CP-S-09/CP-PAD-02, CP-S-09/CP-PAD-03, CP-S-11/CP-PAD04 and CP-S-14/CP-PAD-05, if they are to be impacted by development. The development and implementation of a programme of salvage excavation and reporting is recommended if it is warranted by the results of the test excavation programme.	To be prepared by Proponent prior to any relevant works commencing
	▪ The development and implementation of a Care and Control of artefacts strategy, devised through consultation with appropriately recognised groups, is recommended for all collected and excavated archaeological material retrieved during the abovementioned surface collection, testing and/or salvage excavation works. Such a strategy should be agreed and finalised with the Aboriginal stakeholders prior to any archaeological site works commencing.	To be prepared by Proponent prior to any archaeological site works commencing
	▪ The properties located at 269 North Macquarie Road and 342 Calderwood Road are to be assessed for their archaeological potential if any relevant works are proposed.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ Copies of the finalised report will be provided to relevant groups and NSW DECCW, and that the completed site cards (see Appendix D.3 of the Aboriginal Archaeological and Cultural Heritage Assessment) be provided to the DECCW AHIMS Registrar as per Section 91 of the *NP&W Act*.	To be demonstrated by the proponent at the time of any relevant detailed application
Acid sulphate soils	▪ Maximum excavation depths are to be identified (for any development involving excavation) and further assessment of potential acid sulphate soils undertaken to the proposed excavation depths within the properties shown on Figure 18 of the Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010 depths.	To be demonstrated by the proponent at the time of any relevant detailed application

	▪ An Acid Sulphate Soil Management Plan is to be prepared (if required) for any relevant development based on the findings of the Acid Sulphate Soils Assessment prepared by Douglas Partners included at Appendix O of the Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010 depths.	To be demonstrated by the proponent at the time of any relevant detailed application
Geotechnical	▪ Development within the areas shown as 'Less Stable Land' and 'Moderately Unstable Land' on Figure 17 of the Concept Plan Environmental Assessment Report prepared by JBA Urban Planning Consultants Pty Ltd and dated March 2010 are to demonstrate good engineering practice for hillside slopes.	To be demonstrated by the proponent at the time of any relevant detailed application
Groundwater	▪ Where cuts greater than 2 metres in depth are proposed in areas located below RL 20, further groundwater assessment is to be undertaken to establish the ground water level of the site.	To be demonstrated by the proponent at the time of any relevant detailed application
	▪ Further assessment of local groundwater conditions is to be undertaken at the locations of detention basins.	To be demonstrated by the proponent at the time of any relevant detailed application
Contamination	▪ Field investigation is to be undertaken at the time of any future application relating to land within an Areas of Concern identified on Drawing 10 at Appendix A of the Contamination Assessment prepared by Douglas Partners and included at Appendix FF of the Concept Plan Environmental Assessment Report prepared by JBA demonstrating suitability of the land for the development proposed."	To be demonstrated by the proponent at the time of any relevant detailed application

9.0 Conclusion

9.1 Project Strategic Justification

The significance of and strategic justification for the Calderwood Urban Development Project can be summarised as follows. Further detail in relation to each of the key areas of strategic justification is provided at Section 2.

Housing affordability

- Housing affordability is a major policy concern at the National, State and Illawarra regional level.
- Recent analysis undertaken by the Department of Housing (2009) demonstrates a large number of Shellharbour residents are experiencing housing stress and there is a significant lack of affordable housing available for purchase for low and moderate income earners. The capacity of residents to purchase housing in the Shellharbour market is tight and is rapidly worsening.
- The Project delivers housing affordability through increased land supply in the short to medium terms, the delivery of a wide range of housing choices, matching housing choices with consumer's ability to pay and specifically targeting affordable housing solutions through product development and other initiatives including government programs. The project meets a demonstrated strategic need that delivers and maintains housing choice, diversity and relative affordability levels for Shellharbour residents.
- A significant market entry level housing component will help reduce housing stress and encourage economic activity by attracting and retaining a skilled and younger labour force and increasing disposable incomes of residents.

Residential land supply

- The IRS requires 38,000 new dwellings to be delivered in the Illawarra region in the years to 2031. The Illawarra UDP 2008 highlights the need to deliver approximately 780 lots (dwellings) annually within the region and given the status of existing release areas in the region, an additional major release area needs to be brought on line by 2010 to avoid a regional housing shortage, particularly for detached housing.
- Calderwood is identified as an investigation area in the 2007/08 Metropolitan Development Program. It is one of the two supply sources of scale identified in the MDP, along with West Dapto.
- The site is nominated in the IRS as a source of alternative residential land supply if demand for additional housing arises because of growth beyond projections of the Strategy or because regional lot supply is lower than expected. It is the only alternative site specifically identified for urban release in the IRS.
- It is apparent that the regional land and housing supply requirements identified in the IRS cannot be delivered in the timeframe or numbers that were expected when the Strategy was published 3 years ago. In the 3 years since the IRS was finalised, the WDRA, which was identified as the priority release area for the Illawarra region, has not commenced. At the time of writing the WDRA LEP has not been gazetted and the required Section 94 Contributions Plan not yet publicly exhibited.
- There is a lack of alternative Greenfield land supply source to meet the housing demand in the Illawarra market. Key factors restricting housing delivery in the Illawarra include the heavy reliance placed in the Strategy on high annual rates of production from WDRA as a single major source of housing supply.

To date no lots have been delivered within WDRA. Other existing release areas are not meeting market expectations, providing market presence or addressing affordability concerns.

- Population in the Illawarra region has increased by 1.1% per annum between 2006 and 2008, which is 60% in excess of the population growth forecast under the IRS of 0.7% per annum.
- Delivering residential land to market quickly is required to support the significant additional population growth in the Illawarra.
- The Calderwood Urban Development Project can underpin the IRS dwelling supply targets by providing an alternate land supply to meet a predicted dwelling shortfall in the Illawarra Region in an environment where other nominated Release Areas are under review. It can provide about 12% of the Illawarra Regional Strategy new dwellings target. It is a prudent course of action to mitigate the impact of continuing implementation challenges with the proposed WDRA to ensure smooth and timely land supply in the Illawarra.
- Commencement of the Calderwood Urban Development Project is consistent with the findings of the Growth Centres Commission Report (2008) that in the context of the State government's policy to release as much land to the market as quickly as possible, the early release of Calderwood could be considered subject to ensuring timely delivery of local infrastructure in West Dapto. The Growth Centres Commission recognised that such additional supply of land to the market may also have benefits for housing affordability putting a downward pressure on house prices and that developers will self regulate the supply of land based on market conditions.
- The Project satisfies each of the Sustainability Criteria of the IRS that have been established as the basis for the assessment of alternative sources of residential land supply under the Strategy.

Impact on West Dapto Release Area supply

- When published in 2007, the IRS assumed lot production from the WDRA would occur at a rate of approximately 500 dwellings per annum by 2009, after a ramp up of 150 dwelling in 2007 and 350 dwelling in 2008.
- Revised estimates contained within the 2008 Growth Centres Commission Review of the WDRA suggest that a lot production rate of 300 dwellings per annum from the WDRA by 2015 is more likely, ramping up from 100 dwellings in 2010.
- Based on the latest data available, lot dwelling production estimates for the Illawarra region demonstrate that with assumed production from the WDRA of an estimated 300 dwellings per annum by 2015 (consistent with the 2008 Growth Centres Commission Review of the WDRA), the Illawarra is set to experience a cumulative shortage of 8,000 homes by 2031.
- Even if lot production from the WDRA was to commence in the short term, and an annual yield of 500 dwellings achieved, available data demonstrates that there would still be a cumulative housing shortage in the Illawarra by 2031.
- The Calderwood Urban Development Project proposes approximately 4,800 dwellings over a 20+ year time frame, with an annual lot production of approximately 225 dwellings per annum anticipated.
- Due to the significant cumulative housing shortage projected for the Illawarra to 2031, and the lack of alternative Greenfield land supply sources to meet housing demand, the Calderwood Urban Development Project will underpin the supply of land to market in the Illawarra without undermining the implementation of the WDRA.

Infrastructure delivery and independence from West Dapto Release Area

- The site is a significant consolidated land holding. Consolidated landholdings with scale provide the opportunity for control of implementation and delivery of infrastructure, services and facilities in a way that ensures integrated service delivery, efficient use of resources and equitable access through shared or co-located facilities, joint use arrangements and convenient locations.
- The Project is supported by a clear and viable infrastructure servicing strategy that leverages readily accessible existing infrastructure and demonstrates that the Project can be implemented as a standalone proposal.
- The Project presents an opportunity to provide infrastructure and high quality new facilities in a timely manner based on leading practice sustainability principles and sustainable funding, management and maintenance arrangements.
- While the Project can be implemented as a standalone proposal, the DLL infrastructure and servicing strategy provides structural enhancements to the Region's infrastructure base and long term synergies with other proposed Release Areas.
- The infrastructure and servicing strategy minimises implementation risk and cost to Government by utilising DLL expertise and delivery proposals.
- Calderwood and WDRA represent the last remaining greenfields urban release areas of scale in the Illawarra. Whilst the projects will be virtually contiguous when fully developed, and the timing of the release of land in both areas is likely to overlap, their respective early stages of release (ie initial development fronts) are more than 10km apart and will be supported by an entirely different services and delivery implementation mechanism.
- Whilst the timing of the release of land at West Dapto and Calderwood is likely to overlap, both developments have different servicing provisions and therefore do not significantly affect each other. The infrastructure, services and facilities implementation and delivery proposal for Calderwood demonstrates that the Project can be serviced independently of West Dapto and will not affect the provision of infrastructure for the WDRA other than positively with respect to providing structural enhancements to the region's infrastructure base.

Economic growth, employment and retail impact

- The Project will have a series of quantifiable economic benefits and positive flow on effects to neighbouring communities and business, including:
  - Direct injection of an estimated $2.9 billion into the local economy during the construction period in the form of payments to goods and service providers;
  - Creation of an additional $6.3 billion in net value for the Shellharbour economy over the project period;
  - Assistance in maintaining existing employment positions particularly in the construction sector, and create an additional 8000 full time equivalent positions, with around 5,260 of these located in the Shellharbour LGA. This yields a high job containment ratio of over 60% for the development.
- The Project will provide an appropriate level of retail floor space to support the future population without adversely impacting on known existing or planned future centres and development.

Environmental constraints and benefits

- Detailed investigations of site constraints demonstrate that the land is relatively free of major physical constraints and has a high ratio of urban capable to non urban capable land.

- The Project meets the objectives of the NSW State Plan and secures urban capable land identified in the IRS for that purpose.
- The Project can deliver sustainable land use, management and funding solutions for non urban capable land within the site.

Alternative land uses

- The Project site is located immediately north west of the existing urban footprint of Albion Park and is adjacent to existing utilities and services. It is both compatible with, and complementary to, surrounding existing and future urban land uses.
- The ongoing use of the site for limited existing agricultural practices does not represent the highest or best use of the land.
- Existing agricultural practices on the site do not support regionally significant areas of food production. Nor does any land within the immediate vicinity of the site.
- More than half of the existing rural land in the vicinity of the site has been identified by the State government for future urban development.
- The Project will have nil to minimal impact on primary production values and practices of adjoining areas due to the existing limited agricultural production in the locality. Existing adjoining rural land likely to be influenced by the Project represents only 0.04% of the total area of land used for agricultural production in the Illawarra region.
- The Project will have minimum impact on regionally significant areas of food production because the site does not currently support any livestock and crop production and is not located in or close to any area of regional agricultural significance.
- Any impact it might have on the small amount of adjoining land used for agricultural production will be so low when considered on a regional basis as to be imperceptible.

Sustainability

Delfin Lend Lease (DLL) is part of the Lend Lease Corporation (LLC). Both DLL and LLC have won numerous awards for environmental outlook and delivery. For full details, visit the Lend Lease website: http://www.lendlease.com/ and follow the links to 'Lend Lease Sustainability'.

LLC is included in the "Global 100" list of the world's most sustainable corporations. Lend Lease is the only Australian company to be listed on all three of the 2008 Dow Jones Sustainability Index, the 2008 Goldman Sachs JB Were Climate Leadership Index and 2009 Global 100. A copy of the LLC Policy Statement on the Environment can be found at the following link: http://www.lendlease.com/sustainability/pdf/LendLease_Environment_policy.pdf

The Calderwood Urban Development Project demonstrates sustainability as follows:

- The Project delivers integrated planning and design that coordinates community, physical, transport and economic outcomes.
- It will deliver a range of densities, lot sizes and dwelling types and create a diverse community that is demographically balanced. The variety of housing forms will provide opportunities to respond to changing life cycle, lifestyle and work requirements over time, enabling people to age in place. It delivers key social sustainability outcomes.

- As a developer lead master planned community the Project can be delivered in a manner that achieves a relatively high level of self containment in terms of employment generation, retail expenditure and vehicle trip generation. This self containment will contribute positively to reducing the carbon footprint of the development as compared to traditional Greenfields residential development.
- A comprehensive package of deliverable sustainable transport measures is identified to assist in achieving a 10% mode shift away from private vehicle. Measures include timely provision of facilities and services, a diversity of land uses and housing types across the project, walkable access to key amenities and an holistic approach to the design of the street network, carefully balancing the needs for vehicle movement with the needs of pedestrians and cyclists.
- The Project will make a positive contribution to the achievement of travel and vehicle use goals in the Illawarra. It will form part of a larger urban area and assist in the achievement of a public transport catchment that can be serviced by economically efficient transport services.
- The Project makes special provision for home based businesses and working from home in accordance with the principles of the National broadband network. Combined with employment lands and a new Town Centre and Village centre, this will reduce car dependency and trip generation rates.
- The Project will generate approximately 8000 full time equivalent jobs by 2031, of which there will be a high containment ratio to the Shellharbour LGA – approximately 60%. This will contribute positively to a reduction in trip generation and to minimising the carbon footprint of the development.
- The Project retains core biodiversity areas within the site and incorporates both east west and north south habitat connectivity. It presents a long term ownership and management regime for the protection of natural resources.
- The proposed infrastructure and servicing strategy provides for structural enhancements to the region's infrastructure base and long term synergies with other proposed release areas. It will deliver efficiencies and economies of scale in infrastructure delivery and thus improve the sustainability of regional infrastructure to support future urban growth within the wider region.
- The Project adopts flood plain management and water sensitive urban design measures and features that respond to an analysis of potential climate change impacts. The large size of the site and its availability for coordinated development enable the delivery of an holistic flood plain mitigation plan accompanied by water cycle management that will result in a net improvement in water quality in Marshall Mount Creek, Macquarie Rivulet and as a consequence Lake Illawarra. Water cycle management integrates with urban design, salinity risk and riparian corridor protection measures.
- DLL is committed to the development of alternative technologies in its communities. The issues of carbon emissions, renewable energy targets and land tenure solutions will become increasingly relevant to new urban developments. DLL sees potential for both solar farms and co (or tri) generation as part of the Project, particularly for the Town Centre and employment precincts. Such opportunities will continue to be considered throughout the project.
- Energy sustainability for the Project focuses on reducing the demand for energy through the efficient design of the urban form to capitalise on the natural features of the site. Demand will also be mitigated through consumer demand initiatives including BASIX requirements for dwelling design.
- The Project adopts potable water supply conservation targets and identifies sustainable integrated options for water supply, wastewater and stormwater servicing.

Implementation and delivery

The Project will deliver a comprehensive series of social, economic and environmental public benefits as demonstrated throughout this Section.

The Calderwood project is unique in being able to deliver the combination and scale of economic, environmental and social benefits identified. This is as a direct result of:

- Consolidated landholdings;
- Managed and predictable infrastructure and implementation planning;
- The uncomplicated nature of the proposal;
- DLL's business model, expertise and provision of financial certainty; and
- DLL's unparalleled experience in the creation and delivery of master planned communities in Australia.

Investment certainty is assured as:

- The proposal will be implemented by DLL which is wholly owned by Lend Lease Corporation.
- Urban development is core Lend Lease business. This provides implementation certainty for Government as the proposal is more than a speculative venture aimed at boosting balance sheets: it is a realistic investment proposal by a proponent with financial resources and core business skills in urban development.
- Lend Lease can meet Government prudential, funding and governance requirements.

9.2 Environmental and Cumulative Impacts and Mitigation Measures

The Site Analysis at Section 2 justifies the footprint of the urban capable land reflected in the Concept Plan proposal and the area of land that is proposed to be zoned RE1 General Residential and B4 Mixed Uses under the SEPP Amendment.

Land to be incorporated into the site riparian network, open space master plan and environmental conservation lands under the Concept Plan and proposed to be zoned E2 Environmental Conservation, E3 Environmental Management, SP2 Infrastructure (local drainage) and RE1 Public Recreation accords with the findings, conclusions and recommendations of detailed technical investigations including, particularly the:

- Flora and Fauna Report prepared by Ecological;
- Riparian Consistency Report prepared by Ecological;
- Geomorphology Report prepared by Douglas Partners;
- Water Cycle Management Study prepared by Cardno;
- Floodplain Risk Management Study prepared by Cardno; and
- Groundwater Assessment prepared by Douglas Partners.

The Concept Plan and SEPP Amendment proposal presents an holistic and integrated outcome having regard to riparian, flooding, biodiversity and water quality and quantity.

The Strategic Justification for the Project (refer above), the Environmental Assessment at Section 7 and the technical supporting investigations at Volume provide a detailed assessment of the environmental impact of the proposed land use change (SEPP Amendment proposal) and Concept Plan development.

All measures that have been recommended as part of the detailed technical investigations and studies to mitigate potential environmental impacts have been incorporated into the Concept Plan and SEPP Amendment proposals, or are included in the Statement of Commitments at Section 8.

Cumulative impacts have been considered throughout this report. Specifically, the development proposal and the assessment of its environmental impacts:

- Responds to future patterns of growth and development in the Illawarra outside of the development site, including regional land use planning assumptions as identified at Section 2.
- Demonstrates that the cumulative impact of the proposed development and that likely to occur in the future having regard to the identified future regional land use planning context is satisfactory with respect to regional agricultural practices and regional food production.
- Demonstrates that the cumulative impacts of traffic growth, both with and without the proposed development, can be appropriately mitigated and managed through a series of road network improvements. The assessment has had regard to the necessary staging / timing and appropriate apportionment of cost for these works based on regional cumulative traffic growth.
- Demonstrates the manner in which demand for utilities services infrastructure can be met having regard to both the demand generated by the proposed development, as well as that of other known release areas in the region including West Dapto.
- Demonstrates that the proposed development will not contribute to an increase in flood levels in the 1% AEP event, and thus will not contribute to any cumulative impact in terms of flood extent or levels within the catchment.
- Demonstrates that appropriate community and human services infrastructure will be provided for the development and thus the development will have no cumulative impact on the capacity of existing facilities and services.

9.3 Public Interest

The development proposal is in the public interest as demonstrated by the Strategic Justification for the Project.