LAWSON

WRITE YOUR STORY

Lawson Residential Estate – Stage 2B

EDP Amendment Design Report

Job Number 50522-050

SUBURBAN LAND AGENCY

23 December 2022

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Appendices

1. INTRODUCTION

Lawson Stage 2B is predominantly located on the Western side of College Creek, between the creek and Lake Ginninderra and is the subject of this EDP Amendment S197 application. Lawson Stage 2A is part of a separate S197 application in progress. Lawson Stage 1 is located to the East of College Creek and has been a functioning neighbourhood for a number of years.

The suburb of Lawson comprises a parcel of land in north eastern Belconnen with a developable area measuring approximately 100 hectares in area, including open space. The site is bounded by the former Belconnen Naval Transmission Station to the north, the arterial roads of Baldwin Drive to the east and Ginninderra Drive to the south and the Ginninderra Creek arm of Lake Ginninderra to the west. The suburb is bounded by the existing developed suburbs of Giralang to the north, Kaleen to the east, Bruce to the south, Belconnen to the south west, and McKellar to the west.

This EDP responds to the Lawson South Structure Plan (ACTPLA November 2010), the Lawson South Concept Plan (ACTPLA October 2011) and the Lawson South Master Plan, prepared by The Expert Client for the Land Development Agency (LDA) in 2010, now Suburban Land Agency (SLA). It also draws on the Territory Plan, the ACT Government Affordable Housing Action Plan 2007, and consultation with a range of Government stakeholders including Environment, Planning, Sustainable Development Directorate (EPSDD), Transport Canberra and City Services (TCCS), Evoenergy and ICON Water.

This application relates to Stage 2B of the site. Stage 2B requires an EDP Amendment due to the change from the previous Stage 2 EDP Amendment, that is to retaining the existing 132kV and 11kV overhead power lines instead of relocating. The has required some minor adjustments to the estate layout.

It should be noted that a number of the attached Appendices were included in the Stage 2 EDP Amendment and the Stage 1 EDP Design Response Report as these reports cover the broader development site and formed part of the Original EDP submission.

This Estate Development Plan has been prepared based on the Guidelines for the Preparation of Estate Development Plans (ACTPLA, May 2009) and as defined in the Territory Plan and Section 94 of the *Planning and Development Act 2007.*

This report outlines the key planning objectives, principles and infrastructure upon which Lawson is planned. The report should be read as an accompanying document to the drawings contained within the EDP submission and as listed below and in response to the requirements of the Estate Development Code.

The Estate Development Plan will be assessed under the Impact Track. A Section 211 exemption was granted on the 21st November 2012 which allows the Development Application to be assessed under the Impact Track without the requirement to undertake an Environmental Impact Statement (EIS) (refer Ecological Assessment below). This Section 211 exemption has now expired, however, an Environmental Significance Opinion (NI2017–443) was approved by the conservator in conjunction with this EDP submission (Refer **Appendix I** for a copy of NI2017–443).

The Lawson Stage 2B development proposal includes the following elements of work:

- Removal of Existing Vegetation
- Earthworks
- Road Construction
- Stormwater Servicing
- Re-routing of College Creek

- Sewer Servicing
- Water Supply
- Provision of Utility Services
    - Electricity
    - Communications
- Water Quality Control Measures
- Hard Landscaping
- Landscape
    - Verge Grassing, Street Trees, Open Space

Correspondence and responses to previous comments received from previous EDP submissions are incorporated in Appendix P.

This EDP Amendment report is supported by Civil, Landscape and Planning drawings accompanying this submission, as listed below.

The EDP Amendment Changes are shown on the Civil drawing 50522050-EAC-01 EDP AMENDMENT CHANGES (last drawing in civil plan set).

Civil Plans

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50522050-BDP-03	BLOCK DETAIL PLAN SHEET 3 OF 3
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50522050-RDLS-07	ROAD LONGITUDINAL SECTION FIRETRAIL 03 AND 04
50522050-PTP-01	PUBLIC TRANSPORT NETWORK AND OFF ROAD MOVEMENT SYSTEM PLAN
50522050-OSP-01	ON STREET PARKING PLAN
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22064-102	TREE ASSESSMENT PLAN 2 30.11.2022 A
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Planning Plans

NonSpec160 -	Lawson Stage 2B DIP 01 & 02 - Dec 22
NonSpec160 -	Lawson Stage 2B BTP - Dec 22
NonSpec160 -	Lawson Stage 2B PCP - Dec 22

1.1. Site Characteristics

Location and Views

The proposed development involves creation of blocks shown as AA, AB, AC, AD, AF, AH, AX and DB (Open Space) as shown on Concept Master Plan, drawing number 50522050-502-CMP.

Lawson is located in north east Belconnen and is bounded by Ginninderra Drive to the south, Baldwin Drive to the east, Lawson North to the north (the former Belconnen Naval Transmitting Station) and Lake Ginninderra to the west. To the south of Lawson is the University of Canberra campus and to the southeast is the Australian Institute of Sport, Canberra Institute of Technology and Calvary Hospital.

The current major land use of Lawson Residential Estate Stage 2B is the Evoenergy Belconnen Zone Substation in the middle of the site. This includes an access road to the substation and associated Evoenergy power lines that traverse the site.

The Lawson landform is highly visible from many surrounding areas with the dominant feature being Reservoir Hill that provides views in all directions, particularly to Lake Ginninderra, Black Mountain, the Belconnen Town Centre, the Brindabella Mountains and to the former Belconnen Naval Transmitting Station.

Existing Vegetation

Much of the vegetation within the area of Lawson Stage 2B has been modified by a long history of agricultural use. An assessment of the Lawson South area found it to contain a diverse range of vegetation communities in various ecological conditions.

A review of the vegetation within the area confirmed that most of the ecological characteristics of the area remained unchanged but noted an increase in the cover of native grasses throughout the site. The regeneration of native grasses is most noticeable to the south of the electrical substation however, remains in a degraded condition.

With the exception of the area to the south of the electrical substation, most of the site contains a low component of native forbs. Weeds that are common throughout the area include serrated tussock (*Nassella trichotoma*), St John's Wort (*Hypericum perforatum*), saffron thistle (*Carthamus lanatus*) and catsear (*Hypochaeris radicata*).

Refer to Section 4 Landscape Master Plan for further details of existing tree assessment and proposed landscape outcomes for the development This report provides details including the condition of existing trees within the development site. It is the intention as part of this development that significant areas of trees are to be retained including those along the southern portion of the historic travelling stock route.

Ecological Assessment

The EPBC Decision for the whole of the Lawson Residential Estate was approved on 13 September 2012 and is included in Appendix I.

For completeness, a copy of the ecological assessment is included in Appendix C, which is that previously issued as part of the Lawson Residential Estate – Stage 1 EDP. EPSDD advised that the previous ecological reports do not require an update based on Minutes of Meeting dated 08/03/2017 included within Appendix N.

1.2. Heritage

A cultural heritage assessment for the whole of the Lawson Residential Estate was undertaken by Navin Officer Heritage Consultants in January 2009. The fieldwork was conducted over two days and involved inspections of the locations of all previously recorded sites and all areas of ground surface visibility within the study area.

The study recommended no further action was required regarding the sites within the study area. However, as each of the sites are listed on the ACT interim Heritage Register, advice should be sought by the development proponent from the ACT Heritage Council regarding the appropriate course of action regarding these sites.

At the time of the Stage 1 EDP submission, advice was received from the ACT Heritage Council on 17 September 2009 that the Heritage Council endorsed the recommendations of the CMP and agrees that no further work is required before the commencement of works at the site.

Further correspondence with ACT Heritage Council in January 2018 also requires that an Unanticipated Discovery Protocol (UDP) be in place during works on site to ensure any artefacts of elements of interest/importance be handled appropriately.

Appendix E includes Heritage Advice from the previous EDP Amendment as a condition of the NOD, states "*The Tree Management Plan and all related documents amended to clearly show the retention of trees numbered 888-910".* Trees 888-910 are further north within the Travelling Stock Route which were shown as being removed in the original Tree Management Plans. The updated Tree Management Plan submitted as part of the S197 submission retained trees 888-910 to comply with this Heritage Advice, and this remains the same in the current submission.

For completeness, a copy of both the Cultural Heritage Assessment and Heritage Advice are included in Appendix E, which are those previously issued with the Lawson Residential Estate Stage 1 EDP.
EPSDD advised that the previous heritage reports do not require an update based on Minutes of Meeting dated 08/03/2017 included within Appendix N.

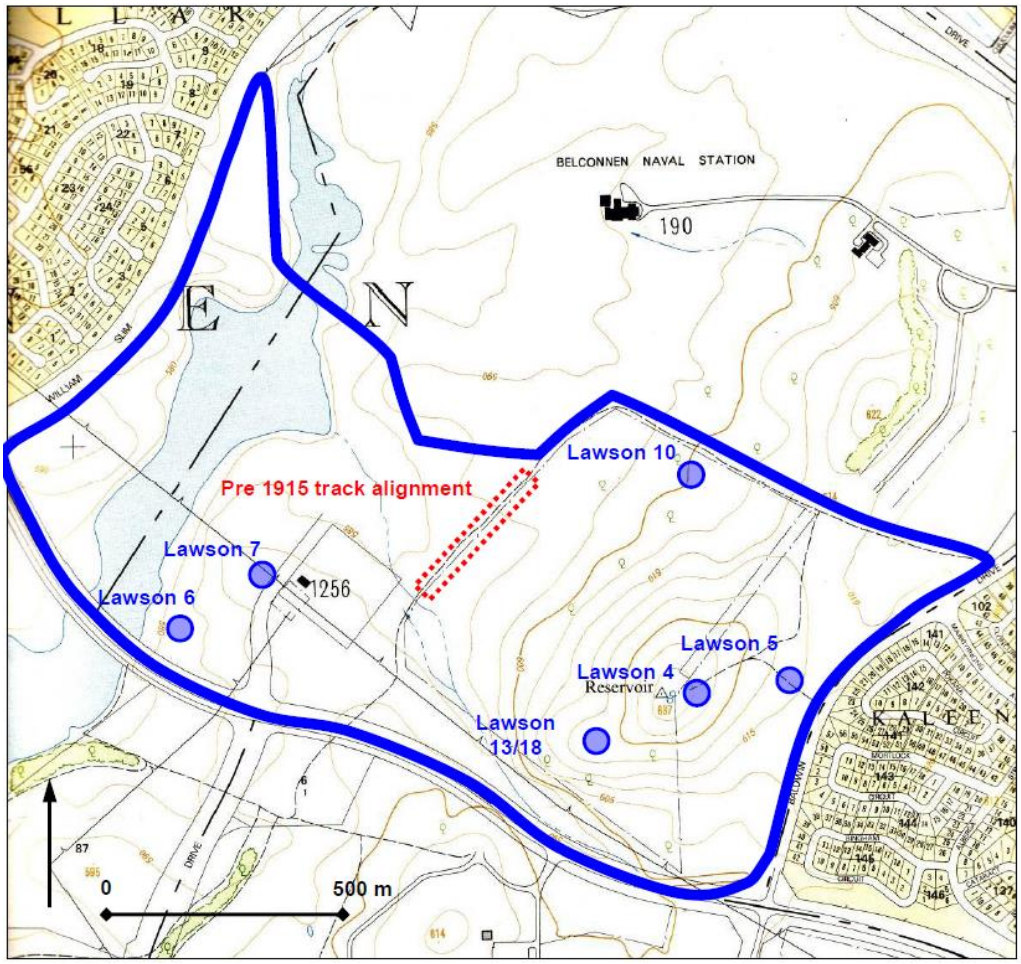


Figure 1 – Pre 1915 Stock Route Alignment (Source: ACT Concept Planning Study: Archaeological Assessment, Navin Officer Heritage Consultants, September 2009)

1.3. Planning Context

Reference is made to the Design Responses Report prepared by Canberra Town Planning as part of this submission to provide the relevant planning inputs including responses to rules and criteria in the Territory Plan.

The previous Estate Development Plan for this development was approved on 24 September 2018. The NOD reference is DA201834093. A subsequent S197 amendment was issued and NOD issued on 18 March 2019.

The subject site co-located with Block 1 Section 5 which houses the Evoenergy Belconnen Zone substation and Block 2 Section 5 which contains the substation access road. The Estate Development Plan has been prepared to respond to the provisions of the Territory Plan.

Applicable principles and policies that apply to the Lawson future urban area are set out in the Lawson South Structure Plan. The land subject to Stage 2 is zoned as RZ5 High Density Residential, RZ4 Medium Density Residential, CZ5 Mixed Use, CFZ Community Facility, PRZ1 Urban Open Space and NUZ3 Hills, Ridges and Buffer, TSZ1 Transport and TSZ2 Services with a Future Urban Area (FUA) overlay. There are no gazetted or constructed roads on the site. Lawson South is unleased Territory Land under the custodianship of the Suburban Land Agency (SLA). The Lawson South Concept Plan guides the design and assessment of subdivision proposals in Lawson.

2.0 PLANNING PROPOSAL

The Estate Development Plan comprises a number of key elements that respond to the identified objectives, planning principles, constraints and opportunities. They work in concert to give Lawson Residential Estate its functionality and unique character. The elements listed below generally focus on Stage 2B of Lawson Residential Estate, except where part of a wider network that ties into Stage 1 (for example cycle networks).

2.1 Urban Design

Formative Roads

- A simple, legible and permeable road network that responds to identified design generators. These include natural drainage patterns, slope, aspect prospect and significant engineering constraints including substation and associated buffers, 132kV lines, 11kV lines and the Ginninderra Drive/Aikman Drive intersection performance. The resultant section layout ensures that a maximum number of blocks obtain optimal solar access;
- Roads have been spaced to optimise section depths for multi-unit apartment forms and where applicable mixed use development and community facility development;
- The major collector road (Road 01) passes centrally through higher density residential zones to support bus operations and provide access to public transport to the maximum number of residents. Stage 2B is configured to provide an opportunity to create an urban hub associated with high-density apartments and potential mixed use commercial activities as per the Lawson South Concept Plan. The alignment of Road 01 has been configured to allow for the rationalisation of higher density residential parcels adjacent the lake, the enhancement of the significant view corridor out over Lake Ginninderra and responds to engineering constraints;
- A bus capable road linking the Aikman Drive / Ginninderra Drive intersection with proposed Road 01 and Road 02 to the approved Stage 1 Road 02 intersection has been provided to complete the bus link for the two-stage development. This will optimise estate legibility, permeability and connectivity. Road 02 (Stockman Avenue) in Lawson Stage 1 is currently under construction;
- Edge streets have been provided to parkland at all locations to ensure that community parks are addressed and overlooked by dwellings. This arrangement has a number of benefits including access to parkland by the broader community, natural surveillance of parkland with accompanying security benefits, avoidance of unsightly back fences addressing community parks and preservation of the public realm from acquisitive private lessees. Edge streets provided to Sections AF and AH are accessible by emergency vehicles only;
- Road reservations have been developed to allow for amenable footpaths, kerbside parking, compliant carriageways and central parking. They also allow for regular street tree planting to provide functional and visual amenity for all users.

Urban Design and Place-making

A series of significant visual axes are created within the whole of the Lawson Residential Estate development. Some of these are generated by existing landscape, landform, and built-form. Others have been created by the proposed road, cycle and pedestrian networks. They include:

- A visual axis reinforcing views from the major collector road (Road 01) north to the waters of Lake Ginninderra;
- A series of view corridors connecting views between Lake Ginninderra and Reservoir Hill (through College Creek open space);
- The introduction of landscaped earth mounds at the southern end of Road 01 to reduce the visual impact of the substation on this important entrance road.

Links with the Past

- The travelling stock route has been preserved and integrated into the urban fabric. New plantings have been introduced to strengthen and unify this historic landmark. Its extension through Block AX will establish a strong sense of place and assist way finding. Refer also Section 4 Landscape Master Plan;

Parks for People

- A major waterside park along the foreshore of Lake Ginninderra to the North of Stage 2B will incorporate the significant stands of exotic trees and eucalypt plantation in the north-west corner of the estate. The park includes a plaza on the view corridor from Road 01, a children's playground, toilet block, a timber jetty with seating and kayak/canoe launching pads.
- This area includes emergency access and landscaped areas with native grasses to reinforce existing Natural Temperate Grasslands to the north. Refer Section 4.5 Management Strategies including for vegetation.

Environmental Sustainability

- Sections and blocks have been oriented to meet the proposed solar access provisions in the Territory Plan and where required in the Estate Development Code. This will facilitate energy efficient housing outcomes permitting the economic introduction of active and passive solar energy solutions;
- The preservation of a 30m wide grassland buffer along the boundary with Lawson North - BNTS land except adjacent to Lake Ginninderra where existing planting of eucalypts is present.
- The retention of a significant number of existing trees including trees along the travelling stock route, and trees within the Lake Ginninderra foreshore park. Refer to Section 4.4 Tree Survey and Retention;
- The treatment of all site derived stormwater to reduce pollutant loads to national water quality targets resulting in improved water quality for site discharge to Lake Ginninderra and to the Lawson BNTS. This includes the protection and rehabilitation of existing wet meadow floodplains along College Creek, the introduction and integration of constructed wetlands from Stage 1 as well as bioretention raingardens in public open space, and the introduction of bio-retention systems in all higher density housing typologies. In addition to improving water quality these systems will enhance landscape amenity.

Community Facilities

- 10,008m² is provided for community facilities across two sites: Section AF Block a, and Section AH Block a. The sites are located in close proximity to the major collector road, College Creek recreation corridor, the centre of the Estate and mixed use development. The cycle/pedestrian path network converges on the site;
- A Central neighbourhood playground is provided adjacent the urban plaza in Stage 2B to service the surrounding high density and commercial development, and the wider community.
- A outdoor hardcourt facility is proposed as part of this EDP Amendment adjacent to the neighbourhood playground.
- The existing Lake Ginninderra circuit will be enhanced through its extension along Lake Ginninderra foreshore within Lawson Stage 2B and connection via future pedestrian bridge (by others) over Lake Ginninderra to existing shared path network within Lawson Stage 1. A new circuit will be developed for the whole of the Lawson Residential Estate from Lake Ginninderra foreshore up College Creek corridor and its associated wetlands, into Reservoir Hill, north along the visual axis connecting the former Belconnen Naval Transmitting Station, including visual axis from Reservoir Hill and Black Mountain Tower and then west along the northern boundary via the street network with views out over the Natural Temperate Grasslands until the trail connects back to Lake Ginninderra foreshore. Stage 2B implements the final links of this circuit between Stages 1 & 2.

Cycle and Pedestrian Paths

The street layout and associated paths encourage walking and cycling in a network that is safe and accessible for pedestrians and cyclists. Pathways include:

- Dedicated on road trunk cycle paths following the alignment of the major and minor collector roads (Roads 01 & 02/Stockman Avenue) connecting from Kaleen through to Ginninderra Drive at Kangara Waters. The proposed Stage 2 works will enable the completion of the on road trunk cycle path with the connection to Stockman Ave.
- As part of the Lawson Residential Estate – Stage 1 approvals, a trunk cycle path commencing at the Allawoona Street intersection, running parallel with College Creek, skirting the wetland and associated potential future community gardens and continuing along College Creek through to Lake Ginninderra was approved. As part of the Stage 2B works, the trunk cycle network is extended from the Lawson Stage 1 open space network into the future Lake Ginninderra foreshore open space areas.
- A trunk cycle path running around the Lake foreshore connecting to a future proposed bridge (by others) over the northern arm of the Lake and into the existing underpass at Ginninderra Drive;
- Footpaths around high and medium density housing packages that will link with trunk cycleways and other lower order pathways;
- As part of this EDP Amendment, several of the proposed pathways have been widened, including the shared path around the lake edge widened to 3m. No pathways have been removed or reduced in width since the previous EDP approval.

Public Transport

- The major and minor (Road 01 and Road 02) collector roads will allow for Transport Canberra bus travel connecting the intersection of Ginninderra Drive/Aikman Drive in the south west with Baldwin Drive/Maribyrnong Avenue in the north east. Bus stops will be located to facilitate access to future commercial and community facilities within the estate and provide a convenient service to all parts of the estate.

  In previous consultation with Transport Canberra, an additional bus stop was located adjacent to proposed Sections AB and AG (Evoenergy substation). There are no changes to bus stop locations as part of this EDP Amendment.

  Through the previous design review of each location, it was determined that the best location for the additional bus stop was adjacent to proposed Sections AB'b' and AG (Evoenergy substation). Further correspondence with TCCS/ACTION Buses has confirmed the location of this bus stop is satisfactory. Refer to email correspondence within Appendix N dated 18/05/2017 at 10:30am.

  Drawing 50522050-RHP-01-530 shows the proposed bus stop locations along Road 1 and Road 2 of the estate.

2.2 Block Yield

Lawson Residential Estate has been designed for a diverse and vibrant community providing a range of dwelling types in accordance with the Concept Plan. **Table 1** provides a block summary as per the *Guidelines for the Preparation of Estate Development Plans* (refer also Block Typology Plan).

For this EDP Amendment submission, the Block Yield has reduced (since the previous EDP Amendment) due to the reduction in block area because of retaining the 132kv overhead power lines.

The Lawson South Concept Plan allows for a maximum of 1850 dwellings but allows for an increase in the dwelling yield above this limit, provided the following can be demonstrated:

a) that there is sufficient capacity in the infrastructure, services and the local and arterial road networks.

The services, infrastructure and local roads will be designed to cater for the increased dwelling yield as part of the development. The trunk services surrounding the development have sufficient capacity for the proposed dwelling yield.

The surrounding arterial roads have sufficient capacity for the proposed dwelling yields. However, the intersection of Road 01 and Ginninderra Drive will have insufficient capacity to cater for the wider road network in 2031. This intersection was analysed in the traffic report and design notes attached in **Appendices G** and **J** and the results provided to RoadsACT for further consideration as a separate Capital Works item.

b) that a range of dwelling types and densities are provided to accommodate varying lifestyle, housing needs and choice to cater for changing demographics and improving housing affordability.

Table 1 Block Summary – Lawson Stage 2B

BLOCK SIZE	NUMBER OF BLOCKS	PERCENTAGE OF TOTAL
MU (Multi Unit Sites)	4	50%
CFZ (Community Facility)	2	25%
CZ5 (Mixed Use)	2	25%
TOTAL	**8**	**100%**

2.3 Planning Drawings

Building Envelope Plan

To be read in conjunction with drawing *NonSpec160 - DIP Sheet 01* to *02 Development Intentions Plan.*

The Development Intentions Plans show the built form outcome achievable in the Estate based on block size, orientation, street context and proposed zoning. The Development Intentions Plans show notional building footprints and demonstrate that dwellings can be provided with suitable orientation to the street and open space frontage, maximise solar access and allow appropriate vehicular and pedestrian access. Shadows are cast at midday on the winter solstice. An indicative location for private open space is shown.

Land Use Plan

To be read in conjunction with drawing *LUP-501 Land Use Plan.*

Stage 2B of the Lawson Residential Estate is contained within a *Future Urban Areas Overlay.* The proposed land use zoning for the Estate is generally consistent with the current Territory Plan zoning and the development shown in the *Lawson South Concept Plan.* Zoning in Stage 2B includes RZ5 High Density Residential Zone, RZ4 Medium Density Residential Zone, CFZ Community Facility Zone, CZ5 Mixed Use Zone, PRZ1 Urban Open Space Zone, TSZ1 Transport Zone and TSZ2 Services Zone. The TSZ2 blocks within Section AG are for Evoenergy and are based on boundary alignments agreed with Evoenergy.

Energy Audit

To be read in conjunction with drawing *NonSpec160 – DIP Development Intentions Plan.*

In accordance the *Estate Development Code* the Lawson Stage 2B subdivision has been assessed under the solar access requirements of the *Multi-Unit Development Code.* Multi-unit sites are compliant the *Estate Development Code*, as demonstrated on the Development Intentions Plans.

Planning Controls Plan

To be read in conjunction with drawing *NonSpec160 – PCP Planning Controls Plan.*

The Planning Controls Plans (PCP) include the following proposed amendments to the Territory Plan for uplifting to the Precinct Code.

Bushfire Affected Blocks

To be read in conjunction with drawing 50522050-BFP-01 *Bushfire Risk Assessment and Management Plan.*

Blocks that require special bushfire construction in accordance with AS 3959 are identified in the above mentioned plan. These blocks have been identified by a Bushfire Risk Assessment and are subject to the *Residential Zones Development Code*.

An updated Bushfire Risk Assessment Report was prepared for this EDP Amendment (refer Appendix A).

Acoustic Impacted Blocks

To be read in conjunction with drawing *NonSpec160 – PCP Planning Controls Plan.*

A noise assessment was undertaken as part of the development of the Concept Plan that identified acoustic requirements for blocks adjacent to Ginninderra Drive and Baldwin Drive. Noise mitigation measures will need to be applied at the identified dwellings in the above-mentioned drawing.

Multi-unit blocks will be subject the *Multi Unit Housing Development Code.* Multi-units constructed within the blocks identified in the above-mentioned drawing will need to comply with AS/NZS 2107:2000, AS/NZS 3671 and the *ACT Environment Protection Regulation.*

Any block prepared for sale as a supermarket within the estate of Lawson Stage 2B must ensure the loading dock is designed to accommodate forward-in and forward-out truck movements through an acoustically sealable loading dock. This is to ensure trucks and activities associated with unloading for supermarket goods are able to be compliant with the noise zone standard.

All commercial zone leases for sale as mixed use sites shall have a lease clause requiring any use listed under the Commercial Zones Development General Code be required to be operated in accordance with a noise management plan endorsed by the EPA.

Dwelling Height

To be read in conjunction with drawing *NonSpec160 – DIP Sheet 01 to 02 Development Intentions Plan.*

A minimum 2 storey dwelling height is proposed on RZ4 multi-unit blocks within the Estate (as implemented in Stage 1). This minimum dwelling height will maximise density to areas of high amenity including bus routes and community facilities (such as Lake Ginninderra and the College Creek Corridor). The minimum dwelling height will visually reinforce the road hierarchy in the Estate and mark entries to assist orientation and way finding.

A minimum and maximum dwelling height is proposed on RZ5 multi-unit blocks. A two storey minimum dwelling height achieves the same objectives as outlined for RZ4 sites. A six storey maximum dwelling height allows for a higher density development adjacent Lake Ginninderra as envisaged by the Concept Plan, and removing any confusion that may be caused the *Multi Unit Housing Development Code.*

The *Commercial Zones Development Code* is silent on maximum dwelling heights. The maximum dwelling height proposed on the CZ5 site provides certainty of development outcomes surrounding this key site within the Estate.

The proposed 4-storey maximum ensures place-making roles are achieved, whilst acknowledging the intention of the Concept Plan. The control would be read in conjunction with R34 of the *Lawson South Concept Plan (2011),* which sets a minimum building height of three storeys.

Commercial Frontage

An additional control is proposed to be read in conjunction with R35 of the *Lawson South Concept Plan (2011).* The proposed control ensures that commercial uses are concentrated on Road 02, activating this important element within the estate. The commercial development will then be highly visible from the proposed adjacent bus stops, on road cycling, the wider verge with large street tree plantings, on-street parking, northern aspect and prospect out over Lake Ginninderra.

2.4 Street Lighting

Underground electricity reticulation and street lighting will be designed in accordance with the current Design Standards for Urban Infrastructure and Evoenergy guidelines.

All local access roads will be designed to Category P4. The street light types proposed for Lawson Residential Estate shall be equal to and compatible with the street light selection for recent new developments. The pole spacing, regardless of the eventual pole type, will be similar to current street light systems.

The major collector roads will be designed with Category V5 lighting.

The streetlight poles have been positioned 1.9m behind the kerb line on roads. This is in accordance with the Evoenergy requirements for locations of streetlights in laneways and main roads. For consistency throughout the development, a standard distance behind the kerb line has been adopted for all roadways with the exception of the streetlight location adjacent to indented parking bays where a 600mm distance from the kerb is proposed.

The detail design will further consider the location of lighting, driveways and street trees.

2.5 Road Hierarchy & Traffic

To be read in conjunction with drawing *50522050-RHP-01 Road Hierarchy Plan.*

Lawson Residential Estate is bounded by Baldwin Drive to the east and Ginninderra Drive to the south. The three points of entry/exit to the development have already been constructed as part of the ACT Government's Capital Works program. These intersections and the ultimate dwelling numbers (1190 - 2070 dwellings) are generally consistent with the *Lawson South Concept Plan* (2011).

A road hierarchy and traffic analysis report were prepared in order to assist in the road and intersection design of Lawson. The key objectives of the study involved an assessment of the likely traffic generation of the estate upon full release and consideration of the route taken by residential and commercial traffic movements, both within and external to the estate. The provision of pedestrian, cyclist and public transport infrastructure has also been considered, benchmarked against the relevant Territory goals.

Key features of the road hierarchy plan include:

i) An extension to the east-west minor collector road (Road 02) which continues on from Lawson Stage 1 - Stockman Avenue which is currently under construction, facilitating a bus route and providing the principal distributor for residences located in the central portion of the estate;
ii) A north-south major collector (Road 01, connecting to Road 02 at its northern extent) which in addition to facilitating external traffic to/from Stage 1 of the estate, services commercial and community facilities adjacent to this corridor;
iii) An interconnected permeable network of lower order residential streets.

High-density residential and mixed-use development is well served by the proposed public transport route and has good pedestrian and cyclist permeability and connectivity. While Stage 1 does not form part of this EDP the traffic generated from stage 1 was analysed as part of this stage of the development.

Significant capacity constraints exist on Ginninderra Drive, and the external road environment is forecast to be under significant pressure in the vicinity of the site during peak periods beyond 2022. This is primarily due to the University of Canberra redevelopment and growth, the ultimate contribution from the Belconnen Naval Transmitting Station, Lawson Stages 1 & 2 and background growth. Care needs to be taken during the detailed design phase to ensure that queues developing on the northern approach to Ginninderra Drive / Aikman Drive / Road 01 do not significantly impact upon access arrangements into the development.
It was advised by EPSDD within correspondence dated 15/03/2018 that Road 30 may fall within the Future Urban Areas location provided it remains categorized as Local Access B and not increased to Collector status. However, the 80m offset to the lake to road reserves must be complied with. Refer to **Appendix N** for copies of this correspondence.

During the detailed design process, Local Area Traffic Management (LATM) measures will be considered to passively re-enforce the speed environment of Road 02.

TCCS has provided in-principle endorsement of the Lawson Stage 2B EDP proposed infrastructure within correspondence dated 16/04/2018, refer **Appendix N**.

In a meeting on 1/03/22, TCCS provided comments in support of the 1st intersection on Road 01 being changed to a roundabout and the disconnection of Road 31 through to Stage 1 subject to traffic modelling confirmation. Refer minutes of meeting included within **Appendix N**.

The updated Transport Impact Assessment is attached in **Appendix G**.

2.5.1 Proposed Road Network Carriageway Widths

As part of the process to prepare the EDP for Lawson Stage 2B to respond to the Estate Development Code (EDC), several issues have emerged between the original design intent of Lawson Residential Estate under the former Residential Subdivision Development Code and a number of requirements of the current EDC.

The revised EDC demands a range of road design variations, effectively increasing some road categories and consequently, design speeds, traffic volumes and road width requirements.

Stage 2B is the western portion of the Lawson Residential Estate, and connects to the current approved Lawson Stage 1 development. A number of design elements adopted in the Lawson Stage 1 EDP Planning Response Report, and the overall Lawson Estate Concept Master Plan identified the intent of the Stage 2B area, and has previously been refined through consultation with Government Agencies over two circulations of the Stage 1 EDP.

Through consultation with TCCS Asset Acceptance in 2014-2015, a Code comparison was undertaken which formed a Discussion Paper (attached in **Appendix J**), and identified that the continuation of the road network from Stage 1 into Stage 2B has been developed with reference to the 'Residential Subdivision Development Code', the 'Estate Development Code', Austroads and relevant codes for clearances to services. Through the Discussion Paper findings, it was agreed (June 2014) that the road network widths as designed reflected the high density urban form, and is consistent with increased pedestrian and cyclist usage whilst ensuring that cars, buses and other vehicles can be accommodated in a safe and efficient manner. The outcomes of this discussion paper and consultation was further confirmed with TCCS during the recent meeting dated 16/03/2017 and minutes are included within **Appendix N**.

2.5.2 Proposed Intersection Treatments

Further to the agreement that the road carriageway network was acceptable, TCCS Development Review and Coordination (DRC) had indicated a desire to avoid four-way intersections in place of roundabout treatments. It was agreed that TCCS DRC would reconsider the intersection treatments with further Traffic Engineering modelling on the following assessment criteria.

i) The Four-way intersection would not cause undue vehicle queue lengths compared to roundabouts
ii) A satisfactory level of service could be maintained for the four-way intersections
iii) Show that combined vehicle, pedestrian, and cyclist movements would not be reduced with the use of four-way intersection treatment.

In addition to the vehicle movements through each intersection being reviewed, both pedestrians and cyclist movements were assessed with an approximate user volume. This estimate of pedestrian and cyclist movements does not take into account the recently announced University of Canberra upgrades including the University Hospital, which we would expect to increase the localised pedestrian and cyclist movements.

To ensure that a high degree of safety is maintained for pedestrians and cyclists, traffic calming devices such as the Roads 01 & 02 central median islands, a proposed raised pedestrian crossing located along Road 02 in front of Section AD, and the provision of speed restriction signage along the bus corridor (Roads 01 & 02), would support the use of priority controlled intersections.

TCCS DRC have reviewed the Design Note (June 2014) and advised that four-way controlled intersections are acceptable for Lawson Stage 2 (Minutes of Meeting: 22 August 2014). This advice was reconfirmed acceptable within the meeting with TCCS dated 16/03/2017. However, this advice has been modified by TCCS as detailed within the meeting minutes with TCCS dated 6/9/2017.

A subsequent meeting on the 1/03/22 with TCCS flagged the option of a roundabout at the Road 01/Road 30/Road 31 intersection which was support in-principle.

The updated intersection requirements include the following:

1. Road 01 / Road 30 / Road 31 Intersection: Proposed as a roundabout in this EDP Amendment changed from the previous 4 way intersection.
2. Road 01 / Road 32 Intersection: Proposed as a roundabout consistent with the previous EDP approval.

Refer meeting outcomes of 1 March 2022 (**Appendix N**).

2.5.3 Proposed Intersection Turning Paths

All vehicle turning movements (using AUSTROADS Design Vehicles and Turning Templates) enable turns in a single forward movement can be accommodated in accordance with Rule 97 of the *Estate Development Code*.

We note that the proposed intersection of Roads 30 complies with Rule 97 - Part b, in that Road 30 (access street), provides a turning path radius of at least 12.5m for a heavy rigid vehicle, using any part of the pavement, in accordance with the Australian Road Rules.

2.6 Stormwater

The proposed stormwater system for the development will be based on the design requirements set out by the TCCS Design Standards for Urban Infrastructure, Section 1. The stormwater system will be a conventional drainage network consisting of a 5 year Average Recurrence Interval (ARI) capacity piped minor system overlain by a 100 year ARI major overland flow system.

2.6.1 Proposed Stormwater Infrastructure

All roads have a minimum 3% one or two-way crossfall and 2% crossfall towards the kerb lines on abutting verges for efficient drainage to the pipe network. Spacing of inlet sumps, manholes and minimum cover over pipelines is in accordance with the TCCS infrastructure standards. The roadway system has also been designed as an overland flow system to convey flows in excess of the pipe network up to and including the 100 year ARI. Overland flow depths and velocities have been limited to comply with flow stability criteria for vehicles and pedestrians and freeboard requirements to prevent inundation of adjacent blocks.

Stormwater flow details are provided on *Stormwater Masterplan Drawing 50522050-SWM-01*.

The downstream end of the various pipe networks within the development drain through College Creek into Lake Ginninderra at five different locations, in addition to two discharge locations directly into Lake Ginninderra. Catchment

nodes G01, G02, E01, D05, and F02discharge to College Creek. Catchment nodes B01 and C01 discharge directly to Lake Ginninderra.

Three Gross Pollutant Traps will be constructed as a part of Stage 2. One Rocla CDS Units - GPT will be located near the intersection of Ginninderra Drive/Aikman Drive servicing the stormwater runoff from part of Road 01 and Sections AK & AX as part of Stage 2A. Two SPEL Ecoceptor GPTs 8000 will be located to the north of Stage 2B near the Urban Plaza servicing the catchment of part of Road 01 and Roads 02 & 32, in addition to Sections AC, AD,, AF and AH.

2.6.2 Overland Flow Management

The proposed overland flow catchments grade towards College Creek and Lake Ginninderra.

A 90m section of College Creek between Section AD and AH is being realigned to accommodate the proposed development layout. This realignment allows for a perpendicular Road 02 crossing of the creek and creates useable open space areas for recreation purposes.

2.6.3 Creek Flow Management

The creek running through Lawson from Ginninderra Drive to Ginninderra Creek has been modelled using xpswmm to determine 1% AEP flows in the creek for both pre-development and post-development conditions. The reach of the creek from Ginninderra Drive to Wanderlight Ave was modelled in 1D whilst the downstream reach to Ginninderra Creek was modelled in 2D. The 1% AEP flood extents and depths for both pre-development and post-development conditions are shown in Figures 1 and 2 respectively.

The maximum 1% AEP flow discharging into Ginninderra Creek under pre-development conditions has been estimated to be 39 m3/s. Under post-development conditions, flow attenuation measures will be provided within the creek to reduce 1% AEP peak flows entering Ginninderra Creek to pre-development levels. The xpswmm modelling indicates that this can be achieved by providing flow training walls and weirs at various locations within the creek alignment (refer Figures 2 and 3) and by restricting the width of the two Stage 2B road bridge crossings over the creek. The preliminary cross section profile for both bridges is shown in Figure 4.

The configuration and sizing of the flow attenuation measures will be finalised during detailed design.

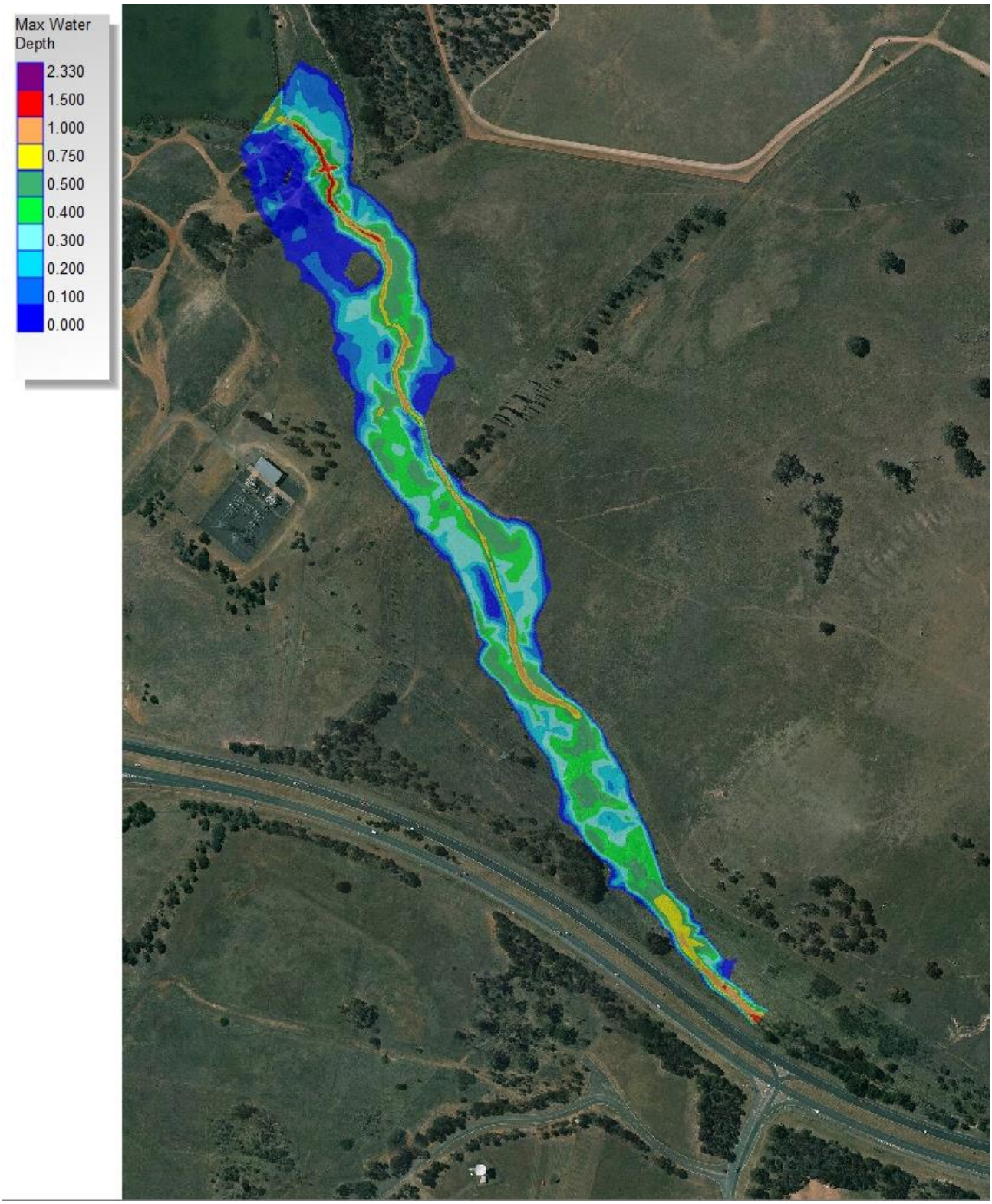


Figure 2 – 1% AEP Flood Extents – Pre-Development Conditions

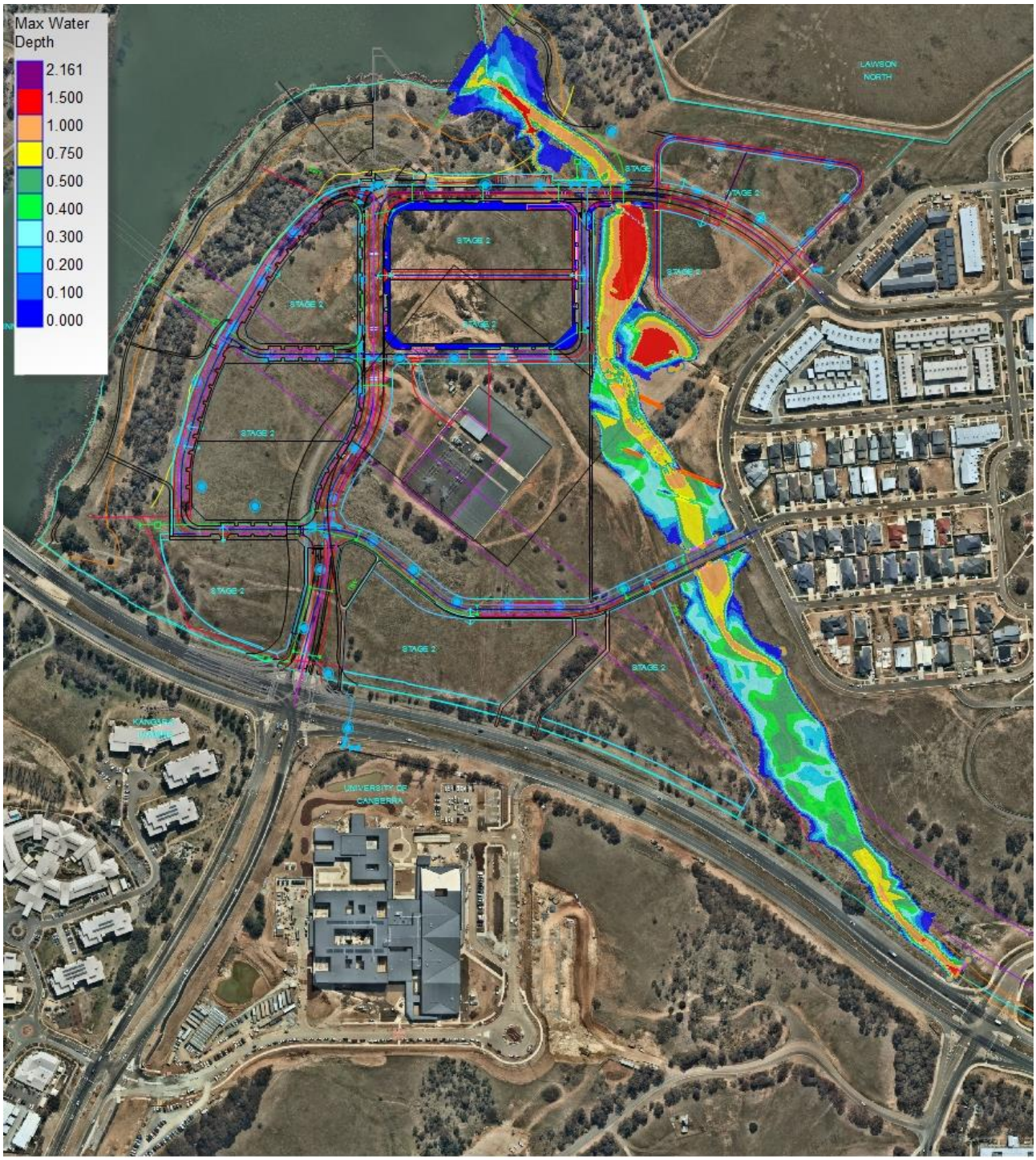


Figure 3 – 1% AEP Flood Extents – Post-Development Conditions

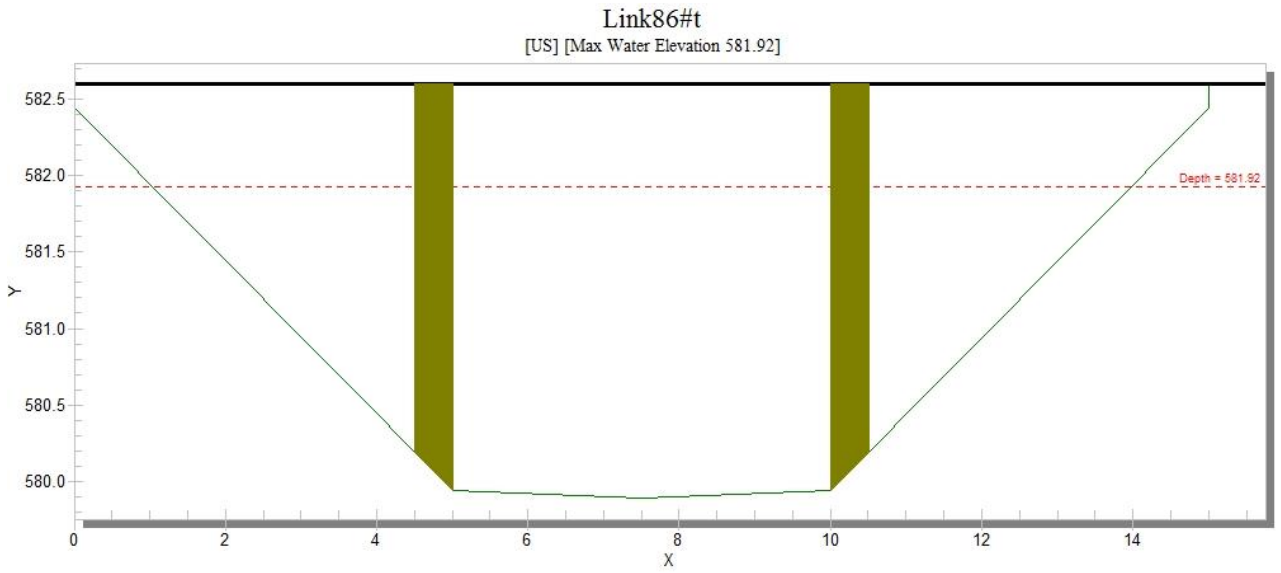


Figure 4 – Preliminary Bridges Cross Section

2.6.4 Sediment Control during Construction

Appropriate erosion and sediment control measures will be implemented prior to construction activities occurring to minimise the amount of suspended soil particles leaving the site.

An erosion and sediment control plan, approved by the EPA, will document the necessary measures including the treatment of stockpiled material, temporary sediment control ponds and the use of hay bales and silt stop fences in water courses.

Discharge from sediment control ponds will only occur when the water is clarified to below 60mg/l of suspended solids.

2.7 Water Sensitive Urban Design

Statutory Requirements

WSUD approaches seek to facilitate sustainable urban development by reducing use of mains water, reducing treated effluent discharge and stormwater runoff, reducing water quality impact on urban waterways and downstream receiving waters. In addition to these water-focused outcomes, WSUD aims to protect or enhance other social amenity and design values traditionally accommodated in the planning process.

The ACT Government's ***Waterways: Water Sensitive Urban Design General Code, February 2020*** provides a methodology for the implementation of WSUD in the ACT to assist in achieving the specific targets. The Waterways guideline applies to development and redevelopment on sites across all zones of the Territory Plan that::

- are currently connected or intended to connect to the mains water supply; or
- Are likely to alter the stormwater regime of the site

The Code states the following mandatory targets for mains water use reduction and for stormwater quality and quantity management.

1. 40% reduction in mains water usage (compared to 2003 water usage levels);
2. 90% reduction in average annual Gross Pollutants (GP) export load;
3. 60% reduction in average annual suspended solids (SS) export load;
4. 45% reduction in average annual total phosphorus (TP) export load;

5. 40% reduction in average annual total nitrogen (TN) export load;
6. Reduction of peak flows to pre-development levels for ARIs ranging from 5 year to 100 year.

These targets must be met for all new developments and redevelopments. The Code describes a broad range of measures that can be utilised to achieve these targets and identifies a number of assessment tools that can be used to demonstrate that the targets are being met.

Preliminary WSUD Strategy – AECOM 2010

In 2010 AECOM Design and Planning were engaged by the Land Development Agency (LDA) to develop a preliminary Water Sensitive Urban Design (WSUD) and Stormwater Management Strategy to guide the master planning for Lawson.

The strategy was intended to identify water management opportunities and constraints that would be embedded into an urban design master plan for the site. The preliminary WSUD Strategy addressed water management issues including:

- rehabilitation and protection of waterways and receiving environments;
- stormwater quality requirements (treatment methodology and nominal sizing);
- the potential for re-using treated stormwater and harvested rainwater;
- the integration of stormwater treatment within the landscape;
- demand management for potable water conservation and wastewater minimisation; and
- the liveability and sustainability of future development.

The 2010 preliminary strategy (AECOM) was based on precinct scale stormwater harvesting and reuse, employing Lake Ginninderra as natural storage.

As part of the development, it was also proposed to modify the existing College Creek corridor. This included the protection of the existing area of wet meadow habitat, rehabilitation of the intermediate currently degraded section and construction of a dedicated flood channel for the downstream reach. These works were intended to stabilise and rehabilitate College Creek in order to improve the health and amenity of the waterway and to safely convey the 100 year ARI (Q100) flood event with allowance for discharge from the external catchments. The proposed treatment of stormwater from the planned development does not rely on these works to meet the stormwater quality objectives.

Assessment of WSUD Strategy

In preparing this EDP, Cardno has undertaken further assessments to refine the components and size of WSUD measures identified in the preliminary strategy (AECOM). Both Lawson Stage 1 and 2 are discussed as both stages are integral to the ultimate water quality outcomes for the estate. Using a more detailed lot layout with refined assessment of impervious and pervious surfaces allowed further consideration to be given to the opportunities to meet the increased potable water reduction targets.

The preliminary assessment considered reuse of water from Lake Ginninderra. This approach was reconsidered during the finalisation of the WSUD strategy and resulted in the adoption of a final strategy to meet the potable water reduction targets through the installation of rainwater tanks on residential and possibly medium and high density developments.

Potable Water Demand Reduction

An assessment was undertaken of the opportunities to achieve increased potable water reductions 20% greater that the ACT target of a 40% reduction in potable water use, i.e. a 48% reduction in potable water use. This assessment sought to establish:

- Whether with water efficient fittings, water efficient appliances and rainwater tanks it is possible to achieve a 48% reduction in potable water demand for single dwelling residential demand;

- Whether with water efficient fittings, water efficient appliances and either a series of small rainwater tank or a consolidated community rainwater tank it is possible to achieve a 48% reduction in potable water demand for medium and high density units;

The potential water savings for residential and medium and high density sites were assessed using BASIX.

The assessment of potential potable water savings for single residential and equivalent medium and high density lots were based on the properties summarised in Table 3. The assessment of medium and high density lots was undertaken by subdividing a medium density or high density lot into a series of equivalent number of smaller lots that would each have two occupants. The properties of each equivalent small lot were calculated as a ratio of two occupants to the total number of occupants multiplied by the lot size, roof area, etc. (refer Table 3).

Table 3 Adopted properties for Residential, Medium and High Density Development

	Average Lot Size (m2)	Roof Area (m2)	Other Paving (m2)	Lawn and Garden (m2)	Contributing Roof Area (m2)	Number of Occupants
Single Residential	559	252	56	252	150	2.5
Medium Density	12,925	7,755	3,231	1,939	3,878	230
Medium Density equivalent lot for two occupants only	112	67	28	17	34	2
High Density	10,186	6,111	2,546	1,528	3,056	265
High Density equivalent lot for two occupants only	77	46	19	12	23	2

BASIX was used to assess an average residential lot and average equivalent lots for medium and high density sites.

Medium and High Density Development

Specific to Lawson Stage 2B, it was found that medium density and high density developments could achieve a 48% reduction in potable water usage if the following measures were implemented:

- Shower heads – 3 star (3 star required to achieve 40% reduction in potable water usage)
- Toilets – 5 star (4 star required to achieve 40% reduction in potable water usage)
- Kitchen taps – 6 star (5 star required to achieve 40% reduction in potable water usage)
- Bathroom taps – 6 star (5 star required to achieve 40% reduction in potable water usage)
- Rainwater Tank – 1.5 kL supplying water for garden and lawn watering and toilet flushing. The overall volume of a consolidated community rainwater tank for medium or high density sites would be governed by the following relationship: ***1.5kL x [total number of occupants]/2***.

Water Quality Objectives

ACT Stormwater Treatment Objectives

The objectives for stormwater quality management will be achieved by the combination of works undertaken by the ACT Government, through its capital works program, and by Government or the private sector through works undertaken in new developments and redevelopments (2020 Waterways Water Sensitive Urban Design General Code).

The responsibility for meeting targets on development or redevelopment sites lies with the developer (Government or private) or builder. Responsibility for meeting the regional or catchment-wide targets lies with the Government.

The final adopted targets are shown in Table 4. They refer to reduction in pollutant export compared to an urban catchment with no water quality management controls.

Table 4 Final Adopted Targets for Reduction in Average Annual Pollutant Exports (ACTPLA, 2020 Waterways WSUD General Code)

	Development or Redevelopment Site
Reduction in average annual Gross Pollutants (GP) export load	90%
Reduction in average annual total suspended solids (SS) export load	60%
Reduction in average annual total phosphorus (TP) export load	45%
Reduction in average annual total nitrogen (TN) export load	40%

Catchment Based Water Quality Modelling

The aim of the catchment based water quality assessments was to assemble a MUSIC model for planned future conditions, drawing on the models assembled by AECOM in 2010 with a more detailed lot layout and assessment of impervious and pervious surfaces. The model(s) were run to estimate the size of water quality measures required to meet the adopted stormwater quality targets for the Lawson Residential Estate as a whole.

MUSIC version 6.2 was adopted for the current assessments.

Land Use

The subcatchment areas and their estimated imperviousness under planned Future Conditions that were adopted are in accordance with the Design Impervious Area Guidelines in MIS08 – Stormwater which stipulate a 70% design impervious area for Multi-Unit and Commercial sites.

Rainfall/Runoff

The 2010 preliminary strategy was assessed using continuous records of rainfall data (at six-minute intervals) which were obtained from Canberra Airport for the periods of:

- 1997-2006. The mean annual rainfall over this period was 510 mm/year and the evapotranspiration was 1201 mm/year.
- 1968-1977. The mean annual rainfall over this period was 655 mm/year and the evapotranspiration as 1116 mm/year. This broadly reflects the long term average for the Canberra region.

The current assessment has analysed the 10 year period from 1968-1977, as did the preliminary study undertaken by AECOM (2010).

Water Quality Parameters

The Event Mean Concentrations (EMCs) used by AECOM in the modelling of the preliminary strategy were the default MUSIC parameters. These parameters apply a mean and standard deviation for GP, TSS, TP and TN (for both base and storm flows) and stochastically generate concentration profiles during modelled events. AECOM (2010) stated that the input means and standard deviation were consistent with the stormwater quality distribution as shown in Australian Runoff Quality (ARQ) and are based on a comprehensive review of over 700 statistically valid water quality sampling studies from around the world.

Stormwater Harvesting

It is proposed to meet the potable water reduction targets for the Lawson Residential Estate through the installation of underground stormwater retention tanks on each of the individual lots within the development sized in accordance with the requirements of 1.4kL/100m^2 of impervious area from the ACT Multi-Unit Housing Development Code. Consequently, stormwater harvesting was included in the MUSIC model in the form of rainwater tanks..

Treatment Measures

The 2010 preliminary strategy was based on constructing a number of wetlands and distributed bioretention systems to treat stormwater (to achieve nationally recognised best practice pollutant removal). These treatments included a combination of a number of wetlands and distributed bioretention systems including tree pits, rain gardens and bioswales. The measures adopted as part of the final strategy include Gross Pollutant Traps (GPTs), tree pits, wetlands and bioretention systems. The updated strategy for Stage 2B consists of similar treatment measures as the original 2010 strategy. These treatments include a combination of distributed bioretention systems, including tree pits and raingardens, stormwater retention tanks, and Gross Pollutant Traps (GPTs). As Stage 2A and Stage 2B are located within the same catchment, the treatment devices proposed for Stage 2A were considered as well.
These systems were represented as follows:

Assumed GPT Characteristics

Stage 2A

The capture of pollutants by a CDS unit, or similar trap was guided by the performance data given in Figures C-2, C-3 and C-4 for TSS, TP and TN given in the 2005 User Guide for MUSIC Version 6.2.

Each CDS trap was modelled with a high flow bypass = 5 m^3/s

Stage 2B

The capture of pollutants by a SPEL Ecoceptor 8000 (GPT) or similar achieves the required performance with the following characteristics:

- 95% GP Removal;
- 71% TSS Removal;
- 69% TP Removal;
- 47% TN Removal; and
- 0.22m^3/s high flow bypass

Assumed Biofilter Characteristics

The following assumptions were adopted when conceptually sizing biofilters:

- The extended detention depth is 0.2 m;

- The filter area is 90% of the surface area;
- The filter depth is 0.6 m;
- The filter media is loamy sand;
- The saturated hydraulic conductivity is 100 mm/hr;
- The filter media TN content is 800 mg/kg;
- The filter media has < 5% organic material;
- The filter media has <55 mg/kg of orthophosphate; and
- There is no submerged zone.

Assumed Stormwater Tank Characteristics

The following assumptions were adopted when conceptually sizing the stormwater tanks:

- A minimum requirement of 1.4kL per 100m^2 of impervious area has been assumed based on the requirements from the ACT Multi-Unit Housing Development Code;
- The stormwater tanks have a depth of 2m; and
- The stormwater tanks are considered to be half full for the purposes of stormwater quality modelling.

MUSIC Model

A modified MUSIC model for planned Future Conditions was assembled by drawing on the models assembled by AECOM in 2010 and based on the model properties described above.

Refer to **Figure X** below for the final MUSIC Model.

MUSIC Results

The performance of the treatment trains for subcatchments in the Lawson Residential Estate Stage 2 is given in Table 5.

Figure 5 MUSIC Model

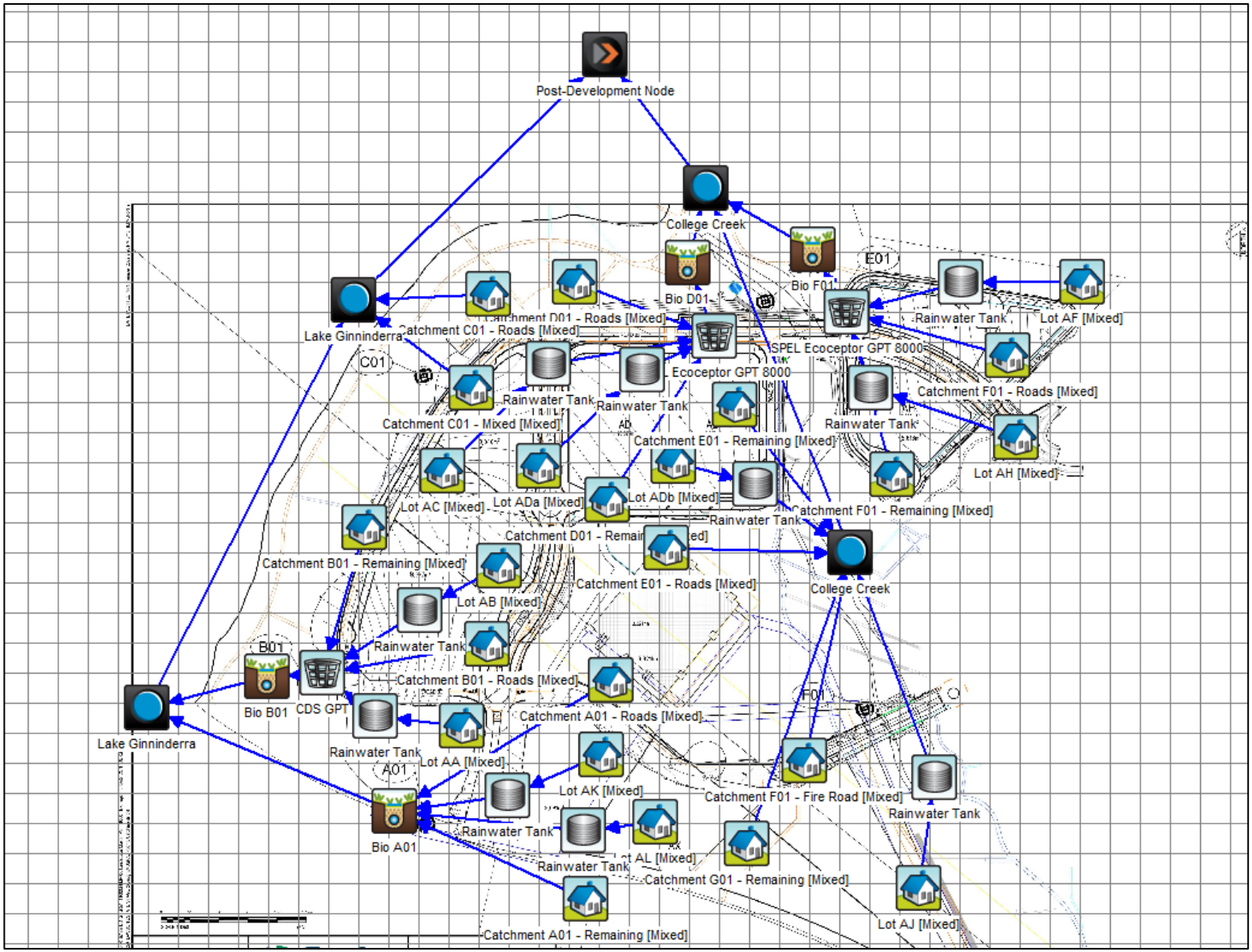


Table 5 Summary of the Lawson Stage 2 MUSIC Model

MUSIC Results for Target Pollutants				
Pollutants	**Untreated Development**	**Required Reduction Targets**	**Treated Development**	**Achieved Reductions**
Total Suspended Solids (kg/yr)	9830	60%	2830	**71%**
Total Phosphorus (kg/yr)	20.1	45%	10.4	**48%**
Total Nitrogen (kg/yr)	170	40%	102	**40%**
Gross Pollutants (kg/yr)	2090	90%	160	**92%**

It will be noted that the size of bioretention and wetlands is less than the sizes previously estimated by AECOM, 2010. This is attributed to the overall imperviousness of the development, which is substantially less than the AECOM model, the change in the GPT products selected, and the inclusion of stormwater tanks.

It is concluded that in subcatchments discharging to the BNTS site, College Creek and Lake Ginninderra, that the treatment trains deliver reductions in average annual pollutant exports that exceed the Development Targets given in the 20020 Waterways Water Sensitive Urban Design General Code and met or exceed the nationally recognised best practice "stretch" targets.

Proposed WSUD Strategy

Assessments were undertaken to refine the components and the size of WSUD measures identified in the 2010 preliminary strategy based on a more detailed lot layout and more detailed assessment of impervious and pervious surfaces.

The assessments also provided an opportunity to further consider the opportunities to meet the "stretch" potable water reduction target through the installation of rainwater tanks on single residential and possibly medium and high density developments. The increased potable water reductions are 20% greater than the ACT target of a 40% reduction in potable water use i.e. a 48% reduction in potable water use.

Two scenarios have been assessed:

Under Scenario 1 the stretch targets for potable water reduction would be met for single residential developments while the target for medium and high density development would be the target given in the 2009 WSUD General Code.

Under Scenario 2 the increased targets for potable water reduction would be met for single residential developments and medium and high density development.

The 2010 preliminary strategy was based on constructing a number of wetlands and distributed bioretention systems to treat stormwater (to meet increased stormwater treatment objectives). These treatments included a combination of a number of wetlands and distributed bioretention systems.

The measures adopted as part of the final WSUD strategy include GPTs, wetlands and bioretention systems. The location of these measures is shown on drawing WSUD – 01. The adopted sizes of these measures have been based on scenario 2 to meet the increased targets for potable water reduction for medium and high density developments.

As part of the overall development it is also proposed to modify the existing College Creek corridor. This includes the protection of the existing area of wet meadow habitat, rehabilitation of the intermediate currently degraded section and construction of a dedicated flood channel for the downstream reach. These works are intended to stabilise and rehabilitate College Creek in order to improve the health and amenity of the waterway and to safely convey the 100-year ARI (Q100) flood event with allowance for discharge from the external catchments. The proposed treatment of stormwater from the planned development does not rely on these works to meet the stormwater quality objectives.

2.8 Sewer

2.8.1 Proposed Sewer Infrastructure

To be read in conjunction with drawing *50522050-SMP-01 to 03 Sewer Master Plan*

The sewerage network for Lawson Stage 2B is divided into four separate catchments. Sections AA, AB, AK and AX(a) fall east to west and connect into the 525mm diameter existing trunk sewer near Lake Ginninderra and Ginninderra Drive. Approximately 240m of existing 375mm diameter trunk sewer main is to be relocated out of Section (AXb) and

reconnected back into the trunk sewer main to the east alongside College Creek in Section DB. Section AC flows north west and connects into the 525mm diameter trunk sewer main. Sections AD(a), AD(b), AF(a), AF(b), AG and AH grade towards the existing 525mm diameter trunk sewer main at the north of Stage 2B. Approximately 100m of the existing trunk sewer main is to be relocated outside Section AD.

ICON Water has previously advised that the trunk sewer has sufficient surplus capacity to accept the flows generated from the development of Lawson Residential Estate and has provided "in principle" approval for the re-alignment of the trunk sewer clear of Section AD.

The Equivalent Population (EP) in the medium and high density residential areas was estimated based on the maximum number of dwellings as dictated by the Territory Plan.

A separate submission of the Sewer Master Plan has been made directly to ICON Water under its formal approval process.

2.8.2 Existing University of Canberra Sewer Connection

In consultation with ICON Water and Rimmington & Associates who are acting on behalf of the University of Canberra, a peak sewer flow of 12.9l/s has been provided for the future University Hospital development. Cardno has included this peak flow into the Lawson Stage 2B sewer master planning between sewer nodes B-5 through to node B-1.

As advised by ICON Water, a DN 225 vitrified clay pipe is required for this section of the sewer network due to the nature of the Hospital flows.

2.9 Water

Stage 2B of Lawson Residential Estate is proposed to be supplied from three separate connections to the existing ICON Water supply network.

The first connection will involve a 225mm diameter water main connecting into the existing 300mm diameter water supply system in the southern verge of Ginninderra Drive at the intersection of Ginninderra Drive and Aikman Drive. Boring under Ginninderra Drive will be required to facilitate this connection.

Lawson Residential Estate is located within the intermediate zone serviced by the North Canberra, Weetangera and Aranda Reservoirs. The Weetangera and Aranda Reservoir TWL is 675 m, with proposed serviceable limits of between 585 m and 640 m. The North Canberra Reservoir TWL in 652m with PRV to 640m.

Fire flow category F6 "for residential areas" is predominant throughout Stage 1 of the Lawson Residential Estate with the F4 and F5 fire rating applied in the medium and high density residential, commercial and community facility areas of Stage 2B. The fire zones have been agreed in principle with the ACT Emergency Services Agency during the master planning process and the Stage 1 EDP.

The internal pipe network has been modelled hydraulically using the computer program WaterCAD. Using this program, the pipes have been sized accordingly to meet ICON Water Supply Standards.

The modelling has shown that all category F4 and F5 fire risk zones have reached the anticipated fire flow peak demand loads of 60 l/s and 45 l/s, respectively with a minimum of 10m pressure head during peak demand.

A separate submission of the Water Master Plan has been made direct to ICON Water under their formal approval process and also to the ACT Emergency Services Agency for their endorsement.

The water supply strategy is illustrated in the Water Master Plan on drawing 50522050-WMP-01.

2.10 Utilities

Previous discussions with Evoenergy and Zinfra have indicated that the Lawson Residential Estate can be fully serviced from existing infrastructure within the road reserves of Ginninderra Drive and Baldwin Drive.

2.10.1 Electrical Supply

Sufficient electrical services traverse the site to enable the development to be serviced. The 132kv overhead power lines are now being retained and the easement associated with this infrastructure has been incorporated into the revised development layout as part of this EDP Amendment.

Safearth has undertaken an assessment of earthing requirements for the development area for which all earthing requirements are included within **Appendix M**.

All works within electrical corridors will require review and endorsement by Evoenergy.

2.11 Bushfire Risk Assessment

A Bushfire Risk Assessment Review update was prepared by Australian Bushfire Protection Planners Pty Ltd in November 2022 for the Lawson Residential Estate. The report undertakes an assessment of the potential bushfire risks for Stage 2B of the development in accordance with the provisions of Australian Standard for Risk Management, AS/NZS 4360:2004. Excerpts from the report are included below, and the report in its entirety is included in **Appendix A**.

2.11.1 Proposed Bushfire Protection Measures

A series of bushfire risk mitigation measures in the form of asset protection zones are proposed around the estate and between the individual stages as documented within the Bushfire Risk Assessment Review. This includes:

- A minimum 40m wide Inner Asset Protection Zone (IAPZ) measured from the proposed Lawson Residential Estate block boundary to the north and north east of the development.
- An ember zone of a minimum width of 200m, measured from the IAPZ, where those buildings erected in the first 50m of the HAPZ are constructed to comply with BAL 12.5 in accordance with AS3959-2009.
- Provision of a fire access road along the back of Sections AF and AH.

The full Bushfire Risk Assessment is contained at **Appendix A**.

2.12 Arsenic Impact Assessment

Coffey Environments Australia Pty Ltd (Coffey) was commissioned (April 2013) by the Suburban Land Agency to delineate the extent of the arsenic impact in the vicinity of the existing Evoenergy substation ('the arsenic impacted area), in the western portion of the Lawson Estate Stage 2B.

2.12.1 Description of the Arsenic Impacted Area

Arsenic impact exceeding the NEPC (1999) health investigation level for standard residential land use (HIL A) and/or the ecology based investigation level (EIL) was identified at a few locations in the area to the south and south-west of the Evoenergy substation onsite in the vicinity of the access road to the substation in February 2011 while undertaking the Phase 1 site investigation.

Based on a review of site history, there is no known potential source of arsenic within this area of the Estate. The extent of the arsenic impacted area was not delineated during the Phase 2 ESA. It was also not known if the arsenic was present from anthropogenic or natural source or if arsenic is present in the form that is bioavailable.

The soil materials from the sampling locations from the arsenic impacted area generally comprise natural silty clay, sandy clay, or gravelly clay to a maximum depth of investigation of up to 1.9mbgs. No visual or olfactory signs of contamination were observed in the sampling locations.

It was concluded in the Phase 2 ESA (January 213) that *"the potential source, nature and extent of arsenic of contamination cannot be confirmed" and it was recommended that: "further assessment of the potential source, nature and extent of arsenic including additional sampling be undertaken"; and "The human health and environmental risks should then be assessed along with the remediation requirements."*

In making these recommendations Coffey recognised:

i) the full extent of arsenic impact had not been defined;
ii) while total arsenic concentrations were elevated that these could be representative of natural background concentrations; and
iii) a high total arsenic concentration does not necessarily mean that all the arsenic would be available for uptake by human users of the site and the environment.

Therefore, Coffey were of the opinion that further investigations focused on these particular aspects would be appropriate to collect additional data as inputs into assessment of human health and ecological risks and hence remediation / management requirements, if any, of the elevated arsenic concentrations in the south eastern portion of the Estate.

2.12.2 Arsenic Impacted Area Findings

The work undertaken also included assessment of the source / nature of arsenic, a bioaccessibility assessment, and leaching test under ASLP. The results indicated that:

- Arsenic was likely present as naturally occurring arsenic, with a primary source of arsenic being the ironstone outcrop, and the secondary source of arsenic being the ferruginous pedogenic pisoliths.
- Bioaccessibility result was <3% in all samples analysed, indicating that only a slow percentage of the total arsenic would be available for human uptake.
- ASLP result was <0.1% in all samples analysed.

Therefore, it is concluded that while the total arsenic concentrations are elevated in soil and rock samples in the investigation area, the results indicate that arsenic is naturally occurring, is relatively immobile and unlikely to present unacceptable health risk to future site users. No specific testing of availability for plants has been completed, but given that many samples exceed the EILs there is potential for phytotoxic risks to plants (albeit the bioaccessibility testing would suggest that the availability may be low).

Based on the findings of the assessment, it is considered that the arsenic impacted area is suitable for the proposed land uses.

Nevertheless, also based on the results of the studies it is considered it may be prudent to:

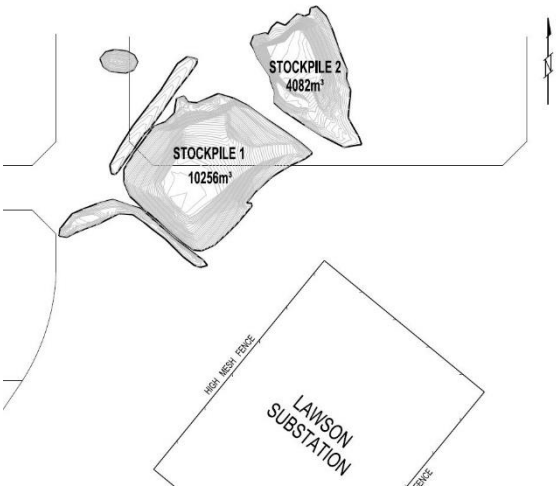
- Use plantings in this area that have a greater tolerance to arsenic. It would be appropriate to obtain the advice of an experienced horticulturalist on suitable types of vegetation plantings.
- Remove near surface rock outcrops and loose ironstone / ferruginous pedogenic pisoliths (given the apparent higher concentrations of arsenic in these) in areas proposed for open space use (including around buildings) during construction.

Any soil / rock materials removed from this area should be disposed of off-site in accordance with the *Environ ACT (2000) ACT's Environmental Standards: Assessment & Classification of Liquid & Non - liquid Waste.*

The full Arsenic Impact Assessment is contained in **Appendix L**.

2.13 Stockpiles On Site

Stockpiling works have been undertaken on the subject site of Lawson Stage 2B which have left approximately 15,000 m^3 of material on site to the north west of the existing substation. Corespondence with the EPA related to stockpiling works is attached within **Appendix N**.



3 AGENCY LIAISON AND CONSULTATION

Agency Liaison

A summary of the Agency and stakeholder consultation regarding the Lawson Residential Estate EDP's is outlined in the Table below (selective correspondence with agencies has been provided within Appendix N).:

Agency	Date	Purpose and Outcome
All ACT Government agencies information session	7-Feb-11	An information session was provided to all ACT Government agencies on the master planning of the Lawson South Estate and the documentation suitable for the submission of an EDP.
ACT Emergency Services	17-May-11	Meeting to discuss Defence agreeing to management of OAPZ in Lawson North.
	21-Feb-11	A meeting was held with ESA to discuss asset protection zones including the adjacent Commonwealth land, edge roads and the development of Lawson South and the bushfire risk assessment undertaken.
ACT F&R	4-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
	4-Oct-2022	Correspondence re disconnecting Stage 2B Road 31 through to Stage 1 and subsequent requirements for emergency vehicle access.
ICON Water	21-Feb-11	Communication regarding the sewer servicing of Lawson South and the potential relocation of the trunk sewer clear of Section AD
	20-Mar-11	Communication regarding water supply strategy to supply Lawson South
	4-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
	6-Aug-14	Communication of project restart. Master Plans supplied
	13-Aug-14	ICON Water Advise on Master Plan updates - Inclusion Of University of Canberra future Hospital flows
	16-Sep-14	Submission of sewer and Water Master Plans to ICON Water
	16-Jan-18	Submission of sewer and water master plans to ICON Water
	2022	Various correspondence in relation to Stage 2A and corresponding water & sewerage infrastructure to support both Stage 2A and 2B.
Evoenergy	16-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
	11-Jan-13	Meeting to discuss proposed route of the underground 11kV electrical cables being relocated.
	15-Feb-11	A meeting was held with Evoenergy to discuss the project and the relocation of the high voltage power lines.
	26-Aug-11	Meeting to discuss 132kV and 11kV relocation and the zone substation buffer zones.
	21-Mar-17	Meeting to discuss 132kV and 11kV relocation works
	23-May-17	Email confirming Shared Trench Details
	02-May-17	Meeting to discuss 132kV and 11kV relocation works

Agency	Date	Purpose and Outcome
	26-May-17	Email correspondence detailing all requirements for works within easements and alignments.
	16-Mar-18	Advice on the proposed use of Section AG by Evoenergy, conversion to TSZ2 and associated Deposited Plan.
	2022	Various correspondence to discuss proposed works for Stage 2B primarily retaining the 132kv overhead power lines and associated requirement for the estate.
Evoenergy, ACTPS and Brown Consulting	21-Feb-11	Meeting regarding the relocation of the existing high voltage power lines.
ACTF&R	14-Mar-12	Meeting to discuss provision of fire trails around areas of development fronting potential fire fronts.
Transport Canberra	17-May-11	Communication with ACTION regarding the proposed bus route and bus stops within the development.
	5-Jul-12	Meeting to discuss Stage 1 Entity Endorsement. Stage 2 EDP also briefly discussed. The endorsement received for Stage 1 including a note regarding the bus stop locations in Stage 2. This was considered but ultimately not adopted due to the ACTION proposed bus stop locations being with the Actew zone substation buffer zone.
	14-Jul-14	Email Re bus route and 4-way intersection treatments
	6-Aug-14	Email response - current road network acceptable. Request additional bus stop on Road 01. Cardno requested confirmation of the location of the additional bus stop of Road 01 and intersection treatment.
	18-May-17	ACTION buses layout options correspondence for EDP
	1-Mar-22	Meeting to discuss bus stop locations in Stage 2B. Accepting of proposed locations as per previous documentation, therefore no change proposed.
EPSDD Impact, Code and Estate Assessment	12-May-11	A meeting was held with the then ACTPLA Impact, Code and Estate Assessment to discuss the EDP submission including staging.
	08-Mar-17	Meeting to discuss updated requirements with EPSDD
	2022	Ad hoc enquires from SLA
Education and Training	12-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
Environment Protection Authority	10-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP was briefly discussed with emphasis on the noise study for the Zone Substation applicable to Stage 2 was discussed
	19-Sep-14	Endorsement of the VENM classification of stockpiles for Lawson. (Inc all associated correspondence and reporting)
Impact Estates and Assessment	10-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
Zinfra	20-May-11	Meeting to discuss the Lawson South development.
	5-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
	6-Aug-14	Issued Draft STMP for comments. Noted services are to be located under fully paved verges for most of the development

Agency	Date	Purpose and Outcome
	13-Aug-14	Email Response from Elle Peters, with concept STMP layout and Trench detail.
	26-May- 17	Updated Shared Trench markups
Planning Conservation and Lands	11-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
Sport and Recreational Services	6-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
Survey and Spatial Planning	6-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
TCCS	1-Mar-11	Meeting to discuss relationship between bushfire management and management of grasslands. This meeting concluded that it was acceptable to TCCS if Defence agreed to the management of part of Lawson North as an OAPZ with appropriate measures to protect the grasslands from weed invasion.
	11-May-11	Meeting regarding the landscape master planning.
	1-Mar-22	Meeting to discuss Lawson 2 staging and road/intersection changes for the development and disconnection of Road 31 to Stage 1.
TCCS Asset Acceptance (now DRC)	25-Nov-11	Meeting to discuss TCCS' EDP comments and proposed staging amendments
	14-Feb-14	Meeting to discuss Road Network Master plan and the Estate Development Code (EDC) against the former Residential Subdivision Development Code
	30-May-14	Meeting to discuss the Road carriageway widths and 4-way intersection treatments based. The meeting was held around design the Cardno/Tait Waddington prepared Discussion Paper data.
	18-Jun-14	Meeting to review 4-way intersection treatments in detail and agreement on carriageway widths.
	15-Aug-14	E-mail correspondence and submission of intersection traffic technical note regarding 4-way intersection treatments.
	22-Aug-14	E-mail response from TCCS Asset Acceptance regarding intersection traffic technical note and 4-way intersection treatments.
	16-Mar-17	Meeting to discuss Stage 2 EDP Submission and assessment against previous Standards.
	06-Sep-17	Meeting to discuss Stage 2 EDP comments and resolve TCCS issues with intersections.
	16-Apr-18	Confirmation of in principle endorsement of Lawson Stage 2 EDP changes from previous EDP submission.
	2022	Various correspondence in relation to Stage 2A design and relevant interface infrastructure with Stage 2B. Correspondence in relation to the Road 01 / 30 /31 intersection changing to a roundabout (as per design submission) and disconnection of Road 31 to Stage 1.
TCCS Asset Integration	19-May-11	A meeting was held with TCCS Asset Integration to discuss the project and compliance with the Residential Subdivision Development Code.
TransACT	10-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.

Agency	Date	Purpose and Outcome
	7-Aug-14	Discussed on phone with Michael Newton the startup of Stage 2, with EDP lodgment intended for September 2014. MN advised that NBN will be the service provider.
Transport Panning and Projects	4-Jul-12	Meeting to discuss Stage 1 EDP Entity Endorsement. Stage 2 EDP also briefly discussed.
University of Canberra (Rimmington & Associates)	23-Jul-14	Advised that Rimmington & Associates are acting on behalf of the University of Canberra and investigating the future Hospital sewer connection options
	22-Aug-14	Advised Cardno of the future Hospital average daily flow of 4.3l/s is required with an invert level of RL=5876.60m required at the northern side of Ginninderra Drive proposed sewer network for Lawson Stage 2
	25-Aug-14	Advised Cardno of the future Hospital peak flow of 12.9l/s is required
Suburban Land Agency	16-Apr-18	Cardno email to SLA regarding the changes and associated correspondence related to addressing the comments received on the EDP from the Deed circulation.
	2021/22	Various meetings/correspondence to develop the layout changes and progress the EDP Amendment.
Environment Planning and Sustainable Development Directorate (EPSDD)	15-Mar-18	Confirmation of acceptable development within FUA boundary.
ACT Surveyor General	14-Mar-18	Advice on the labelling of 11kv and 132kv easements as electrical corridors instead.

4 LANDSCAPE MASTER PLAN

The following section is to be read in conjunction with the *Landscape Master Plan* drawing *22046-200*.

4.1 Landscape Objectives and Principles

A set of landscape objectives were developed for the whole Estate as part of the planning process. These were accompanied by a series of landscape principles, which if adopted would lead to achieving the stated objectives.

Landscape Objectives

A range of key landscape objectives were identified which are consistent with and build on the objectives contained in the Lawson South Concept Plan (2010). The landscape objectives listed below apply to both Stage 1 and Stage 2 of Lawson Residential Estate. Key objectives are:

- To develop a landscape character that is sympathetic to the cultural and heritage values of the area and is conducive to a variety of uses and experiences, with a character that retains inherent site values and cultural associations.
- To create a landscape pattern that brings the open space network close to all urban development providing access and amenity, and that correlates closely with the broader natural landscape setting e.g. forest on protected hills and valleys, woodland on hill slopes, grassland on lowlands and wetlands in valleys and drainage lines.
- To protect native grassland communities and habitats for threatened species through establishing and providing for the management of conservation areas. These grassland areas will establish the overall landscape character of the area, preserving the pastoral nature of the site, reinforcing the existing openness and broad scale, and allowing views to distant hills and recognisable features that identify the area with Belconnen.
- To create visual links from the site to local landmarks to provide a sense of location within and connection to the surrounding area.
- To encourage walking and cycling by providing strong links to the existing pedestrian and cycle network of the surrounding area and establishing new links to the University of Canberra and Lake Ginninderra.
- To utilise street tree species that respond to the site and compliment energy efficient building design, providing summer shade and winter sun.
- To create a hierarchy of streetscapes that reinforces the density of the built form and level of use (i.e. high levels of vehicular and pedestrian traffic on main roads and low levels on minor residential roads).
- To create a consistent landscape language through thoughtful selection of pavement materials, street furniture and plant species.
- To create safe and pedestrian friendly spaces through clear definition of accommodation for cars, pedestrians and cyclists, visual permeability and appropriate lighting.
- To protect and enhance the habitat value of existing vegetation to respond to ACT government objectives for ecologically sensitive urban open space.
- To meet landscape standards prescribed in TCCS Design Standards for Urban Infrastructure including:
    - MIS05 Active travel facilities design
    - MIS16 Urban Open Space
    - MIS20 Street and park furniture
    - MIS21 Recreation facilities
    - MIS24 Soft landscape design
    - MIS25 Plant species for urban infrastructure projects

Landscape Principles

The landscape principles have been grouped into key locations in which they apply. The principles listed below apply to Stage 2 only of the Lawson Residential Estate. Items that relate only to Stage 1 can be found in the Stage 1 EDP Design Response Report. Adoption of these principles will ensure that key landscape objectives are achieved.

General / overall

- Provide strong landscape links between the residential estate and the surrounding landscape and amenities including Lake Ginninderra to the west, existing residential development southwest and east, Belconnen Town Centre and the University of Canberra to the South and the Lawson Grasslands to the North.
- Provide a minimum of 30% canopy cover to the public realm in line with the ACT Governments Urban Forest Strategy 2021-2045. And to provide a comfortable and amenable user experience, encouraging active travel, healthy options and social wellbeing.

Streetscapes

- Develop Road 01 as a legible entrance road into the Estate. Ensure a strong landscape presence at the southern portion combining avenue plantings to create a sense of enclosure and landscaped earth mounds to shield direct views to the sub-station. Enhance the visual connection from the northern portion of Road 01 to Lake Ginninderra through formal street tree plantings, low-level plantings within the median and termination of Road 01 on the formal plaza proposed at the northern end of Road 01.
- Provide streetscapes of appropriate pedestrian scale. Recognise the influence of pavement width and design, street furniture selection and placement, and tree selection and spacing.
- Utilise street trees to establish individual street characters providing a sense of place within the wider development.
- Utilise street trees to define and articulate spaces, give a sense of hierarchy, articulate boundaries between commercial and residential uses, and soften the transition between higher and lower density areas.
- Utilise street trees to provide seasonal variation i.e. autumn colour, summer shade and winter sun.
- Incorporate WSUD into verge planters in response to the ACT government's "ACT Practice Guidelines for Water Sensitive Urban Design".
- Provide appropriate street furniture in higher density and commercial areas including seats, litter bins and bike racks.

Lake Ginninderra Foreshore Park

- Provide spaces for passive and active recreation opportunities, including footpaths for jogging and walking, open grassed spaces for ball games etc., a playground, and shelters with tables, bench seats, bbq facilities and water stations.
- Provide access to the water edge via paths, open grass areas and jetties.
- Provide passive interaction with the wetland via a boardwalk and viewing nodes.
- Protect and enhance the ecological function of the edge zone with appropriate planting and edge treatments.
- Provide an urban plaza as a community focal point at the interface with the higher density adjacent urban areas.

Substation Park

- Evo Energy will be taking responsibility for the open space around the substation. Dryland grassing is included as part of the Estate works surrounding the substation to stabilise the ground for future Evo Energy works by others.

Extension of Travelling Stock Route

- Formally extend the travelling stock route through Sections AL and AJ.
- Enhance the travelling stock route through removal of undesirable tree species, and poorly performing trees and replacement with appropriate succession planting.

4.2 Landscape Proposal

The landscape master plan for the Estate aims to provide high quality public spaces that respond to the existing environmental and cultural aspects of the site and surrounding context, the proposed urban pattern and the wider urban framework of Canberra. This will be achieved through the application of appropriate paving materials and planting treatments that define spaces and provide visual and physical links. The elements listed below generally focus on Stage 2 of the Lawson Residential Estate, except where part of a wider network that ties into Stage 1. Please refer to Stage 1 EDP Design Response Report to complete the picture of how the Estate as a whole responds to the landscape objectives and principles.

Streetscape Character

Refer *Landscape Master Plan* drawing *200, Street Tree Master Plan drawings 301 to 302 and Typical Verge Layout drawings 831 to 833.*

The streetscape character throughout the Estate is informed by both the leafy streets of older Canberra suburbs and by existing environmental conditions and native character of the site. The streetscapes respond to the proposed urban pattern reinforcing street hierarchy, softening built forms, and providing a sense of place within the wider development. Street trees will be predominantly deciduous providing seasonal variation, summer shade and winter sun. The leafy deciduous streetscapes will be bordered by avenue plantings of native trees that will transition the urban residential blocks to the open character of the adjacent open space.

There are three streetscape typologies within Stage 2: Main Roads, Urban Border Roads, and Urban Roads. Individual roads are not limited to one streetscape typology and some roads cover multiple typologies along their length. The streetscape typologies respond to the surrounding land use and function of the road and are described in detail below.

The following species are proposed:

Species	**Streetscape Typology / Roads**
Ulmus parvifolia 'Todd'	Road 01 verges and median
Zelkova serrata *Lagerstroemia 'Natchez'*	Road 02 verges (Adjacent section AD)
Koelreuteria paniculata	Road 30 verges
Pyrus calleryana 'Burgundy Snow' *Quercus robur*	Road 02 verges (adjacent Sections AF and AH) Road 02 median (adjacent Sections AF and AH)
Pistacia chinensis	Road 32 verges (excluding verge adjacent substation)
Gleditsia triacanthos var. inermis 'Continental'	Road 31 southern verge (adjacent Sections AX)

Main Roads (Roads 01 and 02)
Road 01 is the main vehicular corridor linking Lawson Residential Estate Stage 2 to Ginninderra Drive and Stage 1 (via Road 02). Large canopy trees (Ulmus parvifolia) line the verges and median creating a strong avenue effect and providing ample shading opportunity to the verges.

The verges are fully paved (except adjacent the substation) to provide good pedestrian facility.

The median will be planted with low shrubs and native grasses to soften the impact of the vehicular corridor and discourage pedestrian crossing outside the nominated crossing points.

Road 02 runs east from Road 01 to link in with Lawson Residential Estate Stage 1. The road is an important corridor connecting the estate with the Lake Ginninderra foreshore park, the commercial node and the community facilities. The verges will be planted with *Zelkova serrata* providing summer shade, winter sun and seasonal variation, these will be supplemented with secondary plantings of lagerstroemia 'Natchez' for seasonal colour and interest. The double row of planting will provide a heightened sense of place and more amenable pedestrian environment with significant summer shade and winter sun. The verges are typically fully paved to provide a high degree of pedestrian facility. A disabled accessible bus stop for each direction will be located in the verge adjacent the Lake Ginninderra Foreshore park and Section AD. Bench seats with back and armrests and bike racks are co-located with the bus stops.

Urban Border Roads (Roads 30, 31 and 32)
The urban border roads are typically defined by an avenue planting of deciduous trees to the development verge with the opposite verge open to the adjacent open space. The deciduous trees will provide summer shade and winter sun to a formal edge to the urban side of the street. The verge adjacent the open space will be subservient to the character of the open space beyond providing a sense of connection between the development and the surrounding open spaces.

Road 30 runs adjacent the Lake Ginninderra Foreshore park and forms the western boundary of the development. *Koelreuteria paniculata* will be located in the eastern road verge adjacent residential development with the opposing verge open to the native trees of the Lake Ginninderra Foreshore park.

Road 31 runs along the south of the substation open space and links Road 01 in the west. *Gleditsia triacanthos* var. *inermis* 'Continental' will be located in the southern road verge adjacent Sections AX. The northern verge remains clear of trees open to the substation open space.

Road 32 runs along the north of the substation open space and turns north adjacent the college creek open space Pistacia chinensis will be located in the northern verge opposite the substation open space. *Pistacia chinensis* will be planted in the western verge opposite the college creek open space.

Urban Roads (Roads 30 and 33)
High density residential roads are typically defined by fully paved verges with deciduous trees in tree blisters between parallel parking bays. These trees will provide a strong sense of location within the development and facilitate high pedestrian amenity through summer shade and winter sun.

Open Space Areas
Refer *Landscape Master Plan* drawing *200* and Detail Area drawing *310*.

There is one main open space areas and the extension of the Travelling Stock Route. The main open space area is the Lake Ginninderra Foreshore Park. Landscape buffers include the 30m buffer to the BNTS site and the 10m wide buffer to Ginninderra Drive.

Lake Ginninderra Foreshore Park

Along the northern boundary of the development, Lake Ginninderra foreshore offers passive and active recreational opportunities, enhanced ecological systems to the lakeside and College Creek, an overall improved amenity and connections with local and regional networks. The foreshore is characterised by a predominately native landscape setting. The new recreation opportunities will be enclosed by the existing established vegetation that provides shade and shelter throughout the foreshore park.

Connections with the broader community will include a Canoe/Kayak launching point, for Canberra Canoes Polo Club and other park/lake users. A 2.4m wide shared path extending along the length of the foreshore and connecting with the future proposed Lake crossing (to the North of the Site) establishing a bicycle circuit around the lake.

An urban plaza is to be constructed in the open space, north of the Road 01/Road 02 intersection. This will reinforce the axis established by the road extension of Aikman Drive and provide a civic gathering space with high quality finishes. Park furnishings within this area will include timber and steel shelters, bench seating, tables, bins, and water drinking stations. An opportunity for a café has been created to take advantage of the open northern aspect across the lake.

Open views are encouraged northwards from the plaza across the lake and beyond. Seating height walls step down towards the lake's edge providing level grass terraces. Stepped access between terraces will be allowed at the centre of each wall, on alignment with Road 01.

A central neighbourhood playground will be located east of the plaza. The play areas will be set across multiple terraces and play opportunities will utilise the level change within the site and integrate play experience for users. Timber and steel shade structures will be in character with other shelters within the foreshore park. Deciduous trees will provide a counterpoint within this foreshore park and offer solar access to the playgrounds in the winter months.

Varied landscape conditions to the lake's edge will provide enhanced ecological function and allow access to the lake's edge at managed grassed areas and timber jetties. A water treatment area with timber boardwalk and viewing platform is proposed where College Creek meets Lake Ginninderra.

Extension of Travelling Stock Route

The travelling stock route alignment bisects Sections AJ and AL. It will be reinforced through succession planting of historically appropriate eucalypts, comprising *Eucalyptus cinerea* (Argyle Apple) and *Eucalyptus mannifera* (Brittle Gum) with dryland grass and native grass banding as understorey planting. A 2.5m wide shared pathway is provided on either side of the historic alignment, connecting the trunk cycle way along Lake Ginninderra with the northern portions of the travelling stock route. At the Ginninderra Drive end of the stock route entry markers made of local stone and a paving treatment will announce the entry.

The travelling stock route design is the subject of a stand alone process being undertaken by the LDA currently nearing completion of construction.

Ginninderra Drive Buffer

The landscape buffer to Ginninderra Drive will reinforce the existing planting of Eucalypts in dryland grass. Tree species include *Eucalyptus mannifera* (Brittle Gum), and *Eucalyptus polyanthemos* (Red Box). Groupings of screening shrubs will be planted amongst the dryland grass to provide screening of varying heights including *Ispogon anemonifolius*, *Banksia spinulosa*, *Grevillea lanigera* and *Correa alba*.

4.3 Canopy Cover

The proposal achieves a projected 32% mature canopy cover. The Area used for the calculation is road reserves, foreshore open space, substation block and electrical easement block and excludes developable blocks. The total area is 189,585m2 and the total tree canopy cover including existing trees retained, new street trees and new open space trees is 60,916m2. The figures used for mature tree canopy are the from TCCS Design Standards for Urban Infrastructure tree species fact sheets.

4.4 Tree Survey and Retention

The following section is to read in conjunction with *Tree Management Plan* drawings *150 to 152* submitted as part of the Lawson Residential Estate Stage 2 EDP, *Tree Management Plan* drawings *50522050-01 to 05* submitted as part of the Stage 1 EDP, the updated Stage 2B tree assessment review undertaken by Enviro Links Design (November 2022), the updated Stage 2 Tree Assessment undertaken by Spacelab (April 2017, Appendix B), the Lawson South Tree Assessment Report (LSTAR) by DSB Landscape Architects (Appendix B) and the Lawson South Tree Removals and Assessment by Harris Hobbs Landscapes (Appendix B). LSTAR identified individual trees and groups of trees across the Lawson Residential Estate and recommended trees for removal or retention, see Appendix B. The Harris Hobbs Landscapes report identifies groups of trees within the 80m Lake Ginninderra Foreshore landscape buffer.

The Stage 2B tree assessment review undertaken in 2022 (ELD) reviewed the 2017 (spacelab) tree assessment and provided updates as shown (in the tree assessment table on drawing 100 and with revision clouding on the corresponding drawings) on the tree assessment plans (drawings 100, 102, 107, 108, 110, 115). Updates to the 2017 assessment are:

- 2 trees now dead (523 and 1136)
- 4 trees no longer on site (528, 541, 975 and 977)
- 5 trees changed quality rating (525, 924, 926, 1032 and 1038)
- 2 tree groups changed quality rating (G22 and G23)
- 1 additional tree group was added (G39)

All trees to be retained will be protected during construction with a 1.8m high chain link fence. The fence shall be at a minimum outside of the tree protection zone of regulated trees and beyond the canopy of non-significant trees (as indicated on the Tree Management Plans).

The Lawson Residential Estate Stage 1 EDP included the removal of poor quality and dead trees within the Stage 2 EDP area. The Lawson Residential Estate Stage 2 EDP proposes further removal of trees within the Stage 2 area, as identified in the table below.

The Estate is designed to retain the majority of existing trees in the open space network with a focus on those recommended for retention by LSTAR and Harris Hobbs Landscapes report. The majority of trees proposed for removal are those identified for removal by LSTAR due to poor condition, declining health and safety issues or in accordance with the Evoenergy requirements surrounding the electrical substation. Additional trees were only proposed for removal after options for the retention were explored but could not achieve the yield target and did not perform as the proposed design against the planning objectives and principles. All design options were considered and exhausted.

Trees to be removed are listed in the table below;

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
514	Eucalyptus albens	White box	N	Within Evoenergy electrical substation buffer zone	Y
515	Eucalyptus blakelyi	Blakley's red gum	Y	Within Evoenergy electrical substation buffer zone	Y
516	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
517	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
518	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
523	Eucalyptus nicholii	Willow-leaved peppermint	N	Within Evoenergy electrical substation buffer zone	

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
524	Eucalyptus nicholii	Willow-leaved peppermint	N	Within Evoenergy electrical substation buffer zone	
528	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
529	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
535	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
536	Eucalyptus nicholii	Willow-leaved peppermint	Y	Within Evoenergy electrical substation buffer zone	Y
635	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	N
636	Eucalyptus viminalis	Ribbon gum	Y	All design options have been considered and exhausted	N
638	Eucalyptus viminalis	Ribbon gum	Y	All design options have been considered and exhausted	N
644	Eucalyptus viminalis	Ribbon gum	Y	All design options have been considered and exhausted	N
646	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	N
650	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	N
654	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	
658	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	
659	Eucalyptus viminalis	Ribbon gum	N	All design options have been considered and exhausted	N
975	Eucalyptus bicostata	Southern blue gum	Y	Within Evoenergy electrical substation buffer zone	Y
977	Eucalyptus bicostata	Southern blue gum	Y	Within Evoenergy electrical substation buffer zone	Y
978	Eucalyptus bicostata	Southern blue gum	Y	In poor health and recommended for removal by Landscape Architects	Y

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
979	Eucalyptus elata	River peppermint	Y	All design options have been considered and exhausted	Y
982	Eucalyptus albens	White box	Y	All design options have been considered and exhausted	Y
983	Eucalyptus albens	White box	Y	All design options have been considered and exhausted	Y
992	Eucalyptus bicostata	Southern blue gum	Y	All design options have been considered and exhausted	Y
994	Eucalyptus albens	White box	Y	Within Evoenergy electrical substation buffer zone	Y
995	Eucalyptus albens	White box	Y	Within Evoenergy electrical substation buffer zone	Y
997	Eucalyptus bicostata	Southern blue gum	Y	Within Evoenergy electrical substation buffer zone	Y
998	Eucalyptus mannifera	Brittle Gum	N	Within Evoenergy electrical substation buffer zone	Y
999	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	Y
1000	Eucalyptus mannifera	Brittle Gum	N	Within Evoenergy electrical substation buffer zone	Y
1001	Eucalyptus albens	White box	N	Within Evoenergy electrical substation buffer zone	Y
1002	Eucalyptus albens	White box	N	Within Evoenergy electrical substation buffer zone	Y
1003	Eucalyptus albens	White box	N	Within Evoenergy electrical substation buffer zone	Y
1004	Eucalyptus albens	White box	N	Within Evoenergy electrical substation buffer zone	Y
1006	Eucalyptus sp.	Eucalypts	N	Within Evoenergy electrical substation buffer zone	Y
1007	Eucalyptus sp.	Eucalypts	N	Within Evoenergy electrical substation buffer zone	Y
1016	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	
1017	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	N

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1018	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1019	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	N
1020	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1034	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1035	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	
1036	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1047	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1048	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1049	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1050	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	Y
1052	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1053	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1054	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1055	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1056	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1057	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1058	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1060	Eucalyptus bicostata	Blue Gum	Y	All design options have been considered and exhausted	
1063	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	Y
1065	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	
1076	Eucalyptus bicostata	Blue Gum	Y	All design options have been considered and exhausted	
1077	Outside assessment area	-	-	-	-
1084	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	
1085	Eucalyptus bicostata	Blue Gum	Y	All design options have been considered and exhausted	N
1087	Eucalyptus bicostata	Blue Gum	Y	All design options have been considered and exhausted	
1088	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	
1089	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1090	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1091	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1092	Eucalyptus dives	Broad-leaved peppermint	Y	All design options have been considered and exhausted	N
1093	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	N

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1094	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	N
1095	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1096	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1097	Eucalyptus vimilalis	Ribbon Gum	Y	All design options have been considered and exhausted	N
1098	Eucalyptus vimilalis	Ribbon Gum	Y	All design options have been considered and exhausted	N
1099	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1100	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1102	Eucalyptus vimilalis	Ribbon Gum	Y	All design options have been considered and exhausted	N
1103	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1104	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1108	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1109	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1110	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1111	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1112	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	N

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1113	Eucalyptus vimilalis	Ribbon Gum	Y	All design options have been considered and exhausted	N
1114	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	N
1122	Eucalyptus rubida	Candle Bark	Y	All design options have been considered and exhausted	Y
1123	Eucalyptus mannifera	Brittle Gum	Y	All design options have been considered and exhausted	Y
1124	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	Y
1125	Eucalyptus rubida	Candle Bark	Y	All design options have been considered and exhausted	N
1126	Eucalyptus mannifera	Brittle Gum	N	All design options have been considered and exhausted	Y
1127	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1129	Eucalyptus bridgesiana	Apple Box	N	All design options have been considered and exhausted	N
1130	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1131	Eucalyptus vimilalis	Ribbon Gum	Y	All design options have been considered and exhausted	N
1134	Eucalyptus rubida	Candle Bark	Y	All design options have been considered and exhausted	N
1135	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1136	Eucalyptus rubida	Candle Bark	Y	All design options have been considered and exhausted	N
1137	Eucalyptus bicostata	Brittle Gum	Y	All design options have been considered and exhausted	N

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1144	Casuarina cunninghamiana	River Oak	Y	All design options have been considered and exhausted	N
1145	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1146	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1147	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1151	Eucalyptus vimilalis	Ribbon Gum	N	All design options have been considered and exhausted	N
1153	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1154	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1159	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1160	Casuarina cunninghamiana	River Oak	N	All design options have been considered and exhausted	N
1161	Casuarina cunninghamiana	River Oak	Y	All design options have been considered and exhausted	N
1163	Casuarina cunninghamiana	River Oak	N	All design options have been considered and exhausted	N
1164	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1165	Eucalyptus rubida	Candle Bark	N	All design options have been considered and exhausted	N
1166	Casuarina cunninghamiana	River Oak	N	All design options have been considered and exhausted	N
1598	Fraxinus oxycarpa	Desert ash	N	All design options have been considered and exhausted	N

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
1599	Fraxinus oxycarpa	Desert ash	N	All design options have been considered and exhausted	N
1600	Fraxinus oxycarpa	Desert ash	N	All design options have been considered and exhausted	N
1601	Fraxinus oxycarpa	Desert ash	N	All design options have been considered and exhausted	N
1602	Salix sp.	Willow	Y	All design options have been considered and exhausted	N
1701	Eucalyptus sp.	Eucalypts	N	Within Evoenergy electrical substation buffer zone	Y
G1	E. mannifera, E. polyanthemos, E. bridgesiana	White brittle gum, Red box, Apple box	N	Partial tree group removal as all design options have been considered and exhausted	
G2	E. mannifera, E. bridgesiana, E. pulverulenta	White brittle gum, Apple box, Silver Mountain gum	N	Partial tree group removal as all design options have been considered and exhausted	
Part G3	E. smithii, E. bridgesiana, E.rubida	Gully Gum, Apple box, Candle bark	Y	Partial tree group removal as all design options have been considered and exhausted	N
G4	Casuarina cunninghamiana	River Oak	Y	Partial tree group removal as all design options have been considered and exhausted	N
Part G5	E. polyanthemos, E. ovata, E. Cinera, E. sp.	Red box, Swamp gum, Argyle apple	Y	Partial tree group removal as all design options have been considered and exhausted	
G6	Casuarina cunninghamiana, Populus deltoides	River Oak, Cottonwood	N	Partial tree group removal as all design options have been considered and exhausted	
G7	Casuarina cunninghamiana	River Oak	Y	Partial tree group removal as all design options have been considered and exhausted	N
Part G21	Populus deltoides	Cottonwood	Y	Partial tree group removal as all design options have been considered and exhausted	N
Part G31	E. mannifera, E. bridgesiana	White brittle gum, Apple box	Y	Partial tree group removal as all design options have been considered and exhausted	

Tree No.	Species	Common Name	Regulated	Reason for removal	Included in Stage 1 EDP
Part G33	E. mannifera, E. polyanthemos, E. melliodora	White brittle gum, Red box, Yellow box	Y	Partial tree group removal as all design options have been considered and exhausted	
Part G35	E. mannifera, E. polyanthemos, E. rubida, Acacia sp	White brittle gum, Red box, Candle bark	Y	Partial tree group removal as all design options have been considered and exhausted	N
Part G36	E. mannifera, E. polyanthemos, E. rubida, Acacia sp	White brittle gum, Red box, Candle bark	Y	Partial tree group removal as all design options have been considered and exhausted	N
Part G37	E. mannifera, E. polyanthemos, E. rubida, Acacia sp	White brittle gum, Red box, Candle bark	Y	Partial tree group removal as all design options have been considered and exhausted	N
G38	E. mannifera, E. bridgesiana, Acacia sp.	White brittle gum, Apple box	Y	Partial tree group removal as all design options have been considered and exhausted	
G39	Casuarina cunninghamiana	River Oak	N	Partial tree group removal as all design options have been considered and exhausted	

4.5 Management Strategies

Three significant cultural and environmental features have been identified in the Lawson Residential Estate for specific vegetation management strategies, the Historic Wind Break, Travelling Stock Route and the grassland buffer. The Travelling Stock Route and the grassland buffer are relevant to the Stage 2 EDP. The management strategy for the Travelling Stock Route and grassland buffer are as provided below:

Travelling Stock Route

The Travelling Stock Route is a significant cultural feature and identifiable landscape element within Lawson Residential Estate. The following is a summary of the detailed Tree Replacement Strategy provided in LSTAR (Appendix B).

- Identify trees for short and medium term retention. Trees shall have shape and form suitable for a tree in public open space, with a height appropriate to age and that deadwood removal and tree surgery are undertaken to make 'safe' resulting in a tree suitable for retention in public open space. The tree shall not have any obvious disease that may cause the death of the tree within 10-15 years.
- Immediately remove the following trees: 108, 115, and 925.
- Retain the following trees for approximately 5 years: 104, 105, 106, 107, 110, 111, 915, 927, 929, 930, 933, 938, 941, 942, 950, 951, 956 and 959.
- Retain the following trees for approximately 10 years: 924, 926, 934, 935, 937, 939, 940, 943, 948, 949, 952, 953, 961, 888-910, 1024, 1025, 1061-1072.
- Retain the following trees for 20+ years: 103, 116, 936, 946, 960, 1011-1015, 1021.
- Trees not identified for removal shall be pruned to remove all dead wood and to provide a clean trunk to allow pedestrian or maintenance vehicle access. In the case of smaller/younger trees formative pruned towards the provision of pedestrian or maintenance vehicle access so that trees are safe and consistent with the standards applied by TCCS for urban open space trees.

- All new-planted trees and trees identified for removal in approximately 5 years and within approximately 10 years and the trees identified for longer-term retention shall be inspected annually and any dead or dangerous trees shall be removed. Trees that have deteriorated since the previous inspection shall be pruned to make safe. By the end of 5 years and 10 years respectively, all trees previously identified shall be removed and annual replanting shall be almost complete.
- Where practical, where the retained trees are close planted or form a group, it is recommended that the existing grass or weed cover be sprayed with herbicides to remove the grass/weed cover and the area beneath the close planted or groups of trees be mulched with stockpile chippings to the extent of the crown spread of the trees or groups.
- Trees identified for retention for more than 20 years shall be treated with an approved root zone improvement treatment.
- 'Infill' planting is required between trees selected to be retained after dead or poor condition trees have been removed. 'Infill' trees shall be planted in a more or less straight line with the planting positions 'stepped out' to be between 10-14 metre centres. The location of the trees should not be surveyed into position and the gaps between the trees should allow each tree to develop into a form that is typical of the species. At this spacing, the trees will develop with straight vertical trunks and good shaped crowns without the adverse impact of interference from adjacent trees until near maturity.
- New plantings should be undertaken immediately after the removal of those trees identified for removal. The ground shall be prepared by deep ripping along the planting lines or by excavating oversized, wider rather than deep holes. The inclusion of water crystals or equivalent into the backfilling materials is required but the addition of large amounts of improved topsoil is not required.
- New plants should be not less than 200mm diameter spring ring containers with the tree as a single, stout trunk with side growth removed to about 600mm and not less than 1,200mm tall when planted. Individual tree staking is to be avoided, the use of a raised ring of soil to form a watering basin not less than 1,000mm diameter with the tree at the centre should be provided. An identifying stake not less than 25x25x1 200mm in size is to be driven to 800mm above ground level and not closer than 150mm to the tree is required.
- Mulched watering basins surrounding each new-planted tree shall be maintained as a grass/weed fee surface for a minimum of two years following planting. The suppression or elimination of grass/weeds shall be in accordance with an approved weed spraying programme.
- It is recommended that the surrounding protective fences be retained in good order and condition until residential construction in the immediate vicinity of the Travelling Stock Route is at least 85% complete.

Grassland Buffer

The grassland buffer serves two important landscape functions; firstly as an ecological buffer to the grasslands in the BNTS site and secondly as a bush fire inner asset protection zone. A temporary vermin proof (VS) type fence with shade cloth applied to the lower 300mm will be installed on the development edge of the grassland buffer until the grassland is rehabilitated. After construction any disturbed grassland shall be reinstated with species consistent with the EPBC referral dated 13 September 2012 and can be found in Appendix I. The reinstatement shall be applied as hydromulch with a seed mix as outlined in the EPBC. The native grass seed shall be collected from local sources.

Appendix A

BUSHFIRE RISK ASSESSMENT

Appendix B

TREE ASSESSMENT

Appendix C
ECOLOGICAL ASSESSMENT

Appendix D

NOISE STUDY

Appendix E

HERITAGE ASSESSMENT

Appendix F

(Not Used)

Appendix G

TRAFFIC ANALYSIS

Appendix H
(Not Used)

Appendix I
EPBC DECISION ON APPROVAL

Appendix J
Discussion Paper, Traffic Technical Note and TCCS Correspondence

Appendix K
NCA BNTS Asset Protection Zone Letter

Appendix L
PHASE 1 & 2 ENVIRONMENTAL SITE ASSESSMENTS

Appendix M
RISK ASSESSMENT OF ELECTRO MAGNETIC FREQUENCY

Appendix N
2017 CORRESPONDENCE WITH AUTHORITIES

Appendix O
GEOTECHNICAL REPORTS

Appendix P
PREVIOUS EDP COMMENTS AND RESPONSES