

Allera

PROJECT: Forbesview Pty Ltd - School Road, Forbes

Contents

EXECUTIVE SUMMARY 5

1.0 INTRODUCTION 7

2.0 THE SITE 8

2.1 SITE LOCATION & EXISTING SITE CHARACTERISTICS 8

2.2 SITE CONTEXT 10

2.3 LAND OWNERSHIP 11

2.4 SUPPORTING DOCUMENTATION 11

3.0 PLANNING FRAMEWORK 13

3.1 STRATEGIC CONTEXT 13

3.1.1 HOUSING 2041 13

3.1.2 REGIONAL HOUSING TASKFORCE 14

3.1.3 CENTRAL WEST AND ORANA REGIONAL PLAN 2041 14

3.1.4 COMMUNITY STRATEGIC PLAN 2018-2028 15

3.1.5 LOCAL STRATEGIC PLANNING STATEMENT 2040 16

3.1.6 FORBES HOUSING STRATEGY 2021-2041 16

3.2 STATUTORY FRAMEWORK 18

3.2.1 FORBES LOCAL ENVIRONMENTAL PLAN 2013 18

3.2.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 32

3.2.3 BIODIVERSITY CONSERVATION ACT 2016 32

3.2.4 STATE ENVIRONMENTAL PLANNING POLICY (RESILIENCE AND HAZARDS) 2021 33

4.0 PLANNING PROPOSAL 34

PART 1 - OBJECTIVES OR INTENDED OUTCOMES 39

PART 2 - EXPLANATION OF THE PROVISIONS 40

PART 3 - JUSTIFICATION OF STRATEGIC AND SITE-SPECIFIC MERIT 45

PART 4 - MAPS 55

PART 5 - COMMUNITY CONSULTATION 55

PART 6 - PROJECT TIMELINE 55

5.0 ENVIRONMENTAL ASSESSMENT 57

5.1 COMPATIBILITY WITH SURROUNDING LAND USES 57

5.2 FLOOD AND DRAINAGE 57

5.3 CONTAMINATION 58

5.4 ECOLOGY 58

5.5 LAND RESERVED FOR ACQUISITION 59

5.6 TOPOGRAPHY 59

5.7 TRAFFIC 59

5.8 SERVICES INFRASTRUCTURE 60

5.9 SOCIAL AND ECONOMIC 60

5.10 HERITAGE 61

5.11 GEOTECHNICAL 61

5.12 BUSHFIRE 62

6.0 CONCLUSION 63

List of Figures

Figure 1. Aerial Image of Site (Nearmaps, 2023) 9

Figure 2. Cadastral Map of Site (Nearmaps, 2023) 9

Figure 3. Site Context Map (Nearmaps, 2023 - as amended by Allera Planning) 11

Figure 4. Land Zoning Map (NSW Legislation, 2023) 21
Figure 5. Minimum Lot Size Map (NSW Legislation, 2023) 22
Figure 6. Height of Buildings Map (NSW Legislation, 2023) 23
Figure 7. Land Reservation Acquisition Map (NSW Legislation, 2023) 24
Figure 8. Heritage Map (NSW Legislation, 2023) 25
Figure 9. Flood Planning Map (NSW Legislation, 2023) 26
Figure 10. Urban Release Area Map (NSW Legislation, 2023) 27
Figure 11. Terrestrial Biodiversity Map (NSW Legislation, 2023) 28
Figure 12. Groundwater Vulnerability Map (NSW Legislation, 2023) 29
Figure 13. Watercourse Map (NSW Legislation, 2023) 30
Figure 14. Wetlands Map (NSW Legislation, 2023) 31
Figure 15. Concept Masterplan (Hatch Roberts Day, 2023) 35
Figure 16. Composite Plan (Hatch Roberts Day, 2023) 36
Figure 17. Previous iteration of concept masterplan (Hatch Roberts Day, 2023) 37
Figure 18. Precinct Plan (Hatch Roberts Day, 2023) 38
Figure 19. Proposed Land Zoning Map (Hatch Roberts Day, 2023) 41
Figure 20. Lot Size Map (Hatch Roberts Day, 2023) 42
Figure 21. Maximum Building Height (Hatch Roberts Day, 2023) 43
Figure 22. Land reserved for acquisition (Hatch Roberts Day, 2023) 44
Figure 23. Urban Release Area Map (Hatch Roberts Day, 2024) 45

List of Tables

Table 1. Existing and Proposed FLEP 2013 Provisions 5
Table 2. Legal Description of the Site 8
Table 3. Supporting Documentation 12
Table 4. Current Land Zoning Permissibility and Objectives 18
Table 5. Existing minimum subdivision lot size controls 22
Table 6. Existing and Proposed FLEP 2013 Provisions 40
Table 7. Strategic and site-specific merit test (DPE, 2023) 45
Table 8. Consistency with the Local Planning Directions 48
Table 9. Consistency with the relevant State Environmental Planning Policies 54
Table 10. Indicative project timeline 55

Executive Summary

This Planning Proposal has been prepared by Allera Planning on behalf of Forbesview Pty Ltd and seeks to amend the *Forbes Local Environmental Plan 2013* to facilitate the development of a concept masterplan at School Road, Forbes (830, 831, 386, 387, 388, 389, 375, 376, 1272 and 1273 in DP 750158).

This Planning Proposal comprises the rezoning of land to facilitate a concept masterplan comprising a mix of residential allotments, neighbourhood centre, public recreation and conservation land at School Road, Forbes (The Site). The proposal would comprise approximately 745 residential lots, 1.56ha land zoned for a neighbourhood centre, 5.63ha for open space and 4.41ha of area identified as conservation management. This concept masterplan has been developed in consultation with Council. The proposal would be undertaken through numerous stages across an estimated lifespan of 10-15 years, these stages would be subject to the underlying housing demand in the Forbes Local Government Area.

The subject Site is identified for future residential development in the Forbes Housing Strategy 2021-2041. This proposed concept masterplan warrants support as it represents significant fiscal investment into underutilised land identified for future residential development. The rezoning of this land would enable private investment within Forbes which will assist in taking the pressure of Council who are presently catering for the increasing housing demand in the LGA and the Central West region through the rezoning and subdivision of their own sites. The Housing Strategy sought to provide release areas over multiple properties to promote the purchase and development of land in response to market opportunities. The proposal would provide for a diverse range of lots and housing typologies at varying price points to cater for an array demographics. More specifically, the concept masterplan highlights areas for small lots within proximity to the neighbourhood centre. Through the supply and diversity of new housing the proposal will provide greater housing choice and contribute to affordability. The subject Site represents site-specific strategic merit through the inclusion with the Forbes Local Housing Strategy and consistency with other key strategic documentation such as the Forbes Local Strategic Planning Statement and Central West and Orana Regional Plan.

The Planning Proposal requests amendments to the zoning, minimum subdivision lot size, height of buildings and land reserved for acquisition map. A summary of the proposed provisions is provided in the table below. These are further outlined in Section 4.0 of this report.

Table 1. Existing and Proposed FLEP 2013 Provisions

Control	Existing Provisions	Proposed Provisions
Land Use Zoning	RU1 Primary Production RE1 Public Recreation R5 Large Lot Residential	R1 General Residential RE1 Public Recreation C3 Environmental Management E1 Local Centre
Minimum Subdivision Lot Size	200ha 1ha 'Area A'	250m² 400m² 550m² 2ha Remove 'Area A'
Height of Building	10m 8.5m	12m 10m 8.5m
Land Reserved for Acquisition	'Regional Open Space'	Increase the area identified for 'Regional Open Space'.
Urban Release Area	N/A	Site to be included on the 'Urban Release Area' map.

An assessment has been undertaken of contamination, geotechnical, flooding and drainage, servicing and infrastructure, transport, heritage, and social and economic impacts. All recommendations appear to be

capable of being complied with and there are no significant environment planning impacts that would preclude future development of this land. Further, a preliminary Biodiversity Development Assessment Report has been prepared which indicates that a portion of land located on the northern boundary comprises significant native vegetation. As such, the proposal has incorporated a conservation area within the masterplan to seek to preserve this native vegetation.

On balance, it is requested that the proposed amendment to the FLEP 2013 be favourably considered by Forbes Shire Council to allow the proposal to proceed to Gateway Determination by the Department of Planning and Environment.

1.0 Introduction

This Planning Proposal Report has been prepared on behalf of Forbesview Pty Ltd to support a Planning Proposal submitted to Forbes Shire Council.

This Planning Proposal comprises the rezoning of land to facilitate a residential masterplan comprising a mix of residential allotments, neighbourhood centre, public recreation and conservation land at School Road, Forbes (The Site). The proposal would comprise approximately 745 residential lots, 1.56ha land zoned for a neighbourhood centre, 5.63ha for open space and 4.41ha of area identified as conservation management. This concept masterplan has been developed in consultation with Council. An Urban Design Report has been prepared by Hatch Roberts Day and is provided at Appendix 2 of this Report.

This Planning Proposal responds to the Site's inclusion in the Forbes Housing Strategy 2021-2041. The Site has been identified for future residential development to cater for the significant population growth that is anticipated in the Forbes Local Government Area (LGA). This is a unique opportunity for the Forbes LGA given the size and its location on the urban fringe allowing for a masterplanned development to cater for underlying housing demand. Forbesview Pty Ltd being the landowner and sole developer will be able to provide certainty of supply of housing to address the underlying housing demand in the Forbes LGA and Central West region, demand that was previously being met by Council through development of their own land.

We commend Council on this significant body of work preparing a comprehensive Housing Strategy. We look forward to delivering a high-quality residential masterplan that seeks to increase the housing choice and diversity in the Forbes LGA.

The structure of this Planning Proposal Report is provided below:

- Introduction
- The Site
- Planning Framework
- Planning Proposal
- Environmental Assessment
- Conclusion

2.0 The Site

2.1 Site Location & Existing Site Characteristics

The Site subject of this Planning Proposal Report is School Road, Forbes and the legal description is provided in the table below:

Table 2. Legal Description of the Site

Lots	Deposited Plan
830	750158
831	750158
386	750158
387	750158
388	750158
389	750158
375	750158
376	750158
1272	750158
1273	750158

The Site comprises approximately 92.38 hectares, is irregular in shape and currently comprises a single dwelling house and agricultural land. The subject Site is bound by School Road to the north, Farnell Street to the east, Morton Street to the south and Edward Street to the west. The proximity to Bogan Way and Newell Highway provides enhanced accessibility to a regional road network. The Site is located approximately 3.6km from Forbes Town Centre, 33km to Parkes Town Centre, 120km to Orange City Centre and 154km to Dubbo City Centre. Further, the Site is located within proximity of the Council's DA approved subdivision that is currently under construction.

The Site and surrounding context are shown in Figure 1 and 2 below.

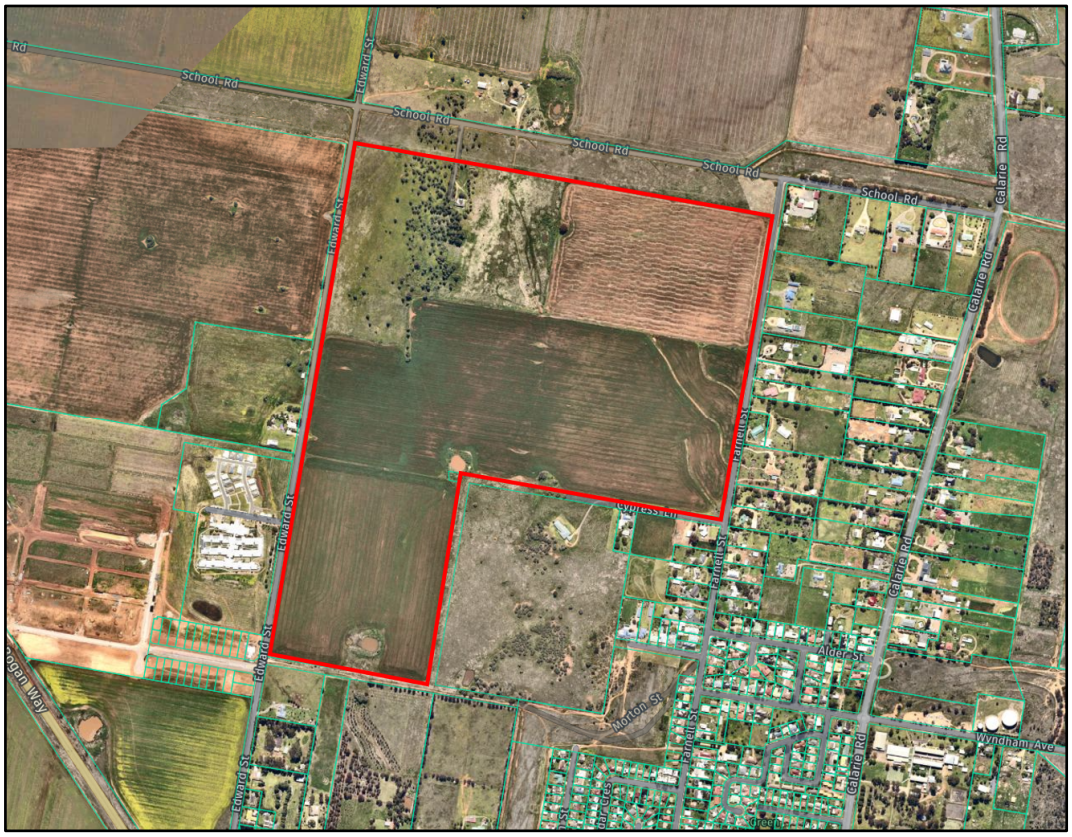


Figure 1. Aerial Image of Site (Nearmaps, 2023)

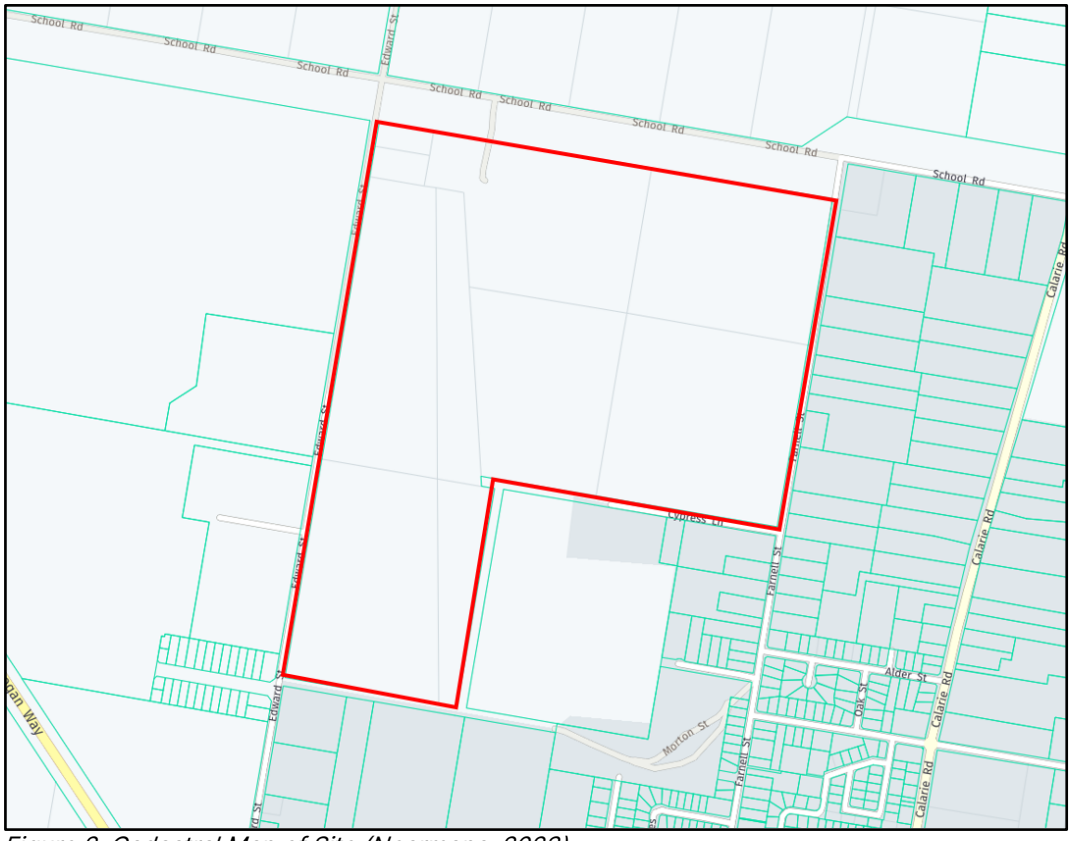


Figure 2. Cadastral Map of Site (Nearmaps, 2023)

The Site is in the Forbes LGA and is subject to the provisions of the *Forbes Local Environmental Plan 2013* (FLEP 2013). The Site is currently zoned RU1 Primary Production, R5 Large Lot Residential and RE1 Public Recreation. The Site comprises the environmental sensitivities including:

- Land reserved for acquisition; and
- Terrestrial biodiversity.

2.2 Site Context

The Site is located within the Forbes LGA. The immediate surrounding context comprises residential and rural zoning. More specifically, the following land use zones surround the Site:

- **South:** R1 General Residential zone
- **West:** R1 General Residential and RU1 Primary Production zones
- **North:** R5 Large Lot Residential zone
- **East:** R5 Large Lot Residential zone

The FLEP 2013 remains the primary Environmental Planning Instrument applicable to the Site. It is noted that the Site is located on the urban fringe and within direct proximity to Forbes Town Centre. As noted above, the Site is in proximity to a regional road network being Bogan Way and the State controlled Newell Highway but does not share a frontage with a regional.

Given the above, the contextual attributes of the Site are noted as follows:

- The Site is located approximately 3.6km from Forbes Town Centre.
- The Site is contained within the Forbes LGA.
- The Site is surrounded by residential and rural land use zones.
- FLEP 2013 is the primary Environmental Planning Instrument that applies to the Site. Pursuant to FLEP 2013 the Site is zoned RU1 Primary Production, R5 Large Lot Residential and RE1 Public Recreation.
- The proximity to Bogan Way provides enhanced access to facilities and services.
- Located next to Council's DA approved subdivision.

A Site context map is provided in the image below.

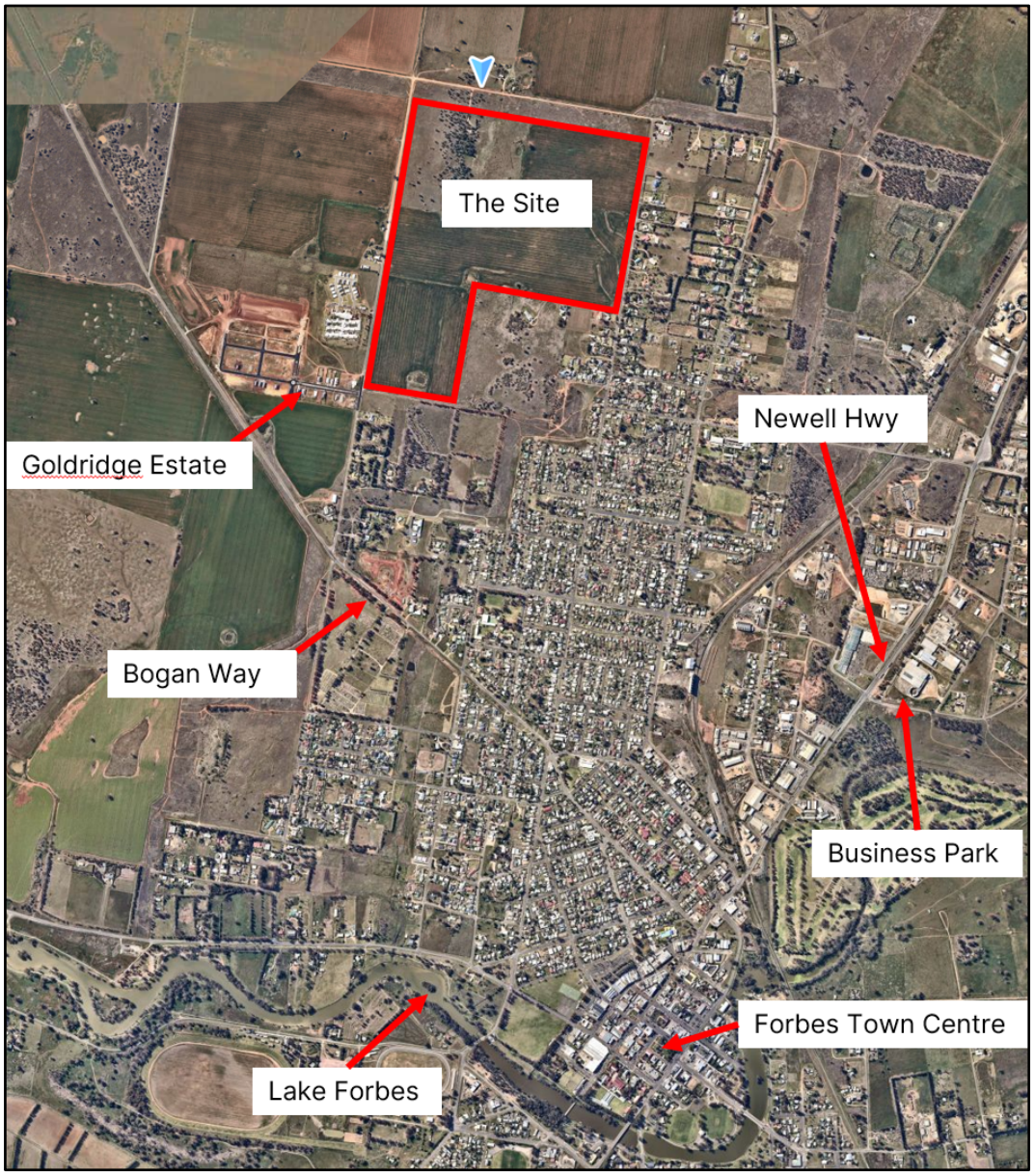


Figure 3. Site Context Map (Nearmaps, 2023 - as amended by Allera Planning)

2.3 Land Ownership

Forbesview Pty Ltd has exchanged contracts over the entirety of the Site and is subject to a delayed settlement. It must be acknowledged that it is considered a unique opportunity; single ownership maximises the opportunity and certainty to provide a high quality urban design outcome for the Site, and better meet the underlying demand for not only land, but housing in the region. The scale of the development would also allow for significant investment into an underutilised Site.

2.4 Supporting Documentation

This Planning Proposal is supported by the following relevant documentation to be read in conjunction with report:

Table 3. Supporting Documentation

Appendix	Title	Prepared By
1	Survey Plan	Zenith Construction Surveying
2	Urban Design Report	Hatch Roberts Day
3	Preliminary Site Investigation	Sydney Environmental
4	Geotechnical Report	Core Geotechnical
5	Preliminary Biodiversity Development Assessment Report	Travers Bushfire and Ecology
6	Flooding and Drainage Report	GHD
7	Servicing and Infrastructure Review	GHD
8	Transport Impact Assessment	Crossley Transport Planning
9	Aboriginal Heritage Constraints Assessment	Biosis
10	Social and Economic Impact Assessment	Hill PDA

3.0 Planning Framework

3.1 Strategic Context

This section provides an overview of the relevant planning strategies at the state, regional and local levels which includes:

- Housing 2041
- Regional Housing Taskforce
- Central West and Orana Regional Plan 2041
- Community Strategic Plan 2018-2028
- Local Strategic Planning Statement 2040
- Forbes Housing Strategy 2021-2041

3.1.1 Housing 2041

Housing 2041 is a 20-year vision for housing in NSW. It embodies the government's goals and ambitions to deliver better housing outcomes by 2041—housing in the right locations, housing that suits diverse needs and housing that feels like home.

The 20-year vision for Housing 2041 is set out below:

Peoples and communities have:

- *access to housing security, diversity, and support, irrespective of whether they live in metropolitan or regional areas*
- *choices that enable them to afford a home without compromising on basic needs*
- *support and opportunity in differing circumstances, including people in crisis, social housing residents, private rental tenants and those who aspire to home ownership.*

Homes in NSW are:

- *accessible and suitable for different stages of life or changing circumstances*
- *connected to local facilities, jobs, and social networks, with infrastructure, services, and spaces that people need to live sustainably*
- *designed to support human wellbeing and respond to the environment, maximise technology and support local character and place.*

The concept masterplan seeks to provide quality housing to meet the demands for dwellings in the Central West. The proposal provides housing that would be connected to local facilities, jobs, and social networks. The proposal supports housing diversity and affordability through additional supply and a provision of a range of lot sizes.

Housing 2041 aims to meet this vision through the following aspirations:

1. *Enhanced partnerships and cross-sector collaboration.*
2. *Increased support for those most in need.*
3. *More investment and support for housing that is adaptable to changing needs and environments.*
4. *Improved alignment of housing with infrastructure and community services for NSW communities*
5. *Additional support for first homebuyers.*
6. *Continued support for people in the private rental market.*

The proposal responds to the aspirations of Housing 2041 through the provision of a range of lot sizes and diversity contributing to affordable options through provision of small lot housing.

Further, and of great importance, the proposal would seek to work with Council to provide additional investment in underutilised land to provide housing for the growing population. Additional supply of housing will also have a wider flow on affect such as lowering rents in the private rental market.

3.1.2 Regional Housing Taskforce

As a direct consequence of the significant increases of demand and the resultant shortfall of supply for housing throughout Regional NSW the Regional Housing Taskforce was formed in June 2021 to investigate challenges and barriers to housing supply in the NSW planning system. The Taskforce also sought to develop recommendations on how the planning system and other NSW State Government levers could be used to achieve better housing outcomes for regional NSW.

Key findings of the report, as they relate to this submission, are summarised below:

- Greenfield sites present barriers through site specific constraints such as environmental and biodiversity issues, cost, and complexity of required technical studies, the funding and delivery of critical enabling infrastructure, and development feasibility and market factors. This can lead to land banking or slow release of housing.
- Certain planning processes should be consolidated and streamlined to enable more efficient assessment. Effort and resources should be deployed to address place-based barriers and to resolve complex issues that exist within the planning system.
- There is a need for greater upfront strategic planning including investment in technical studies to resolve issues earlier in the planning process. Further, infrastructure planning, delivery and coordination need to be improved to unblock regional housing supply.

Based on the findings of the Regional Housing Taskforce, the following recommendations were provided:

1. Support measures that bring forward a supply of "development ready" land.
2. Increase the availability of affordable and diverse housing across regional NSW.
3. Provide more certainty about where, when and what types of homes will be built.
4. Investigate planning levers to facilitate the delivery of housing that meets short term needs.
5. Improve monitoring of housing and policy outcomes and demand indicators to better.

The proposal is for a masterplan on a greenfield site. Forbesview Pty Ltd are willing and have commissioned the necessary upfront reports to demonstrate that the land is 'development ready', void of significant environmental planning constraints and suitable for future development. As such, the proposal is considered to align with the findings and recommendations of the Regional Housing Taskforce. Further, the proposal would provide a diverse range of housing which would be clearly articulated throughout the process and providing certainty of housing typologies responding to the market demand. We intend for this to be a collaborative process with Forbes Shire Council.

Further, in August 2022 the NSW Government adopted the recommendations of the Regional Housing Taskforce as part of a comprehensive response to support the delivery of 127,000 new homes needed to house the growing population over the next 10 years.

The proposal is consistent with the aims and objectives of the Regional Housing Taskforce. The proposal seeks to bring forward the delivery of residential development through the unlocking of an existing greenfield Site which is relatively void of significant environmental constraints. Additionally, the proposal provides for a diverse range of lot sizes and housing typologies which seeks to meet the needs of the changing demographic and household composition.

3.1.3 Central West and Orana Regional Plan 2041

The Central West and Orana Regional Plan 2041 (Plan) is a 20-year plan for the region helping guide planning priorities and decision making. It provides an overarching framework to guide subsequent and more detailed land use plans, development proposals and infrastructure funding decisions.

The Central West and Orana Regional Plan notes that Forbes is growing quickly with a projected population growth of 1.4% annually. This is a result of Forbes' proximity to Parkes Special Activation Precinct (SAP), inland rail and industrial and commercial growth. Further, Forbes is emerging as a tourist hub with a state-of-the-art Visitor Information Centre, new Art Gallery, multiple major events such as Vanfest and Frost and Fire,

the Digital Heritage Trail, and the Somewhere Down the Lachlan Sculpture Trail. The Plan notes that Council has leveraged this growth to provide new residential land releases to cater for this growth. The proposal is within an area identified for a new residential land release and is consistent with the Local Housing Strategy.

The proposal is consistent with Part 3 People, centres housing and communities. Specifically, the proposal responds to the following objectives:

Objective 13: Provide well located housing options to meet the demand.

The proposal seeks to provide a high-quality masterplan which caters for the identified need for housing in the Forbes LGA. The Site is identified for future residential development in the Forbes Housing Strategy, relatively void of significant environmental constraints and located on the urban fringe close to the Forbes Town Centre. The proposal is capable of utilising existing services for the initial stages of the development, and we are working with Council to provide planned trunk infrastructure to service the later stages. The Site is considered appropriate for future residential development and the proposal would seek to cater for the housing demand in the Forbes LGA.

Direction 14: Plans for diverse, affordable, resilient and inclusive housing.

The proposal seeks to provide a diverse range of lots and housing typologies at varying price points to cater for varying demographics. More specifically, the concept masterplan highlights areas for small lots within proximity to the neighbourhood centre. Through the supply and diversity of new housing the proposal will provide greater housing choice and contribute to affordability.

Furthermore, the proposal would create significant employment opportunities throughout the construction thereby contributing significantly to the local economy. The neighbourhood centre would also present opportunities for ongoing employment during operation.

Hatch Roberts Day have been engaged as the urban designer and have prepared a concept masterplan. As part of any Planning Proposal Hatch Roberts Day scope is to provide urban design input on all facets of the development to ensure a high-quality urban design outcome and a healthy built environment. As outlined above, providing a high-quality urban outcome is a key objective for this proposal.

It is considered that the proposal is consistent with the Directions of the Central West and Orana Regional Plan to provide housing diversity and choice providing a healthy built environment and a high-quality urban design outcome.

3.1.4 Community Strategic Plan 2018-2028

The Community Strategic Plan was prepared in 2018 and outlined a 10-year vision setting out a collective vision, long term goals and community priorities for the Forbes LGA.

The proposal accords with the Direction 4 *Rural and Urban Landuse* through the provision of a residential masterplan within an area identified for future residential development. Specifically, the proposal responds to the following strategies set out to achieve this direction:

RU2 Develop appropriate landuse planning measures that facilitate diversity and choice in housing and in rural and urban living

The proposed masterplan would result in the creation of a variety of lot types and sizes that would result in providing diversity and housing choice.

RU4 Ensure that issues of amenity and access are addressed and accounted for in local urban design and planning

A high quality masterplan has been designed by Hatch Roberts Day and demonstrates a range of housing typologies around an interconnected set of nodes including a hilltop conservation area, open space, a chain of ponds open space and active travel pathways and a neighbourhood centre. The proposal is considered too represents a high quality scheme that would provide excellent amenity for future residents and enhanced access to the township.

RU6 Ensure that there is adequate land supply and subdivisions to accommodate future population growth and facilitate commercial and industrial expansion

The proposed masterplan is required to cater for the substantial population growth that the Forbes LGA is currently experiencing. The Proponent is working closely with Council to ensure that the development will provide housing diversity and choice in the region. The flow on effects from the provision of residential development includes injection into the local economy through jobs and infrastructure. Further, the proposal incorporates a neighbourhood centre which would cater for the day-to-day needs of future and current residents in the North Forbes area.

We also consider that there is significant benefit in providing a small neighbourhood centre. During the most recent floods, the Forbes Town Centre was inundated with water and many residents were cut off from supplies. The provision of a small neighbourhood centre will be capable of catering for residents in North Forbes during flooding events. The proposal seeks to limit the size of the neighbourhood centre to ensure that the proposal does not detract from the Forbes Town Centre. We consider that this meets Direction 2 of the Community Strategic Plan through the provision of employment generating uses helping to support the day to day needs of residents without jeopardising the function of the Forbes Town Centre.

3.1.5 Local Strategic Planning Statement 2040

The Forbes Local Strategic Planning Statement (LSPS) was prepared in 2020 to set out a vision and planning priorities for the future of the Forbes LGA. The vision for Forbes 2040 notes that the Forbes LGA will be the residential location of choice in the Central West because of its thriving town centre, recreational opportunities, and diverse economy. Further, it states that residential areas will experience strong growth while being mindful of environmental constraints and a wide range of housing will be made available to cater for the projected growth.

The proposal is considered the physical realisation of this vision set out in the LSPS through the provision of a high-quality residential masterplan within an area identified for residential investigation and relatively void of environmental constraints. In particular, the subject Site is not constrained by flood planning area, reactive soils, and groundwater vulnerability.

The LSPS outlined several Planning Priorities including *Our Neighbourhood* which emphasised the need to ensure new land releases were designed to grow a healthy and liveable community considering; functionality, character, and connectivity to services. The LSPS also outlined the desire to provide a balance of housing and open space to cater for the needs of future residents. The proponent has engaged Hatch Roberts Day to prepare a high-quality design of the future land release in North Forbes. The proposal demonstrates a range of housing typologies around an interconnected set of nodes including a hilltop conservation area, open space, a chain of ponds open space and active travel pathways and a neighbourhood centre.

The LSPS set out actions for Council which included the preparation of a Local Housing Strategy and the rezoning of land appropriate to support residential growth. The proposal is consistent with the LSPS through the request to rezone land identified for future residential development in the Forbes Housing Strategy. This proposal seeks to provide land appropriate for future residential development to cater for the growing Forbes community and represents significant investment into underutilised land void of any significant environmental constraints such as; flooding and groundwater vulnerability. The proposal is consistent with the vision, planning priorities and actions of the LSPS.

3.1.6 Forbes Housing Strategy 2021-2041

The Forbes Housing Strategy was prepared in 2021 and endorsed earlier this year. This Strategy outlines the importance of facilitating the supply of new housing to meet the demands of the growing population. We commend Council in undertaking this significant body of work.

Forbes is projected to grow by 34% by 2041 (an additional 3,208 people) through both natural population change (779 persons) and migration (2,430 persons). This change is likely to result in demand 1,580 additional households (~1,819 dwellings when considering the NSW DPE's forecast change to household size and structure). The proposal seeks to respond to the needs of the Forbes LGA, catering for this growth through the provision of not only additional residential land, but a variety of housing product on that land – product that is best provided for by the private sector.

The housing supply analysis noted that based on the current occupancy rate and total dwelling stock, there is a deficiency in the current housing supply for the existing population. Based on future projections and the current rate of housing approvals this deficiency will only worsen. Furthermore, the recent pandemic and the changing working dynamic has seen greater population growth in regional centres. More specifically, the recent social landscape and ability to work from home has seen an increase in migration to regional cities and a significant increase in housing prices as a result. The introduction of additional housing in the Forbes LGA will have flow on effects for more affordable and diverse housing options.

In response to the Forbes Housing Framework, Council have prepared urban growth site options analysis to identify sites capable of accommodating residential growth in the Forbes LGA. The Site was identified as precincts 05 *Edwards Street, Moreton St and Cypress Lane;* 06 *Edwards Street, School Road*; and 10 *Edwards Street, School Road*. The review of each of these precincts notes that they are made up of few titles and present an excellent opportunity to provide an optimum site layout and urban design outcome. i.e., avoiding the challenges associated with fragmented ownership and delivery. The Proponent is seeking to provide this through a high-quality concept masterplan prepared by Hatch Roberts Day. The proposal is considered to represent the physical realisation of the desired future outcome and represents significant investment in an underutilised site. The concept masterplan seeks to build on the extensive work that Council has already completed for the identified precincts.

Although, these precincts have been identified as a Stage 4 and 4a of the Forbes Urban Land Staging Plan it must be noted that this staging is indicative in nature and outlines the quantum of land required to cater for projected population growth rather than the specific timing of each stage. As such, we consider that the rezoning of the subject Site meets the intent of the Forbes Urban Land Staging Plan.

This proposed concept masterplan warrants support as it represents significant fiscal investment into underutilised land identified for future residential development. The rezoning of this land would enable private investment within Forbes which will assist in taking the pressure of Council who are presently trying to cater for the increasing housing demand in the LGA and the Central West region through the rezoning and subdivision of their own sites. The urban staging plan sought to provide release areas over multiple properties to promote the purchase and development of land in response to market opportunities. This is explicitly outlined in Section 15 of the Local Housing Strategy.

A highly indicative masterplan was prepared by Council for the land to accompany the Local Housing Strategy. Whilst we have considered the extensive work that Council has done, we have engaged Hatch Roberts Day to revisit this masterplan, providing a high-quality urban outcome for the Site. We have been collaborating with Council closely to achieve the vision of the Local Housing Strategy.

The concept masterplan seeks to respond to Section 8.6 of the Local Housing Strategy which encourages the higher density living, strong urban form and improved liveability. The proposal seeks to provide well-located higher density product within proximity to open space and the local centre. The proposal will contribute to housing choice and diversity, ensure the viability of the proposed local centre, and encourage greater patronage of the open space facilities. The proposal seeks to provide an enhanced liveability whilst providing high quality, well-thought out and appropriate examples of higher density living in the Forbes LGA.

The proposal is consistent with the vision and aims of the Local Housing Strategy through the provision of additional housing to cater for the growing population in the Forbes LGA.

3.2 Statutory Framework

3.2.1 Forbes Local Environmental Plan 2013

The FLEP 2013 is the primary environmental planning instrument applying to the Site. The relevant provisions are outlined below:

Zoning

The subject Site is currently zoned a mix of RU1 Primary Production, R5 Large Lot Residential and RE1 Public Recreation. The relevant zoning controls are provided in the table below.

Table 4. Current Land Zoning Permissibility and Objectives

Permissibility	RU1 Primary Production	R5 Large Lot Residential	RE1 Public Recreation
Objectives	• To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. • To encourage diversity in primary industry enterprises and systems appropriate for the area. • To minimise the fragmentation and alienation of resource lands. • To minimise conflict between land uses within this zone and land uses within adjoining zones. • To provide opportunities for intensive and extensive agriculture in appropriate locations consistent with the environmental capability of the land.	• To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality. • To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future. • To ensure that development in the area does not unreasonably increase the demand for public services or public facilities. • To minimise conflict between land uses within this zone and land uses within adjoining zones.	• To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes.
Permitted without consent	Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems	Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems	Environmental protection works; Roads; Water reticulation systems
Permitted with consent	Agritourism; Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and	Bed and breakfast accommodation; Building identification signs; Business identification signs; Dual occupancies; Dwelling	Aquaculture; Boat launching ramps; Boat sheds; Building identification signs; Business identification

	breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Home businesses; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping material supplies; Open cut mining; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Veterinary hospitals; Water recreation structures; Water supply systems	houses; Home industries; Oyster aquaculture; Pond-based aquaculture; Roadside stalls; Tank-based aquaculture; Any other development not specified in item 2 or 4	signs; Car parks; Charter and tourism boating facilities; Centre-based child care facilities; Community facilities; Environmental facilities; Flood mitigation works; Heliports; Information and education facilities; Jetties; Kiosks; Mooring pens; Moorings; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Water recreation structures
Prohibited	Any development not specified in item 2 or 3	Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Car parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria;	Any development not specified in item 2 or 3

		Entertainment facilities; Exhibition homes; Exhibition villages; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Helipads; Highway service centres; Industrial retail outlets; Industrial training facilities; Industries; Local distribution premises; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major); Registered clubs; Research stations; Residential accommodation; Resource recovery facilities; Restricted premises; Rural industries; Service stations; Sewage treatment plants; Sex services premises; Signage; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Waste disposal facilities; Water treatment facilities; Wharf or boating facilities; Wholesale supplies	

Whilst the zoning reflects the current uses on the subject Site, the Forbes Housing Strategy has identified the Site for future residential development. The Site is currently surrounded by existing and future residential development including R1 General Residential to the south and west of the Site and R5 Large Lot Residential to east. The proposed rezoning represents the future desired use of the land.

A zoning map is provided in the figure below.

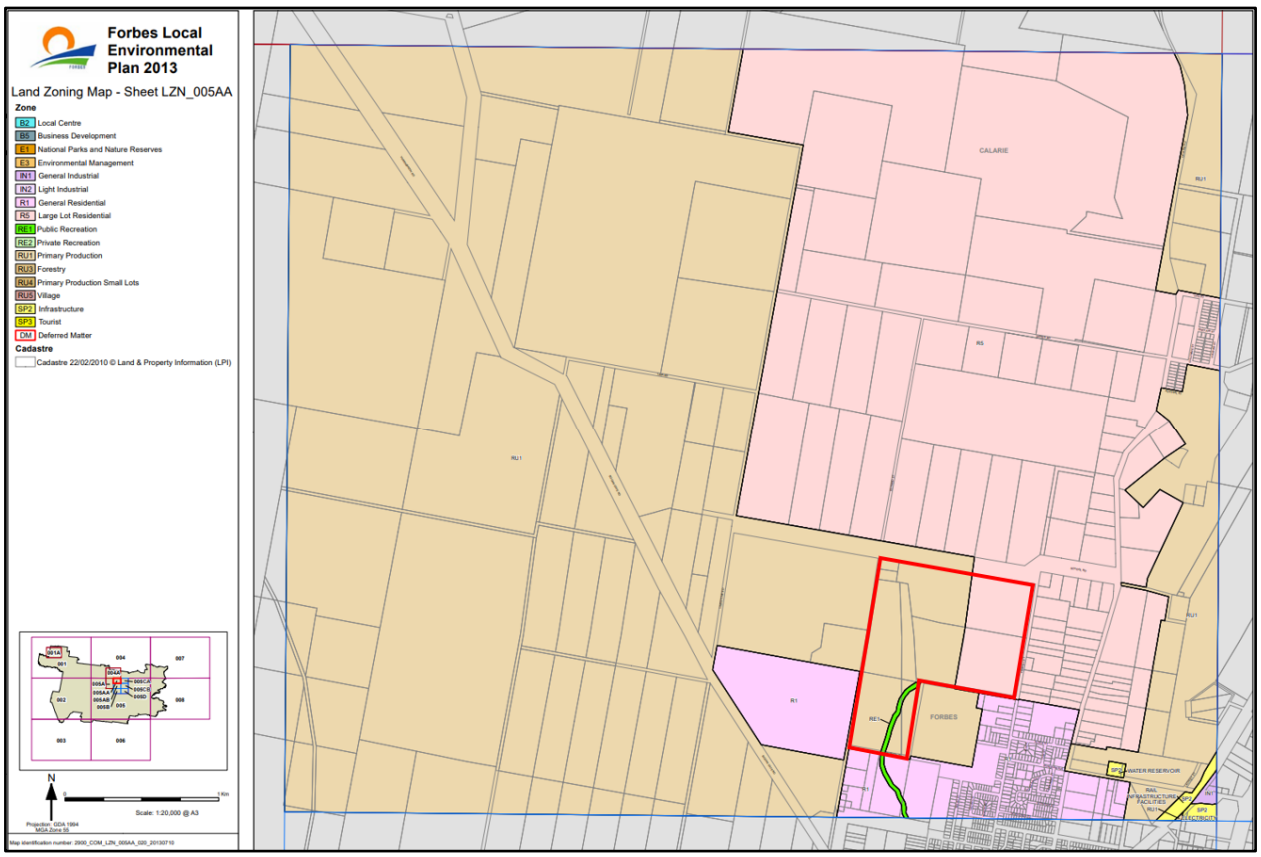


Figure 4. Land Zoning Map (NSW Legislation, 2023)

Minimum Lot Size

Each of the existing zones on the subject Site comprise a different lot size. This is outlined in the table below:

Table 5. Existing minimum subdivision lot size controls

Control	RU1 Primary Production	R5 Large Lot Residential	RE1 Public Recreation
Minimum subdivision lot size	200ha	1ha (Site identified as 'Area A' which may be reduced to 4,000m² lots)	N/A

The minimum lot size map is provided in the figure below.

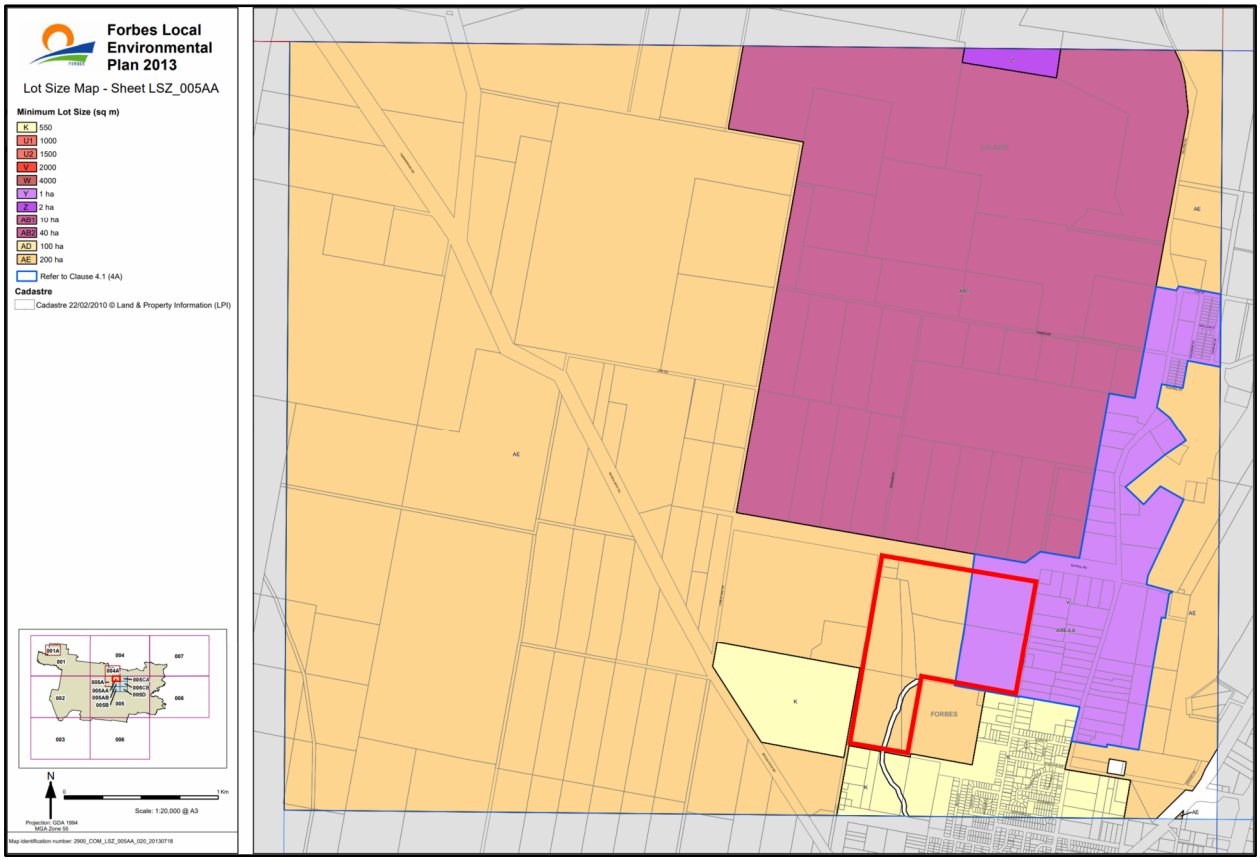


Figure 5. Minimum Lot Size Map (NSW Legislation, 2023)

Height of Buildings

The subject Site comprises a mix of existing maximum building heights of 8.5m and 10m. More specifically, the maximum building height for the RU1 Primary Production and RE1 Public Recreation zoned land is 10m and is 8.5m for the R5 Large Lot Residential zoned land.

The height of buildings map is provided in the following figure.

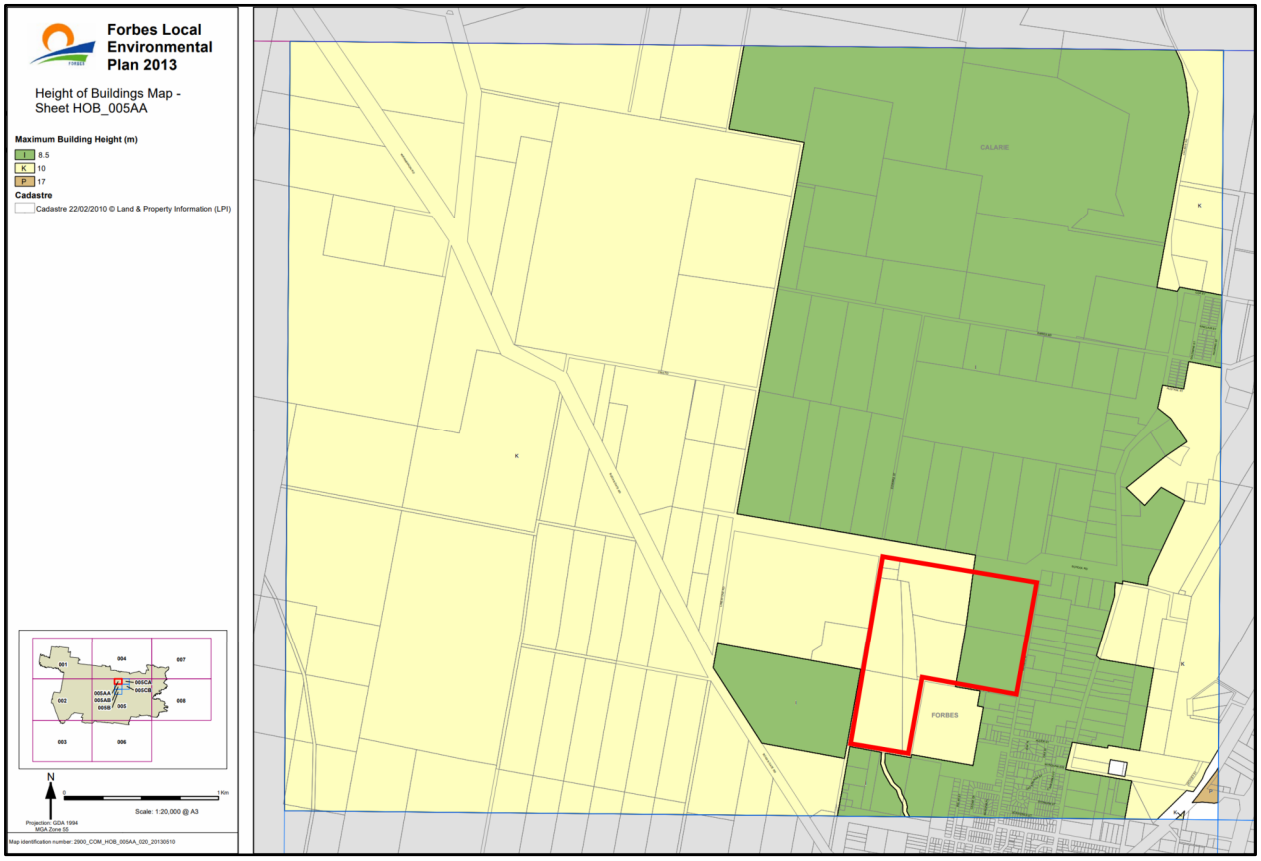


Figure 6. Height of Buildings Map (NSW Legislation, 2023)

Relevant Acquisition Authority

The RE1 Public Recreation Land is identified as being land reserved for acquisition. The land is identified as land for 'Regional Open Space'. No other portion of the land has been identified as land reserved for acquisition.

The Land Reservation Acquisition map is provided in the following figure.

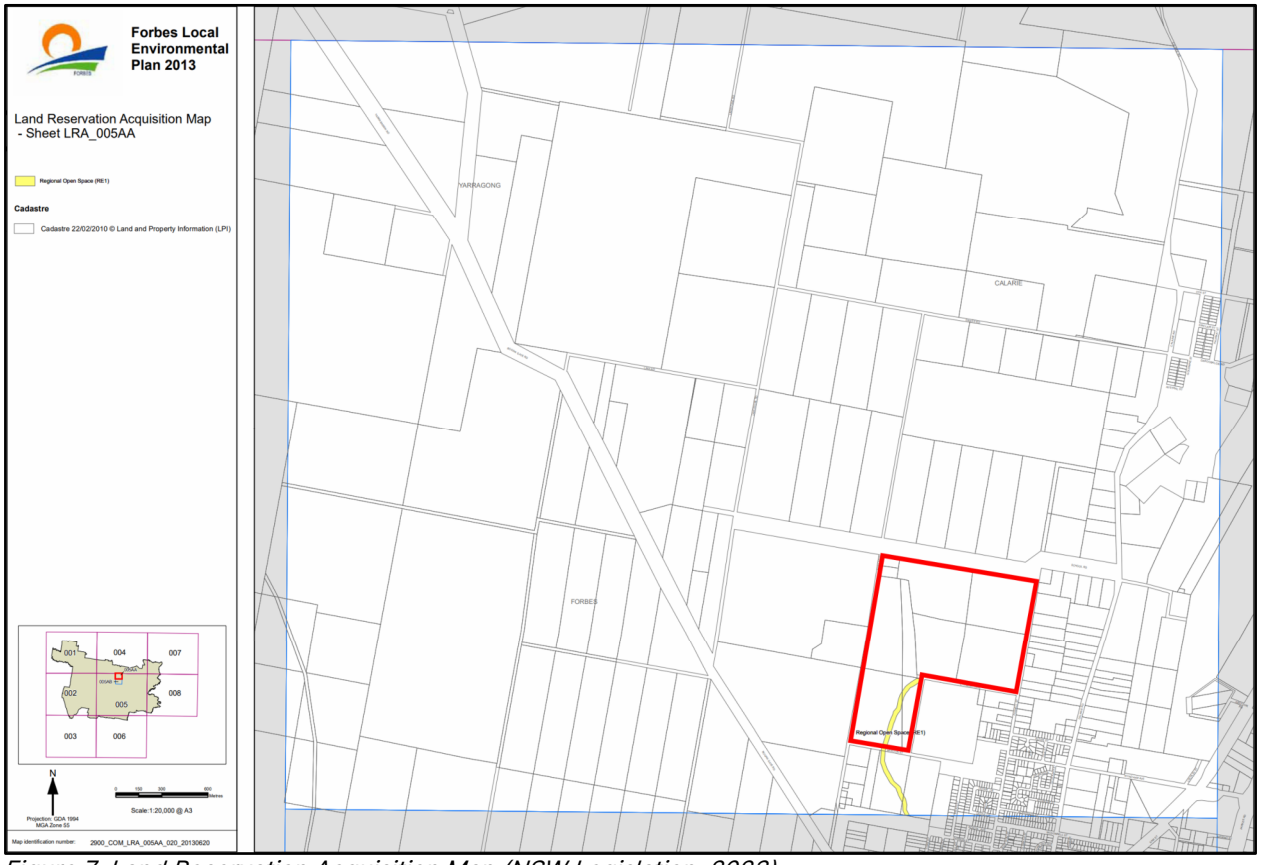


Figure 7. Land Reservation Acquisition Map (NSW Legislation, 2023)

Heritage Conservation

The subject Site is not identified as a heritage item nor is it located with a heritage conservation area. Further, an Aboriginal Heritage Constraints Assessment has been prepared by Biosis which concluded that no further assessment was warranted subject to the implementation of an unexpected finds protocol.

Council's heritage mapping is provided in the following figure, and the Aboriginal Heritage Constraints Assessment is provided at Appendix 9.

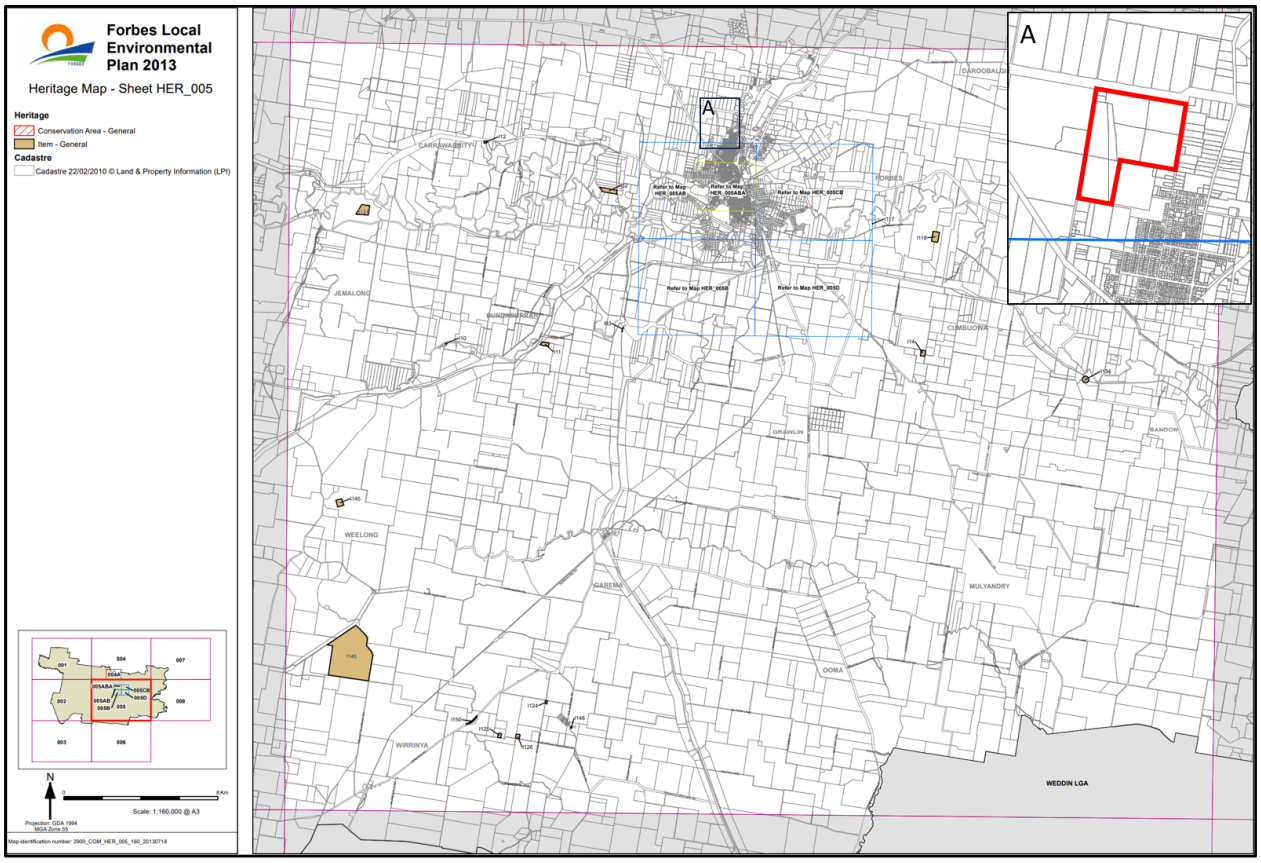


Figure 8. Heritage Map (NSW Legislation, 2023)

Flood Planning

The subject Site is not located within the flood planning area as identified by Council's FLEP 2013 mapping. Notwithstanding Council's mapping, a Flooding and Drainage Report has been prepared by GHD and concludes that the concept masterplan incorporates measures to address the flooding, drainage and water quality requirements that are suitable for consideration by Forbes Shire Council and other relevant authorities.

The flood planning area mapping is provided in the following figure and the Flooding and Drainage Report is provided at Appendix 6.

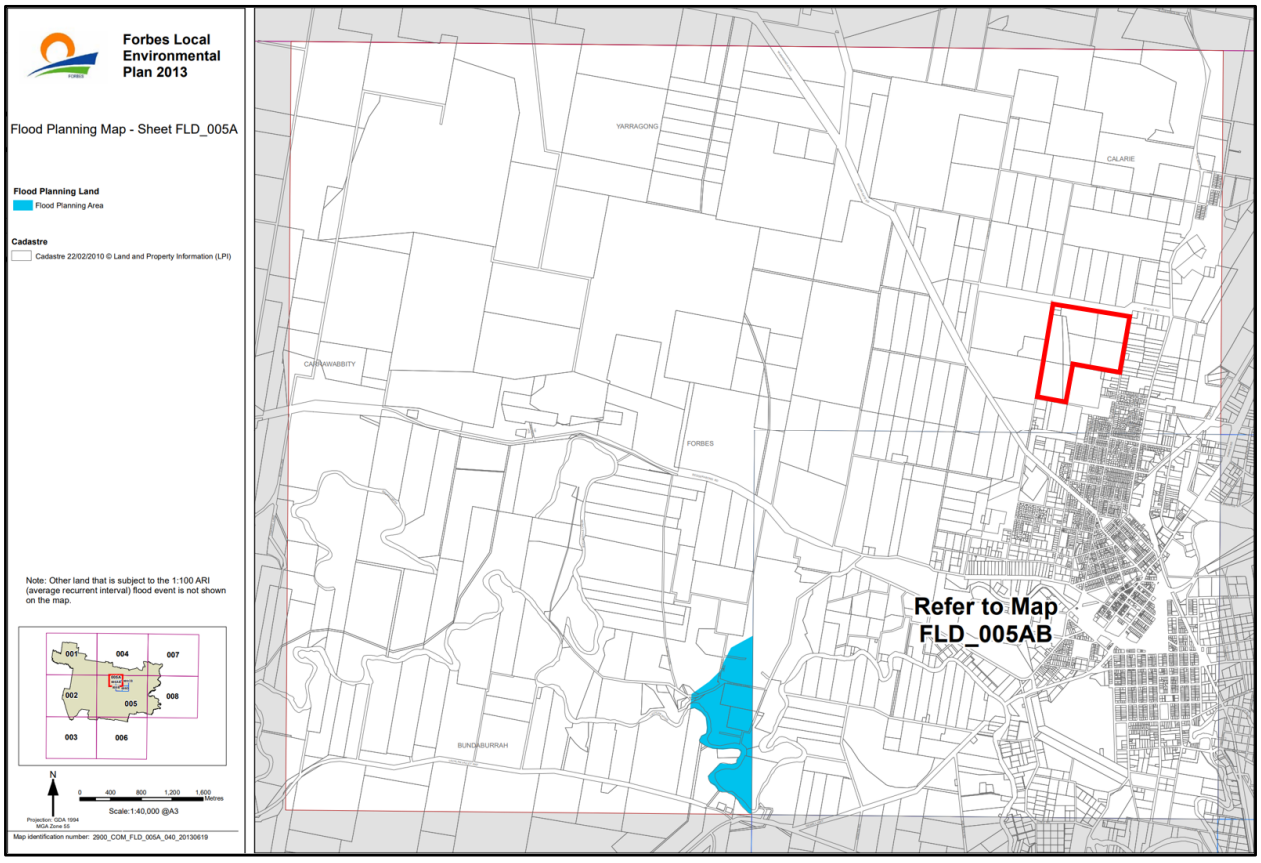


Figure 9. Flood Planning Map (NSW Legislation, 2023)

Urban Release Area

The subject Site is not identified as being located within an Urban Release Area pursuant to the FLEP 2013. The urban release area mapping is shown in the following figure.

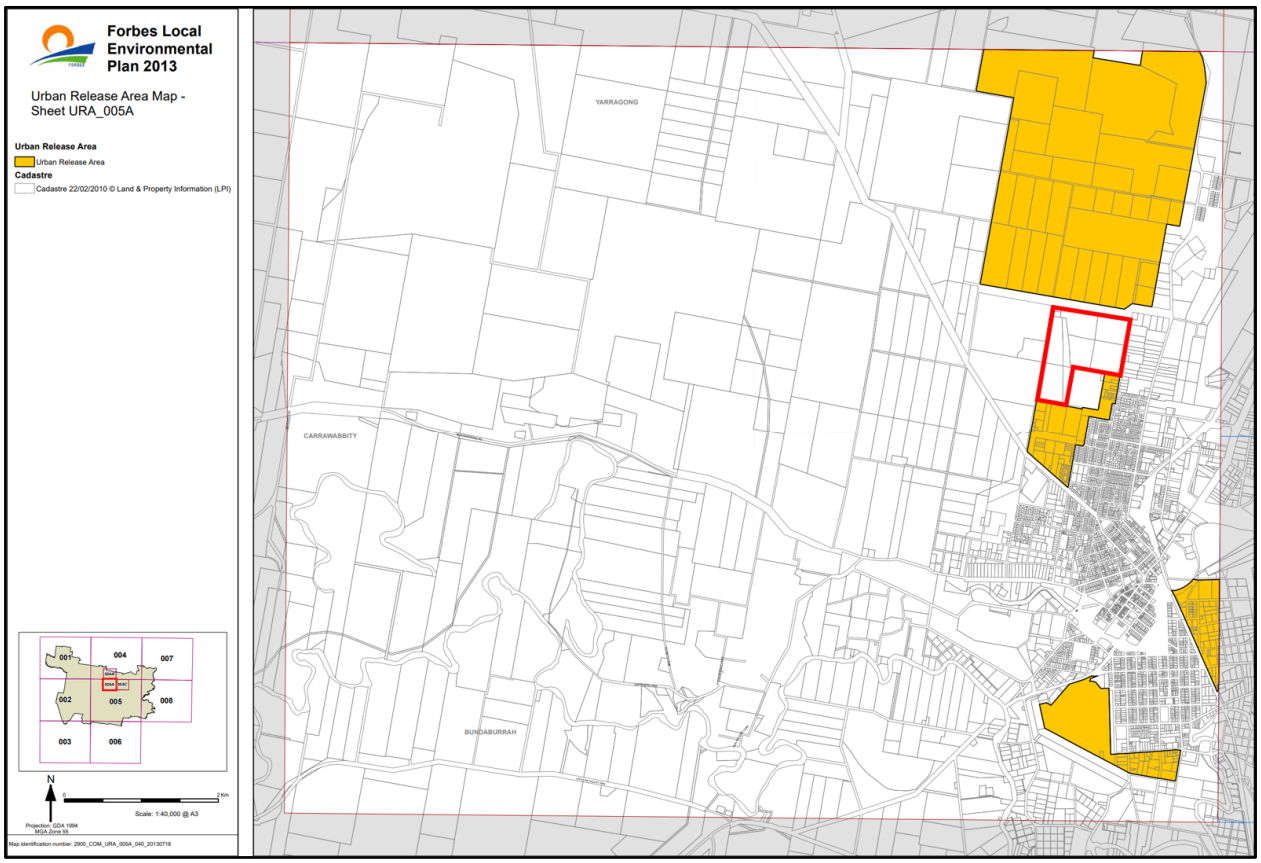


Figure 10. Urban Release Area Map (NSW Legislation, 2023)

Terrestrial Biodiversity

A portion of land along the northern boundary of the Site is identified as containing land comprising high biodiversity. A preliminary Biodiversity Development Assessment Report (BDAR) has been prepared by Travers Bushfire and Ecology. The preliminary BDAR has recommended that we seek to retain as many trees as possible in the northern portion of the Site. This has necessitated the irregular shape of the hilltop reserve.

The terrestrial biodiversity map is provided in the following figure and the preliminary BDAR is provided at Appendix 5.



Figure 11. Terrestrial Biodiversity Map (NSW Legislation, 2023)

Groundwater Vulnerability

The subject Site is not identified as being in an area comprising Groundwater Vulnerability.

The Groundwater Vulnerability Map is provided in the following figure.

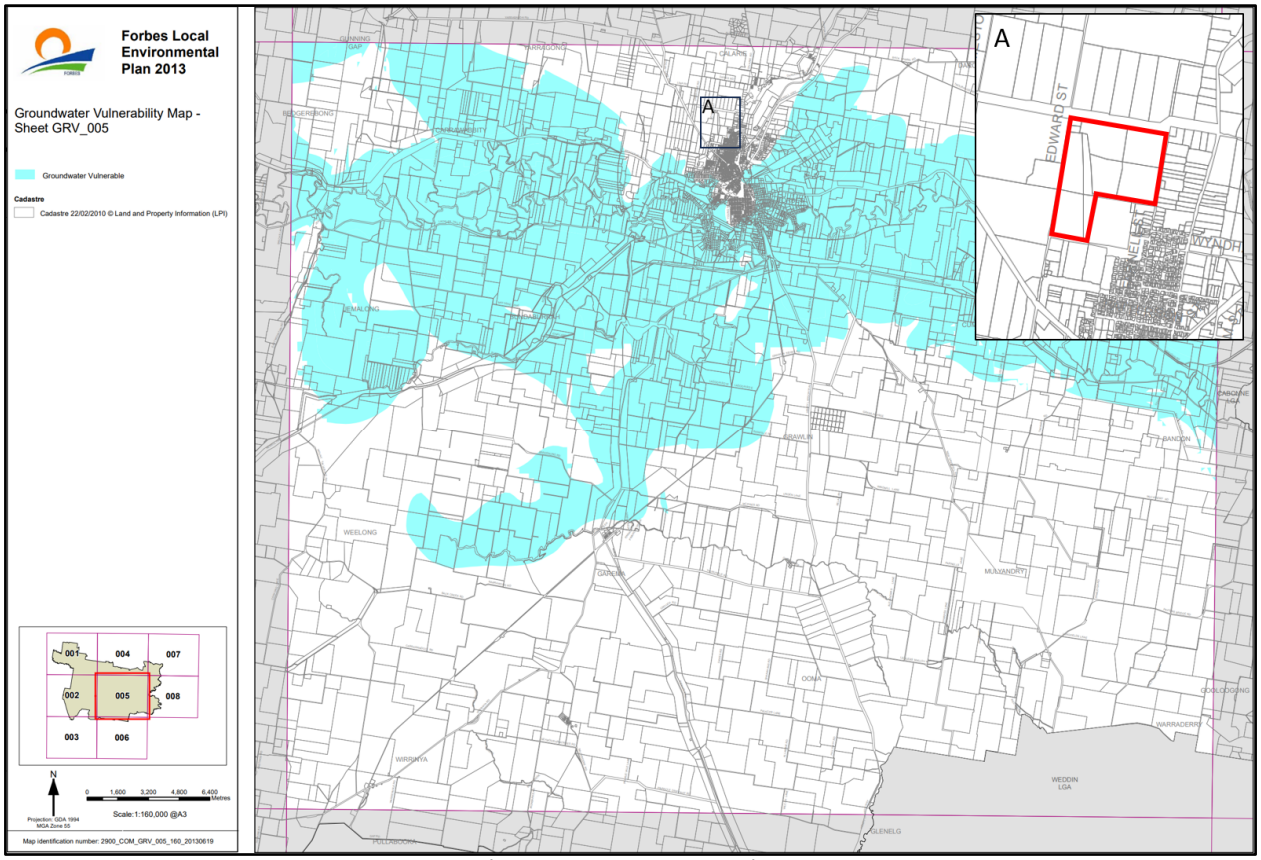


Figure 12. Groundwater Vulnerability Map (NSW Legislation, 2023)

Riparian Land and Watercourses

The subject Site is not identified as comprising riparian land and/or a watercourse.

The Watercourse Map is provided in the following figure.

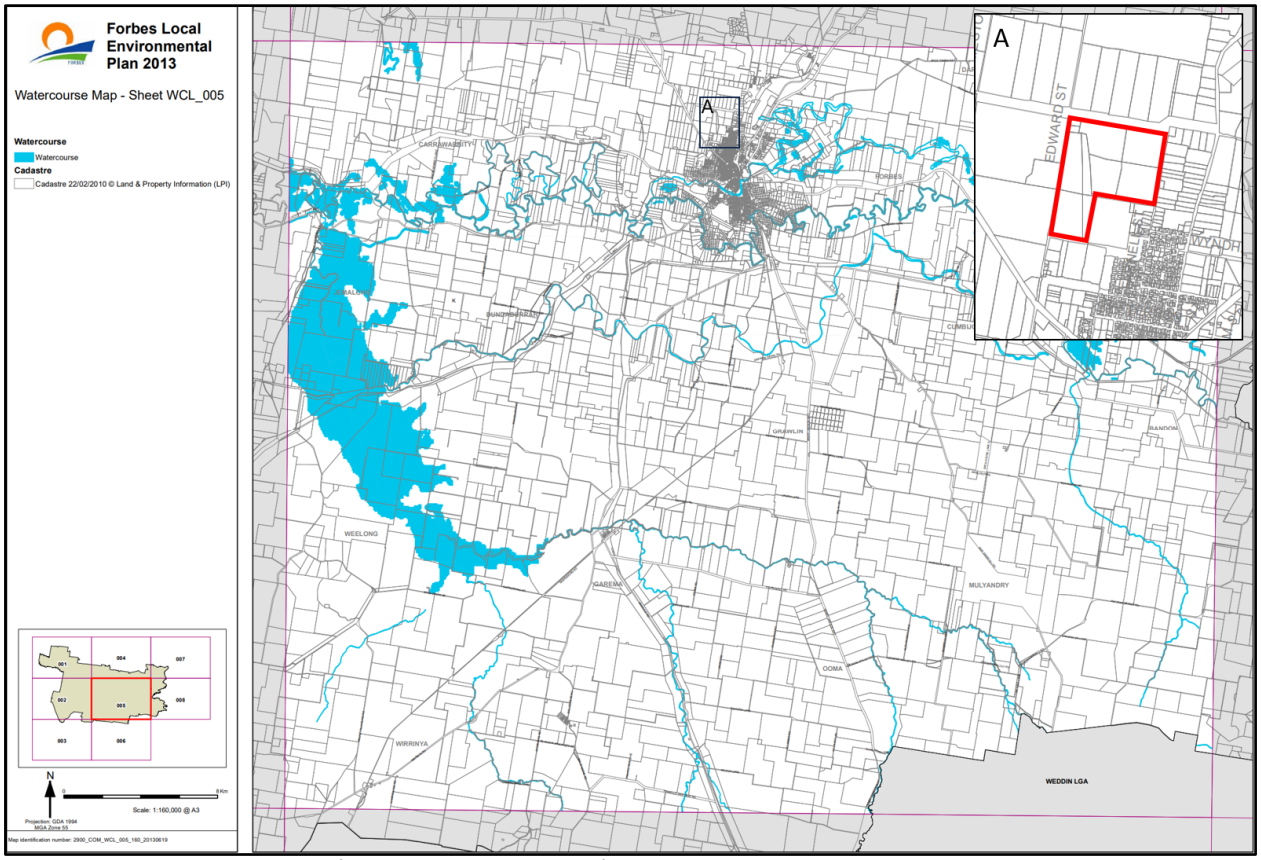


Figure 13. Watercourse Map (NSW Legislation, 2023)

Wetlands

The Site is not identified as comprising a Wetland. The FLEP 2013 Wetlands map is provided in the following figure.

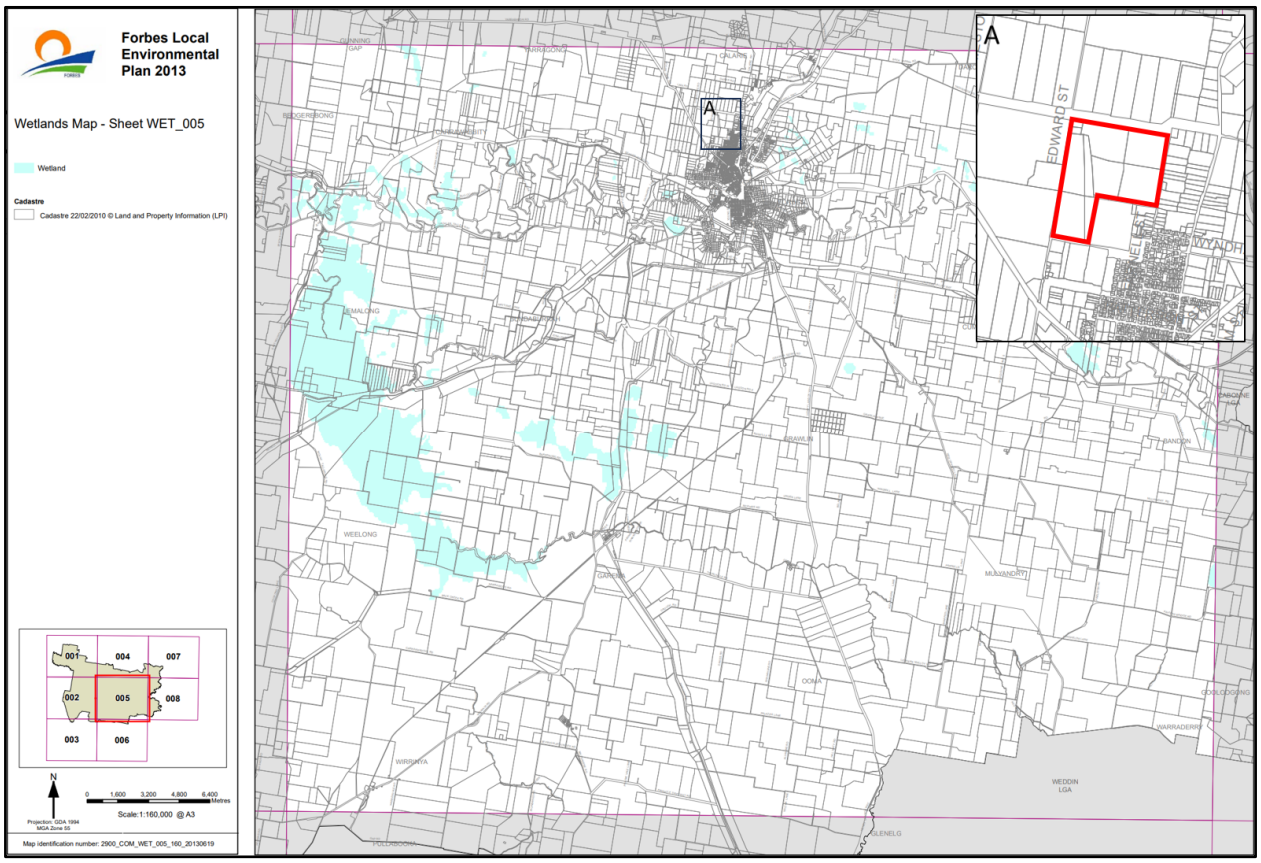


Figure 14. Wetlands Map (NSW Legislation, 2023)

In summary, the subject Site is relatively void of any significant environmental planning constraints and changes are required to the land zoning, minimum subdivision lot size, building height and land reserved for acquisition maps to facilitate the proposed masterplan.

3.2.2 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the overarching statutory planning legislation in NSW. The EP&A Act provides the legislative framework for assessment and approval of the proposed development. The objects of the Act are as follows:

a) *to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
b) *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
c) *to promote the orderly and economic use and development of land,*
d) *to promote the delivery and maintenance of affordable housing,*
e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
f) *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
g) *to promote good design and amenity of the built environment,*
h) *to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
i) *to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
j) *to provide increased opportunity for community participation in environmental planning and assessment.*

The Site has been identified for urban development through the Forbes Housing Strategy and the request for rezoning is considered to promote the orderly and economic use of the land. The rezoning would facilitate residential zoned land for the development of variety of housing and lot types that would contribute to housing choice and diversity in the Forbes LGA.

3.2.3 Biodiversity Conservation Act 2016

The purpose of the *Biodiversity Act 2016* (BC Act) is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecological sustainable development.

Part 4, Division 2 and 5 lists threatened species, ecological communities, and key threatening processes to be considered under s73. S73 sets out the test for determining whether the proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. Further, Part 6 establishes an offsets scheme which aims to ensure there is no net loss of biodiversity values. Entry into the offset scheme is triggered by exceeding the thresholds as outlined in Part 7 of the BC Regulation, specifically:

- Clearing of native vegetation greater than 0.25 ha (based upon minimum lot size of less than 1 ha).
- Clearing of land within the Biodiversity Values Map, which identifies areas of high biodiversity value.
- Development that will significantly affect threatened species or ecological communities, or their habitats (according to s7.3 of the BC Act).

When submitting an application to the consent authority, proponents must provide evidence related to the Biodiversity Offset Scheme thresholds' triggers and, where applicable, the test of significance. Under Part 4 of the EP&A Act, development consent cannot be granted for non-state significant developments if it's believed that there will be serious and irreversible impacts (SAII) on biodiversity values. These SAII determinations are in line with principles listed under Section 6.7 of the *Biodiversity Conservation Regulation 2017*, which focuses on threats that might significantly raise extinction risks for certain species or ecological communities in New South Wales. Furthermore, the threatened species test of significance evaluates the potential impacts of developments on these species or communities and their habitats. This test, detailed in Section 7.3 of the BC Act, is crucial for BOS entry requirements and for activities under Part 5 of the EP&A

Act. If a significant impact is likely or the activity takes place in an area with outstanding biodiversity value, the proponent must utilize the BOS or produce a species impact statement (SIS). Otherwise, the environmental impacts of activities deemed not significantly harmful to threatened species will be evaluated under Section 111 of the EP&A Act.

An ecological survey, compliant with the Biodiversity Assessment Methodology (BAM) and other legislation, was undertaken. This thorough survey confirmed the presence of the Grey-crowned Babbler and the threatened ecological community of Grey Box Grassy Woodlands of South-Eastern Australia within the development footprint.

Given the ecological nuances of the area, an environmental conservation zone has been proposed to avoid impacts on the existing vegetation along the northern boundary of the Site. The primary conservation approach is to strategically design the concept masterplan in areas with low biodiversity, primarily focusing on previously cleared land.

The preliminary BDAR is discussed further in Section 5.4 of this report.

3.2.4 State Environmental Planning Policy (Resilience and Hazards) 2021

A Preliminary Site Investigations (PSI) for Contamination has been prepared by Sydney Environmental to support this Planning Proposal and is attached at Appendix 3. The PSI concluded that a targeted Detailed Site Investigations should be prepared for the portions of the Site identified as Potential Areas of Environmental Concern as part any future Development Application in accordance with the requirements of the *State Environmental Planning Policy (Resilience and Hazards) 2021*. Given the isolated Potential Areas of Concern, the PSI is considered appropriate to support this Planning Proposal and a Detailed Site Investigations would be prepared to support any future Development Application.

4.0 Planning Proposal

A concept masterplan has been prepared for the Site which has been informed by a variety of consultant reports. An Urban Design Report has been prepared by Hatch Roberts Day and is provided at Appendix 2.

Overview of Concept Masterplan

The detailed masterplan would be undertaken through numerous stages across an estimated lifespan of 10-15 years, creating approximately 745 dwellings. This phased development is planned to be responsive to the underlying housing demand.

A focal point of this progressive scheme is the allocation of approximately 1.56ha of land to a multifunctional neighbourhood centre. This centre is anticipated to accommodate an overall floor space between 2,000m² and 4,000m², encompassing essential amenities such as a supermarket, specialised retailers, child care facilities, a medical centre, along with several cafés, gyms, and restaurants. Any future neighbourhood centre would be cognisant and respectful of the existing centre hierarchy and would seek to complement Forbes Town Centre. This is evidenced by a proposed maximum building height of 12m which is lower than that of the Forbes Town Centre (maximum building height of 17m) and the limited building envelope of the proposed E1 Local Centre portion of land.

Adjacent to the community core, a generous 5.63ha of land has been designated for open spaces and recreational amenities. This crucial segment of the development features a distinctive chain of ponds parkland, interwoven with shared pathways and picnic areas, all acting as the cohesive communal focal point within the masterplan. These integrative features aim to substantiate the development as a lifestyle-centric hub for the evolving Forbes community.

The plan promotes and encourages walkability, establishing a green central spine connecting the shared path network and situating the neighbourhood centre within a strategic 10-minute walkable catchment. This innovative integration not only aligns with the foundational principles of the Forbes Housing Strategy but also envisages a connective future pathway extending the town's expansion towards Lake Forbes.

At the northern boundary of the development, a proposed hilltop reserve covers approximately 4.41ha, doubling as a conservation area to protect indigenous vegetation identified as being of high biodiversity value. This area will feature low impact pedestrian pathways and a lookout point with views toward Forbes town centre. Furthermore, the integration of a water reservoir is under consideration, subject to the findings of studies and continuous consultations with the Council, ensuring every component of the development is refined and harmonises with the collective vision and needs of the community.

The proposed concept masterplan prepared by Hatch Roberts Day is provided in the following figure.



Figure 15. Concept Masterplan (Hatch Roberts Day, 2023)

Design Development

This concept masterplan has been developed in consultation with Forbes Shire Council and the project team, and it is the culmination of numerous iterations. Initially, Hatch Roberts Day utilised a composite plan that examined the key elements of the subject site, which began to shape the initial concept. This composite plan considered the topography of the site, its connections, interconnected nodes, growth, and staging, as well as the orientation addressing the terrain.

The composite plan is provided in the following figure.

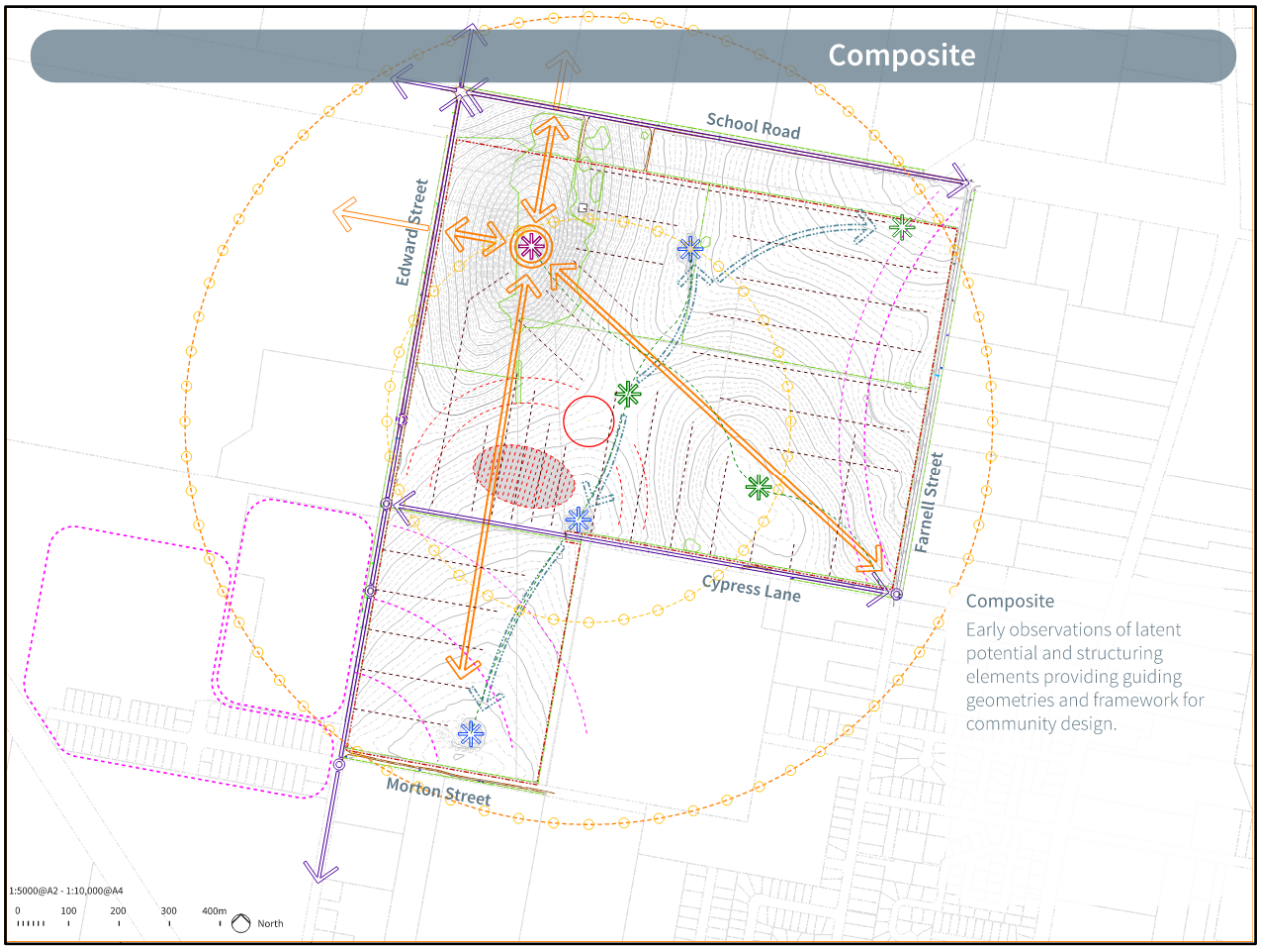


Figure 16. Composite Plan (Hatch Roberts Day, 2023)

This composite plan evolved into the initial concept masterplan, which was then shared with the Council, the Department of Planning and Environment, and the consultant team. Both provided positive feedback, though some minor amendments were discussed. The most significant change stemmed from biodiversity feedback. This feedback highlighted the vegetation to the north as significant, and a recommendation was made to avoid its removal. While previous iterations of the scheme depicted a more regular shape following the ridgelines of the hilltop, this amendment has led to a more organic shape that aims to preserve the vegetation in that area. It must also be noted that roads joining School Road were removed from the proposed masterplan to preserve the Travelling Stock Reserve (TSR).

The previous iteration of the scheme is provided in the image below.



Figure 17. Previous iteration of concept masterplan (Hatch Roberts Day, 2023)

Growth, Precincts and Staging

As noted above, the proposal is likely to be released over a 10-15 year period dependent on the underlying housing demand. The Urban Design Report has identified 5 key precincts being: Southern (A), Central (B), Hilltop (C), Eastern (D) and Northern (E). Whilst the precise detail of the staging is yet to be worked through, the proposal assumes that the Southern (A) Precinct will be developed first given the location of the existing infrastructure and surrounding development. Total number of residential lots released at any time would likely be small to ensure that the market is not saturated.



Figure 18. Precinct Plan (Hatch Roberts Day, 2023)

PART 1 - Objectives or intended outcomes

This section sets out the objectives and intended outcomes for the Planning Proposal.

Objectives

The following aims and objectives have been identified as forming the basis of the proposal.

- Plan a site that can provide for high quality residential development to meet the demand for new housing in the Forbes LGA.
- Respond to the current and projected growth of Forbes and the Central West region with the delivery of a diverse range of lot sizes and dwelling sizes creating diversity and choice in the housing market.
- Enable other land uses that provide facilities or services to meet the day-to-day needs of residents without detracting from major centres.
- Provide a high quality urban design outcome that contributes positively to the Forbes LGA.
- Ensure minimal environmental impact.
- Ensure development is compatible with surrounding development.

The Site and concept masterplan are considered to meet the objectives of the project.

Intended Outcomes

The intended outcomes are to provide:

- Rezone the land to support the concept masterplan as outlined above.
- Provide a small neighbourhood centre to meet the day-to-day needs of the current and future residents in North Forbes without comprising the function of the existing Forbes Town Centre.
- Allow for sufficient public open to space to contribute positively to the future liveability of North Forbes.
- Provide a conservation area to preserve vegetation identified as comprising high biodiversity value.
- Allow for a diversity of housing types to address the needs of the Forbes community.
- A scale of development that integrates with the existing development as well as represents the desired future character of the area.
- Provide a link between town and country with a significant focus on high quality landscaping outcome with a focus on water and a link between the Site and Lake Forbes.
- Allow for a high quality walkable and active transport network which promotes safe pedestrian travel.
- Incorporate Forbes rich cultural identity within the development with links to the civil character and compact public spaces.

These intended outcomes have informed the basis of the proposed concept masterplan.

PART 2 - Explanation of the provisions

The objectives and intended outcomes of the Planning Proposal will be achieved by amendments to the FLEP 2013 as they apply to the Site.

More specifically, the Planning Proposal requests amendments to the zoning, minimum subdivision lot size, height of buildings and land reserved for acquisition map.

A summary of the proposed provisions is provided in the table below.

Table 6. Existing and Proposed FLEP 2013 Provisions

Control	Existing Provisions	Proposed Provisions
Land Use Zoning	RU1 Primary Production RE1 Public Recreation R5 Large Lot Residential	R1 General Residential RE1 Public Recreation C3 Environmental Management E1 Local Centre
Minimum Subdivision Lot Size	200ha 1ha 'Area A'	250m² 400m² 550m² 2ha Remove 'Area A'
Height of Building	10m 8.5m	12m 10m 8.5m
Land Reserved for Acquisition	'Regional Open Space'	Increase the area identified for 'Regional Open Space'.
Urban Release Area	N/A	Site to be included on the 'Urban Release Area' map.

Proposed Land Zoning

Amend the FLEP 2013 'Land Zoning Map' Sheet 005AA as it applies to the subject Site from RU1 Primary Production, RE1 Public Recreation and R5 Large Lot Residential to R1 General Residential, RE1 Public Recreation, C3 Environmental Management and E1 Local Centre as shown in the figure below. For the purposes of the image below, the areas identified as 'Residential' would be zoned R1 General Residential, the areas identified as 'Neighbourhood centre' would be zoned E1 Local Centre, the areas identified as 'Open space' would be zoned RE1 Public Recreation and the areas identified as 'Nature reserve' would be zoned C3 Environmental Management.



Figure 19. Proposed Land Zoning Map (Hatch Roberts Day, 2023)

Proposed Minimum Subdivision Lot Size

Amend the FLEP 2013 'Lot Size Map' Sheet 005AA as it applies to the subject Site from 200ha, 1ha and 'Area A' to 250m² in areas located near the neighbourhood centre and a mix of 400m² and 550m² for the remainder of the Site. Further, the proposal seeks to impose a 2ha minimum subdivision lot size for areas proposed to be zoned C3 Environmental Management. The proposal seeks to remove 'Area A' and no minimum subdivision lot size is proposed for the areas zoned RE1 Public Recreation and E1 Local Centre. The proposed 'Lot Size Map' is shown in the figure below.

The area identified marginally differs from the medium density lots identified on the masterplan. This has been proposed to provide flexibility to allow for an adequate transition in lots sizes within the development. You will note that a minimum subdivision lot size of 400m² has been maintained along Farnell and Edward Street to allow for some articulation of these frontages and 550m² minimum subdivision lot size has been proposed to the north to allow for an appropriate transition to neighbouring properties to the north.



Figure 20. Lot Size Map (Hatch Roberts Day, 2023)

Proposed Height of Buildings

Amend FLEP 2013 'Height of Buildings' Sheet 005AA as it applies to the subject Site from 8.5m and 10m to a combination of 8.5m, 10m and 12m. More specifically, the proposal would incorporate an 8.5m height limit for residential areas, a 10m height limit for recreation and conservation areas, and a 12m height limit for the local centre.



Figure 21. Maximum Building Height (Hatch Roberts Day, 2023)

Land Reserved for Acquisition

Amend FLEP 2013 'Land Reservation Acquisition Map' Sheet 005AA as it applies to the subject Site to include the proposed RE1 Public Recreation and C3 Environmental Management zoned land.

See the proposed land reserved for acquisition shown on the following figure.



Figure 22. Land reserved for acquisition (Hatch Roberts Day, 2023)

Urban Release Area

Amend FLEP 2013 'Urban Release Area Map' Sheet 005A as it applies to the subject Site to include the Site as an urban release area pursuant to Part 6 of the FLEP 2013.

See the proposed land reserved for acquisition shown on the following figure.

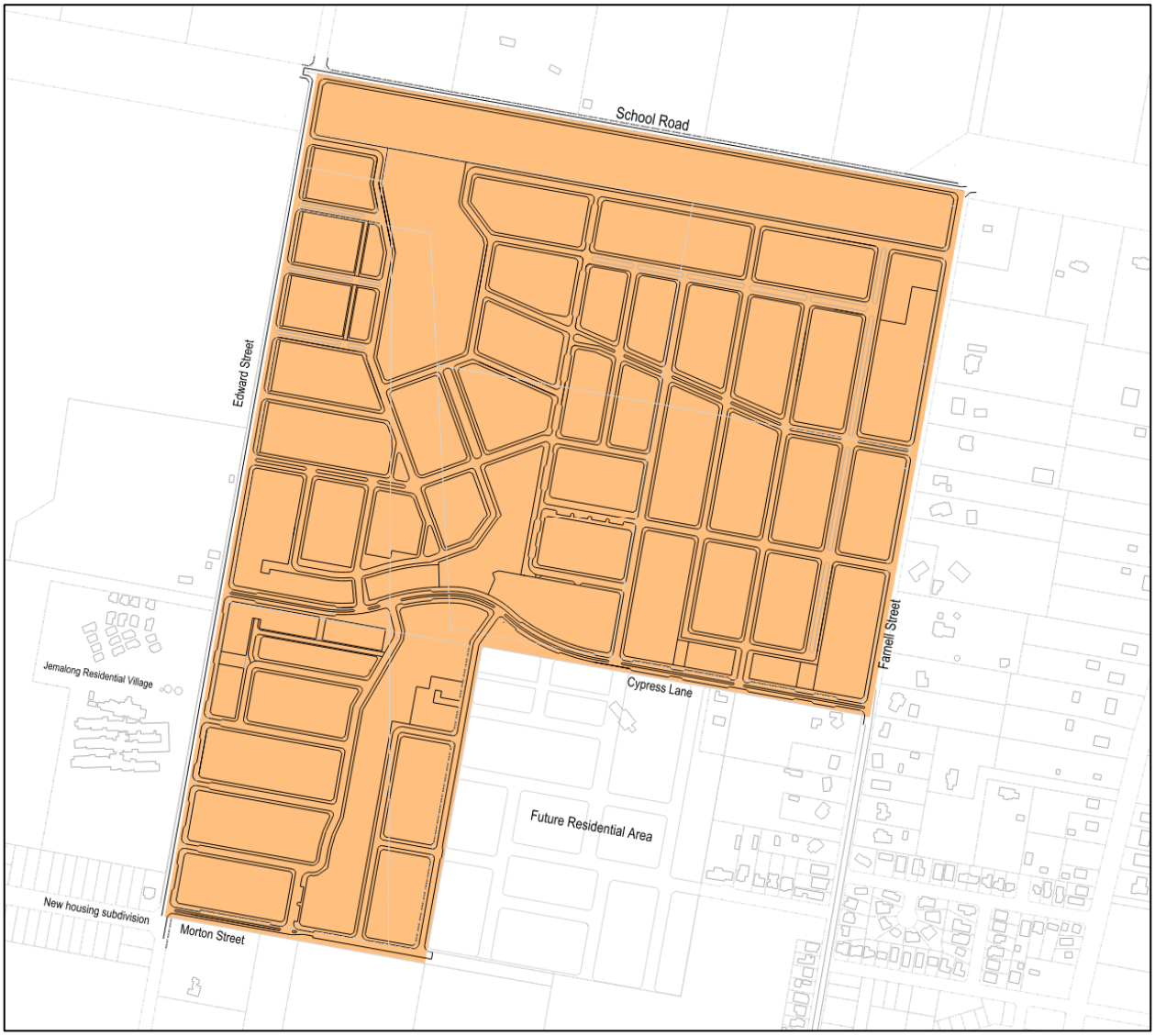


Figure 23. Urban Release Area Map (Hatch Roberts Day, 2024)

PART 3 - Justification of strategic and site-specific merit

This proposal reviews the strategic and site-specific merit of the Planning Proposal. The table below responds to the questions outlined in the Local Environmental Plan Making Guideline prepared by the Department of Planning and Environment.

Table 7. Strategic and site-specific merit test (DPE, 2023)

Question	Consistent	Response
Section A – need for the planning proposal		
1. Is the planning proposal a result of an endorsed	YES	Refer to Section 3.1.5 of this report.

LSPS, strategic study or report?		In the 'Our Neighbourhoods' section of the LSPS, North Forbes was identified as an area anticipated to cater for most of the growing housing needs now and into the future. Further, a key action of LSPS was to prepare a Housing Strategy that identifies future residential growth areas, plans land releases, and proposes strategies to manage required infrastructure upgrades and environmental constraints such as flooding and groundwater vulnerability. The Forbes Housing Strategy 2021-2041 was prepared as result. This Strategy identifies the entirety of the subject Site as land for future rezoning and as such, the proposal is considered consistent with the intent of the Forbes Housing Strategy 2021-2041 and the LSPS.
2. Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?	YES	A Planning Proposal is considered the best means of achieving the objectives and the intended outcomes. The Forbes Housing Strategy recommends the rezoning of this land to facilitate future residential development. The single ownership of a large portion of land such as this would allow for the creation of a high quality masterplan to service the needs of the Forbes community.
Section B – relationship to the strategic planning framework		
3. Will the planning proposal give effect to the objectives and actions of the applicable regional or district plan or strategy (including any exhibited draft plans or strategies)?	YES	The proposal is consistent with the Central West and Orana Regional Plan 2041. Please refer to Section 3.1.3 of this report. The proposal specifically responds to Objective 13 *Provide well located housing options to meet demand* which seeks to provide additional housing in appropriate locations. The concept masterplan proposes residential lots in an area identified with the Housing Strategy and is supported by consultant reports demonstrating the suitability for future development. Further, Objective 14 *Plan for diverse, affordable, resilient and inclusive housing* notes that the household composition is changing, and more housing diversity and choice is required. This Planning Proposal seeks to provide a significant amount of housing diversity and choice through the implementation of new minimum subdivision lot sizes. Specifically, the proposal seeks to provide smaller lot sizes within proximity of the local centre. This proposal seeks to provide a range of lot sizes and dwelling types which would contribute positively to the dwelling diversity and housing choice in the Forbes LGA.
4. Is the planning proposal consistent with a council LSPS that has been endorsed by the Planning Secretary or GCC, or another endorsed local strategy or strategic plan?	YES	As noted above, the subject Site has been identified within the Forbes Housing Strategy 2021-2041 for land to be rezoned for residential purposes. The proposal is consistent with an endorsed strategy. A review of the LSPS and Forbes Housing Strategy is provided at Section 3.0 of this report.

5. Is the planning proposal consistent with any other applicable State and regional studies or strategies?	YES	The proposal's consistency with relevant State and Regional studies is demonstrated in Section 3.1 of this report. The proposal is consistent with following strategies: • Housing 2041 • Regional Housing Taskforce • Central West and Orana Regional Plan 2041
6. Is the planning proposal consistent with applicable SEPPs?	YES	Consistency with the relevant State Environmental Planning Policies (SEPPs) is demonstrated in Section 3.2 of this report. In summary, the proposal is considered consistent with the *State Environmental Planning Policy (Hazards and Resilience) 2021* as a Preliminary Site Investigation for Contamination on identified isolated potential AECs. As such, a Detailed Site Investigations will be provided for these isolated potential AECs as part of any future Development Application to comply with Clause 4.6. Further, the preliminary BDAR has assessed the proposal against the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* and considers the proposal consistent noting that there are no Koala Management Plans applicable to the Forbes LGA. It is also noted that no Koala's have been recorded within 10km of the Site. Notwithstanding the above, table 9 reviews consistency with each of the remaining SEPPs.
7. Is the planning proposal consistent with applicable Ministerial Directions (section 9.1 Directions) or key government priority?	YES	Please refer to the table 8 for the proposal's consistency with the Section 9.1 Ministerial Directions.
Section C – environmental, social and economic impact		
8. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected because of the proposal?	YES	A preliminary BDAR has been prepared to support this Planning Proposal. This preliminary BDAR notes that the proposal is unlikely to impact critical habitat or threatened species, population or ecological communities, or their habitats. Given the subject Site's previous agricultural use, it is largely void of significant vegetation except for a portion along the northern boundary. The scheme proposes to preserve most of the vegetation located within this part of the land and as such, is supported by the project ecologist.
9. Are there any other likely environmental effects of the planning proposal and how are they proposed to be managed?	YES	This Planning Proposal has reviewed potential environmental impacts on the Site which have been summarised in Section 5.0 of this report. The proposal is considered void of any significant environmental impacts that would preclude the development of the concept masterplan on the subject Site.
10. Has the planning proposal adequately addressed any social and economic effects?	YES	A Social and Economic Impact Assessment has been prepared by Hill PDA and is attached at Appendix 10. The Social and Economic impacts are discussed in Section 5.0 of this report. Significant investment into underutilised land and the creation of more homes is considered a significant social and economic benefit to the Forbes LGA.

Section D – Infrastructure (Local, State and Commonwealth)		
11. Is there adequate public infrastructure for the planning proposal?	YES	A Servicing and Infrastructure Review has been prepared by GHD and is provided in Appendix 7. Essentially, the review identifies that the initial stages could be serviced by existing infrastructure in the short to medium term and the later stages would be serviced by planned infrastructure identified for North Forbes and outlined the Forbes Housing Strategy.
Section E – State and Commonwealth Interests		
12. What are the views of state and federal public authorities and government agencies consulted in order to inform the Gateway determination?	YES	We have undertaken Pre-Planning Proposal meeting with the Department of Planning who is generally supportive of the Planning Proposal noting its consistency with the Forbes Housing Strategy. Further, we have sent consultation letters to following organisations to provide them with an opportunity to provide early input into the scheme: • APA Group; • Biodiversity Conservation Division; and • Local Land Services. These organisations were chosen in consultation with Council, as they have infrastructure within proximity of the subject Site and/or are considered important referral authorities for this proposal. At the time of writing this letter only Local Land Services has responded, and we are meeting with on 4 October 2023.

This report demonstrates the subject Site's consistency with the relevant strategic planning documentation. Further, this report establishes site-specific merit noting that it has been identified for future residential development and is relatively void of any site-specific environmental planning constraints.

Consistency with the Section 9.1 Ministerial Directions is shown in the table below.

Table 8. Consistency with the Local Planning Directions

Ministerial Direction	Applies	Consistency	Planning Proposal Response
Focus area 1: Planning Systems			
1.1 Implementation of Regional Plans	YES	YES	As demonstrated in Section 3.1, the proposal is consistent with the Central West and Orana Regional Plan 2041.
1.2 Development of Aboriginal Land Council Land	NO	N/A	The land is not owned by the Aboriginal Land Council.
1.3 Approval and Referral Requirements	YES	YES	This Planning Proposal has sought to address all relevant matters to facilitate the efficient and appropriate assessment of the development.
1.4 Site Specific Provisions	YES	YES	The proposal has sought to utilise existing land use zoning under the FLEP 2013 that would facilitate the proposed concept masterplan.
Focus area 1: Planning Systems – Place Based			
1.5 Parramatta Road Corridor Urban Transformation Strategy	NO	N/A	Not Applicable.

1.6 Implementation of North West Priority Growth Area Land Use and Infrastructure Implementation Plan	NO	N/A	Not Applicable.
1.7 Implementation of Greater Parramatta Priority Growth Area Land Use and Infrastructure Implementation Plan	NO	N/A	Not Applicable.
1.8 Implementation of Wilton Priority Growth Area Land Use and Infrastructure Implementation Plan	NO	N/A	Not Applicable.
1.9 Implementation of Glenfield to Macarthur Urban Renewal Corridor	NO	N/A	Not Applicable.
1.10 Implementation of Western Sydney Aerotropolis Plan	NO	N/A	Not Applicable.
1.11 Implementation of Bayside West Precincts 2036 Plan	NO	N/A	Not Applicable.
1.12 Implementation of Planning Principles for the Cooks Cove Precinct	NO	N/A	Not Applicable.
1.13 Implementation of St Leonards and Crows Nest 2036 Plan	NO	N/A	Not Applicable.
1.14 Implementation of Greater Macarthur 2040	NO	N/A	Not Applicable.
1.15 Implementation of Pyrmont Peninsula Place Strategy	NO	N/A	Not Applicable.
1.16 North West Rail Link Corridor Strategy	NO	N/A	Not Applicable.
1.17 Implementation of the Bays West Place Strategy	NO	N/A	Not Applicable.
1.18 Implementation of the Macquarie Park Innovation Precinct	NO	N/A	Not Applicable.
1.19 Implementation of the Westmead Place Strategy	NO	N/A	Not Applicable.
1.20 Implementation of the Camelia-Rosehill Place Strategy	NO	N/A	Not Applicable.

1.21 Implementation of South West Growth Area Structure Plan	NO	N/A	Not Applicable.
1.22 Implementation of the Cherrybrook Place Strategy.	NO	N/A	Not Applicable.
Focus area 2: Design and Place			
Focus area 3: Biodiversity and Conservation			
3.1 Conservation Zones	YES	YES	The preliminary BDAR has been prepared and recommended a conservation zoning to protect the significant vegetation located on the northern boundary of the subject Site. As such, the conservation zoning has been utilised to protect and conserve environmentally sensitive areas.
3.2 Heritage Conservation	YES	YES	The proposal is not identified as a heritage item nor is it located within a heritage conservation area. An Aboriginal Heritage Constraints Assessment has been prepared by Biosis and is attached at Appendix 9. The Assessment noted no further assessment was warranted subject to the implementation of an unexpected finds protocol.
3.3 Sydney Drinking Water Catchments	NO	N/A	Forbes Shire Council is not identified as comprising Sydney Drinking Water Catchment.
3.4 Application of C2 and C3 Zones and Environmental Overlays in Far North Coast LEPs	NO	N/A	The Site is not located within Ballina, Byron, Kyogle, Lismore, and Tweed LGAs.
3.5 Recreation Vehicle Areas	NO	N/A	The proposal does not include land to be developed for the purpose of a recreation vehicle area.
3.6 Strategic Conservation Planning	NO	N/A	The preliminary BDAR does not identify the Site as being a Strategic Conservation Area.
3.7 Public Bushland	NO	N/A	Forbes Shire Council is not identified as being prescribed LGA for this Direction.
3.8 Willandra Lakes Region	NO	N/A	The land is not identified as Willandra Lakes World Heritage Property on the World Heritage Map.
3.9 Sydney Harbour Foreshores and Waterways Area	NO	N/A	The subject Site is not located within the Sydney Harbour Foreshores and Waterways area.
3.10 Water Catchment Protection	NO	N/A	The subject Site is not identified as being located within proximity of any regulated catchments.
Focus area 4: Resilience and Hazards			
4.1 Flooding	YES	YES	The subject Site is not identified as being located within a flood planning area on Council's FLEP 2013 mapping. Nonetheless, a Flooding and Drainage Report has been prepared to support this Planning Proposal. The Flooding and Drainage Report has been prepared by GHD and is attached at Appendix 6. The Report identifies shallow flooding on the subject Site and provides recommendations to ensure that there are no downstream impacts as part of the rezoning. These will continue to be reviewed and implemented throughout the detailed design phase of the project.

4.2 Coastal Management	NO	N/A	The subject Site is not located within a coastal wetland, littoral rainforest, coastal vulnerability, coastal use, and coastal environment areas.
4.3 Planning for Bushfire Protection	NO	N/A	The land is not identified as being Bushfire Prone Land nor is it located within proximity of land identified as bushfire prone land.
4.4 Remediation of Contaminated Land	YES	YES	The proposal seeks to rezone to a residential use. The previous use of the land as an agricultural use which is listed for a purpose listed in Table 1 of the contaminated land planning guidelines. A PSI has been prepared by Sydney Environmental to support this Planning Proposal and is attached at Appendix 3. The PSI concluded that a targeted Detailed Site Investigations should be prepared for the portions of the Site identified as Potential Areas of Environmental Concern as part any future Development Application in accordance with the requirements of the *State Environmental Planning Policy (Resilience and Hazards) 2021*. Given the isolated Potential Areas of Concern, the PSI is considered appropriate to support this Planning Proposal. The preparation of a PSI is consistent with Direction 4.4(2).
4.5 Acid Sulfate Soils	NO	N/A	A review of the Environment NSW 'eSpade V2.2' web application indicates that the site lies in an area mapped as 'No Known Occurrence' with respect to acid sulfate soils. This infers that land management activities are unlikely to be affected by acid sulfate soil materials.
4.6 Mine Subsidence and Unstable Land	NO	N/A	The subject Site is not identified as being Mine Subsidence or Unstable Land.
Focus area 5: Transport and Infrastructure			
5.1 Integrated Land Use and Transport	YES	YES	The proposal has given due consideration to improving transport choice and providing services and facilities to meet the day-to-day needs of the residents. In particular, the proposal provides for a green corridor through the centre of the development to promote and encourage sustainable forms of active transport and a small neighbourhood centre has been strategically placed to be walking distance from almost all the dwellings within the masterplan. Additionally, the proposed neighbourhood centre will be capable of servicing the wider North Forbes area. In the wider context the proposal has been designed to integrate with Council's public pedestrian network. Furthermore, the proposed street network and traffic generation has been reviewed by Crossley Transport Planning and the final SIDRA results indicated that the key intersections will operate efficiently during peak periods post-development. It must be noted that the road reserves and street network in the masterplan will be subject to further design as part of a site-specific DCP and ongoing discussions with Council.

			Given the promotion of active transport networks and overall connectivity to centres, the proposal is considered to align with the aims, objectives, and principles *Improving Transport Choice – Guidelines for planning and development* and *The Right Place for Business and Services – Planning Policy.*
5.2 Reserving Land for Public Purposes	YES	YES	The proposed RE1 Public Recreation and C3 Environmental Management zoned land is proposed to be land for public purposes. This Planning Proposal seeks approval from Council and the Planning Secretary.
5.3 Development Near Regulated Airports and Defence Airfields	NO	N/A	The subject Site is approximately 10km from Forbes Aerodrome and is not considered to be significantly impacted by the Aerodrome.
5.4 Shooting Ranges	NO	N/A	The proposal is not adjoining an existing shooting range.
Focus area 6: Housing			
6.1 Residential Zones	YES	YES	The proposal comprises the rezoning of the subject land for significant residential development. The proposal is considered consistent with Direction 6.1 for the following reasons: • The proposal would provide a masterplan that would broaden the building types, lot sizes and location in the housing market contributing to housing diversity and choice. • Make use of the existing infrastructure in the short to medium term with the existing planning infrastructure catering for the final stages of the masterplan. • The proposal would not result in the consumption of land on the urban fringe noting that the land is surrounded by urban zoning comprising R1 General Residential and R5 Large Lot Residential. As such, the proposal is considered the logical and orderly development of land through rezoning of the Site to compliment its surrounding context. • North Forbes (including the subject Site) has been strategically identified for future residential development in the Forbes Housing Strategy. As such, the proposal is considered consistent with Direction 6.1.
6.2 Caravan Parks and Manufactured Homes Estates	YES	YES	The proposal does not contemplate a manufactured housing estate; however, caravan parks are permitted with consent as an innominate use in the R1 General Residential zone pursuant to the FLEP 2013.
Focus area 7: Industry and Employment			
7.1 Business and Industrial Zones	YES	YES	The proposal does not result in the reduction of existing employment zones within the Forbes LGA. The proposal would increase commercial floor space

			through the introduction of a E1 Local Centre which in turn would contribute positively to the local economy through ongoing employment.
7.2 Reduction in non-hosted short term rental accommodation period	NO	N/A	The proposal is not located within Byron Shire Council.
7.3 Commercial and Retail Development along the Pacific Highway, North Coast	NO	N/A	The subject Site is not located within proximity of the Pacific Hwy or located within a North Coast Council area (Port Stephens and Tweed Shire inclusive).
Focus area 8: Resources and Energy			
8.1 Mining, Petroleum Production and Extractive Industries	NO	N/A	This Planning Proposal has not sought to restrict mining, petroleum and/or extractive industries.
Focus area 9: Primary Production			
9.1 Rural Zones	YES	NO	Where a Planning Proposal seeks the rezoning of land from a rural zone to residential and employment zoned land is technically inconsistent with Direction 9.1. A review of the consistency matters notes that a Planning Proposal may be inconsistent with the terms of this direction where justified by a study prepared in support of the planning proposal which considers the objectives of this direction. The Forbes Housing Strategy has been prepared and identifies the Site for residential purposes. The Forbes Housing Strategy has considered the rural zoning of the land noting that it will become increasingly constrained as the town grows. Further, it notes that the existing agricultural use of the land is largely constrained given its proximity to existing residential zoned land surrounding the Site. As such, the rezoning of constrained and fragmented rural land accords with the Forbes Housing Strategy which has considered the objectives of this direction. Notwithstanding the above, the rezoning of existing agricultural land that is surrounded by existing urban residential zoning is considered of minor significance and warrants support in this instance.
9.2 Rural Lands	YES	NO	The Planning Proposal is considered inconsistent with Direction 9.2 as it results in the rezoning of rural land to residential land. It must be acknowledged that the existing rural zoned land is fragmented and largely constrained by the surrounding residential land uses. Specifically, the subject Site is predominately surrounded by R1 General Residential and R5 Large Lot Residential zoned land which constrains the ongoing agricultural use of the land. As the township continues to grow this will be further acerbated. Nonetheless, the proposed masterplan has attempted to preserve features of the existing landform. A conservation zone has been proposed in the northern portion of the Site to protect significant vegetation. A green spine has been proposed through the centre of the Site which would seek to respect the existing lower

			portions of land through the provision of a chain of ponds style development. As such, the rezoning of the existing rural zoned land to a residential zoning is considered orderly and logical development of land and warrants support in this instance.
9.3 Oyster Aquaculture	NO	N/A	The subject Site is not located within a 'Priority Oyster Acquaculture Area'.
9.4 Farmland of State and Regional Significance on the NSW Far North Coast	NO	N/A	The subject Site is not located within the Ballina Shire, Byron Shire, Kyogle Shire, Lismore City, Richmond Valley, and Tweed Shire LGAs.

The table below outlines the proposals consistency with the relevant State Environmental Planning Policies.

Table 9. Consistency with the relevant State Environmental Planning Policies

State Environmental Planning Policy	Applies	Planning Proposal Response
State Environmental Planning Policy (Primary Production) 2021	YES	The proposal seeks to change of use of the RU1 Primary Production zoned land to facilitate a predominately residential masterplan resulting in the loss of RU1 Primary Production zoned land. The concept masterplan is consistent with the LSPS and the Housing Strategy which identified this land for future residential development. It must be noted that the land neighbouring the Site has recently been rezoned and/or has been identified in the Forbes Housing Strategy as land suitable for future residential development. As such, we anticipate that land in the vicinity of the Site will eventually be urban land not suitable for agricultural use.
State Environmental Planning Policy (Resources and Energy) 2021	N/A	The proposal does not apply to mining, petroleum production, extractive industries and/or coal seam gas.
State Environmental Planning Policy (Resilience and Hazards) 2021	YES	This has been addressed in Section 3.2.4 of the report and a PSI has been provided at Appendix 3.
State Environmental Planning Policy (Industry and Employment) 2021	N/A	This Planning Proposal does not relate to the Western Sydney Employment Area and does not seek approval for advertising or signage.
State Environmental Planning Policy (Transport and Infrastructure) 2021	YES	This Planning Proposal relates to the rezoning of land of for predominately residential purposes. The proposal is greater than 300 dwellings and may be considered traffic generating development. As such, a Transport Impact Assessment has reviewed the ultimate development scenario and notes that the road network would not be detrimentally affected because of the proposed concept masterplan. The Transport Impact Assessment is provided at Appendix 8 and further discussion is provided in Section 5.0 of this report. Further, the subject Site is located with proximity of gas and electricity infrastructure. These matters would be addressed as part of any future development application, and we have sought to consult with APA Group and Essential Energy from the outset of the project.

		The proposal would not impact the operation of the SEPP.
State Environmental Planning Policy (Biodiversity and Conservation) 2021	YES	Forbesview Pty Ltd has engaged Travers Bushfire and Ecology to prepare a preliminary BDAR which is provided at Appendix 5 and is discussed in Section 5.0 of this report. The proposal has sought to avoid and preserve significant vegetation on the northern portion of the Site. This approach of avoidance and preservation has been supported by the Ecologist. The proposal would not impact the operation of the SEPP.
State Environmental Planning Policy (Planning Systems) 2021	YES	The proposal would not impact the operation of the SEPP.
State Environmental Planning Policy (Housing) 2021	YES	The proposal would not impact the operation of the SEPP.
State Environmental Planning Policy (Exempt and Comply Development Codes) 2008	YES	The proposal would not impact the operation of the SEPP.

This proposal is considered consistent with the Section 9.1 Local Planning Directions and State Environmental Planning Policies relating to the land.

PART 4 - Maps

Proposed FLEP 2013 mapping consistent with the Department's Standard Technical Requirements for Spatial Datasets and Maps will be prepared in consultation with Council and will be provided prior to Finalisation of the Planning Proposal.

PART 5 - Community consultation

Schedule 1 of the EP&A Act requires the relevant planning authority to consult with the community in accordance with the Gateway Determination. It is anticipated that the Planning Proposal would be required to be publicly exhibited for 20 working days in accordance with the requirements of the DPE 'Local Environmental Plan Making Guidelines'. It is anticipated that the public exhibition would be notified by way of:

- A public notice in the newspaper(s).
- A notice on the Forbes Shire Council website.
- Written correspondence to adjoining and surrounding landowners.

The Gateway Determination, Planning Proposal and specialist studies would be publicly exhibited on the website and any other locations considered appropriate to provide interested parties with an opportunity to view the submitted documentation.

PART 6 - Project timeline

An indicative Planning Proposal timeline is provided in the table below.

Table 10. Indicative project timeline

Action	Anticipated Timeframe
Council's Meeting	October 2023

Gateway Determination	March 2024
Public Exhibition	May 2024
Assessment and Consideration of Submissions	June/July 2024
Report to Council	August 2024
Referral to Parliamentary Council for Drafting	September 2024
Submission to Department of Planning and Environment for Finalisation	October 2024
Submission to Parliamentary Council for Publication	November 2024

Please note that this is an indicative timeframe and will be subject to change as the Planning Proposal progresses.

5.0 Environmental Assessment

5.1 Compatibility with Surrounding Land Uses

The Site in question, spanning approximately 92.38 hectares, is situated around 3.6km from Forbes Town Centre and enjoys significant accessibility benefits owing to its proximity to major regional road networks, namely Bogan Way and Newell Highway. Presently, it encompasses a single dwelling house alongside agricultural land and is defined by boundaries along School Road, Farnell Street, Morton Street, and Edward Street. Its location also ensures it's within a reasonable distance from other significant town and city centres like Parkes, Orange, and Dubbo.

In the broader context of its zoning and strategic potential for residential development, the Site is nestled within the jurisdiction of the Forbes LGA. Directly bordering the Site are areas designated as R1 General Residential, R5 Large Lot Residential, and RU1 Primary Production zones, which indicates a diverse surrounding context comprising mainly residential and rural zones. This positioning neighbouring existing residential zones, combined with its closeness to Forbes Town Centre and major highways, underscores its strategic importance. Furthermore, the Forbes Housing Strategy highlights this potential by identifying the surrounding land for future residential expansion, recommending the rezoning of North Forbes. This alignment with the housing strategy makes the Site a potential focal point for residential development, considering its surrounding zones are either already residentially designated or earmarked for future residential projects.

5.2 Flood and Drainage

A Flooding and Drainage Report has been prepared by GHD and is provided at Appendix 6.

The Flooding and Drainage Report reviewed the Forbes Flood Study Review by Lyall and Associates in May 2020 which indicated that the Site is not inundated during the Probable Maximum Flood. This conclusion was reinforced by a 2001 study commissioned by the Forbes Shire Council, which identified areas, including the Site, as potential flood risks. Further site investigations were conducted by Nigel Bosworth of GHD on 15 June 2023. These investigations highlighted that the site has uniform agricultural and vegetated areas, no defined flow paths, and issues with various roads and culverts. Additionally, topographic data was acquired from the NSW Department of Land and Property Information and converted for TUFLOW modelling, which also incorporated survey data from Zenith Construction Surveying.

Rainfall data from the Australian Rainfall and Runoff 2016, provided by the Bureau of Meteorology, was crucial. Due to the absence of detailed rainfall data from 1952, the study employed the 1% AEP rainfall event as a reference. In terms of infrastructure, aerial photography was used to model buildings and other obstructions. Given the context, it was decided to exclude buildings from this modelling investigation. The hydraulic model employed a uniform Manning’s roughness (n) of 0.05, and downstream extents were strategically placed based on the site's boundary.

The Indicative Layout Plan provides vital insights. Developed lands are strategically located above the 1% AEP flood level, with stormwater treatment basins and median swales embedded into the design. Importantly, the road layout has been devised with flood evacuation in mind. Key constraints resulting from flooding considerations ensure that development is limited to areas outside of the 1% AEP flood risk. Additionally, the water cycle management design incorporates innovative solutions, including rainwater tanks, street trees, permeable features, and three water quality basins intended for stormwater reuse.

In conclusion, the concept masterplan is meticulously crafted to address flooding, drainage, and water quality concerns. This plan, developed by Hatch Roberts Day, is positioned to meet the requirements set by the Forbes Shire Council and other stakeholders. The concept masterplan has been designed to cater for all flood and drainage on Site and would not result in impacts for properties downstream. Given the extensive

technical investigations and modelling outcomes, the subdivision is well-prepared for consideration and endorsement by the relevant authorities.

5.3 Contamination

Sydney Environmental Group Pty Ltd (SE) was retained by Forbesview Pty Ltd to perform a Preliminary Site Investigation for the parcel of land situated on School Road, Forbes NSW. The PSI has been provided in Appendix 3.

This expansive agricultural property also hosts a few residential structures. There's a proposal in place to demolish existing structures, followed by subdivision for the construction of about 745 residences, commercial areas, parkland, and requisite infrastructure, all in compliance with the Forbes Housing Strategy 2021-2024. A vital aspect of this project was to ascertain any land contamination that might influence the property's suitability for its intended future residential masterplan.

To achieve the project's objectives, SE executed a systematic approach. They began with a thorough desktop review to collate vital data about the property. This was followed by a physical walkover of the site to grasp the current conditions. The culmination of these activities was a comprehensive data assessment and subsequent report compilation.

From the data, SE identified six specific potential areas of environmental concern (PAECs) for the site. These areas, though present, are limited in scope and deemed to be of low risk, mirroring the property's usage for large-scale horticulture. The subject Site isn't designated as a high-risk zone for Naturally Occurring Asbestos (NOA) according to the NSW Government SEED NOA database. However, neighbouring areas do show a low to medium potential for NOA. SE's focused investigations found no evidence of NOA in the uppermost layer of the soil. Based on gathered data, SE determined the land, in terms of contamination, is fundamentally suitable for the proposed development and sufficient. SE has confirmed that the PSI is suitable for the Planning Proposal given that the PAECs are isolated. A specific Stage 2 Detailed Site Investigation (DSI) is suggested during the development application phase for the PAECs.

To encapsulate, SE recommends several steps moving forward: a targeted DSI for pinpointing potential contamination within the AECs; pre-assessments before any dewatering or demolition activities; strict adherence to the NSW EPA Waste Classification Guidelines (2014) for any soil removed and disposed of off-site; and meticulous record-keeping for any off-site material transportation and disposal. These recommendations would be adhered to as part of development application and construction certificate stage.

5.4 Ecology

Travers bushfire & Ecology (TBE) was commissioned to produce a Biodiversity Development Assessment Report (BDAR) for a proposed residential masterplan at School Road, Forbes. This study covered an extensive area known as the 'study area', and the section directly impacted by the development is termed the 'development footprint'. It's worth noting that while the entire seasonal survey isn't completed, the presence of specific species has been assumed for this assessment.

Various legislative evaluations were carried out in adherence to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Fisheries Management Act 1994* (FM Act), among others. The findings revealed no threatened fauna or flora species within the study area as per the EPBC Act. Additionally, the FM Act confirmed no habitat for threatened marine or aquatic species. However, the development footprint did have the Grey-crowned Babbler species and the Inland Grey Box Woodland community.

An ecological survey, compliant with the Biodiversity Assessment Methodology (BAM) and other legislation, was undertaken. This thorough survey confirmed the presence of the Grey-crowned Babbler and the threatened ecological community of Grey Box Grassy Woodlands of South-Eastern Australia within the development footprint.

Given the ecological nuances of the area, an environmental conservation zone has been proposed to avoid impacts on the existing vegetation along the northern boundary of the Site. The primary conservation approach is to strategically design the concept masterplan in areas with low biodiversity, primarily focusing on previously cleared land.

For further ecological protection, a series of mitigation measures have been proposed. These range from landscaping predominantly with native species, ensuring the restoration and protection of the Grey Box Grassy Woodlands, implementing stringent sediment and erosion control processes, and setting up appropriate fencing to protect conservation zones. Ecological supervision will be integral during construction, ensuring the welfare of the fauna and their habitats. Protocols around the management of hollow-bearing trees, dam dewatering, and pest control will be strictly adhered to, ensuring minimal disruption to the ecosystem.

The preliminary BDAR has also reviewed the likely offsets incurred by the proposed masterplan, however, this will continue to be developed with the inclusion of targeted species studies. The proposed concept masterplan is considered to preserve and enhance the existing ecological features through the strategic location of the conservation zone.

5.5 Land Reserved for Acquisition

Specific portions of land, marked for public recreation and conservation, have been designated as reserved for acquisition. The Council is anticipated to acquire this land at an appropriate rate. The acquisition process is expected to require a Voluntary Planning Agreement/preparation of an Infrastructure and Contributions Plan. This strategy is pivotal for the protection of existing vegetation and to ensure the availability of recreational areas for the benefit of future residents.

5.6 Topography

Zenith Construction Surveying has prepared a Survey Plan for the subject Site which is attached at Appendix 1. The terrain of the site is predominantly flat, except for a hill situated in the northwestern corner. This hill represents the site's highest elevation at RL 276.61 AHD. In contrast, the site's lowest elevation can be found at the northeastern corner, marked at RL250.88 along the Farnell St frontage. Given the topographical features, the land appears to be suitable for a residential masterplan.

5.7 Traffic

A Transport Impact Assessment has been prepared by Crossley Transport Planning and is attached at Appendix 8.

Crossley Transport Planning conducted an evaluation of traffic and transport concerns for the proposed development at School Road, Forbes. This development is set to introduce approximately 745 residential units and other complementary land uses. Findings from the assessment reveal that vehicle access and servicing are satisfactory, and the development will not negatively impact traffic flow. Key intersections close to the site, examined using the SIDRA traffic model, will experience minimal additional traffic due to the proposed concept masterplan. On 23 June 2023, traffic counts were executed at three primary intersections, specifically Johnson Street/Barton Street/Farnell Street, The Bogan Way/Edward Street, and Farnell Street/Wyndham Avenue, in collaboration with the Forbes Shire Council.

The SIDRA INTERSECTION 9.1 software was used for the intersection assessments, focusing on parameters like Level of Service, Average Delay, and Degree of Saturation. Vehicular access to the site will be primarily via Edwards Street and Farnell Street, with Morton Street providing initial access. The internal road layout will consist of a mix of local and collector roads. The development is planned in three phases, culminating in

2035 with the full realization of 745 dwellings, a supermarket, shops, and other facilities. Local road designs are set to cater to on-street parking and facilitate the council's refuse collection service. Traffic generation assumptions were based on RTA (RMS) guidelines. Specific trip distribution assumptions were made according to land use type. The final SIDRA results indicate that the key intersections will operate efficiently during peak periods post-development.

It must be noted that the road reserves and network will be subject to further design as part of a site-specific DCP and ongoing discussions with Council.

Given the outcome of the SIDRA modelling and noting that the development would not have a detrimental impact on the operation of the road network, the proposal is considered to warrant support in relation to traffic.

5.8 Services Infrastructure

An Infrastructure and Servicing Review has been prepared by GHD and is provided in Appendix 7.

This report reviews the developments capability to integrate seamlessly with existing infrastructure and assess any future upgrades. The engineering evaluations carried out have yielded positive insights, indicating that the land can be adequately serviced, syncing with the project's developmental stages.

Electricity for Forbes is channelled through the "Forbes Town" Zone Substation, a property managed by Essential Energy. According to the Essential Energy Distribution Annual Planning Report (DAPR) of 2021, this substation possesses the capacity to cater to the new concept masterplan. However, to bolster this supply, there will be a need to incorporate an additional 11kV feeder. Alongside this, approximately six pad-mount substations are projected to be essential for dispersing low voltage power to various lots and aiding in street illumination.

In the domain of telecommunications, NBN Co is the most prominent provider in Forbes. While most urban sectors are equipped with "fibre-to-the-node" technology, the peripheries are connected through fixed wireless systems. Marking a significant upgrade for the Forbesview masterplan, all its lots are slated to be equipped with the advanced "fibre-to-the-premises" (FTTP) services. This enhancement will require the installation of a new underground pit and duct system, which will connect to the primary NBN exchange nestled within the confines of Forbes.

The current state of water and sewer provisions shows that lots situated to the south of Cypress Lane are connected to the existing water infrastructure, benefiting from the DN150 pipe at Belah Street. There are plans underway to expand the water and sewer infrastructure by 2025-2026 to accommodate the entire subdivision area. Detailed specifics of these enhancements will emerge as the Council finalises the water and sewer network models.

In conclusion, the proposal aligns well with the existing and future infrastructure plans in the Forbes LGA.

5.9 Social and Economic

This Social and Economic Impact Assessment (SEIA) report was commissioned for Forbesview Pty Ltd in connection to a planning proposal of a 92ha Site northwest of Forbes' centre in NSW's Central West region. The SEIA is provided at Appendix 10.

The proposal aims to develop approximately 745 dwellings which would accommodate an estimated 1,560 residents. Additionally, the development includes provisions for retail, commercial spaces, and around ten hectares of open space, conservation areas, play and recreation areas, and active transport routes. The SEIA evaluated the potential housing, social infrastructure, and economic effects, aiming to highlight benefits and suggest measures to mitigate any negative impacts. Background analysis revealed that both the subject Site

and Forbes' north have been previously identified for residential development in the strategic planning documentation including; LSPS and Forbes Housing Strategy. Forbes' demographic indicates a need for varied housing options due to its age structure and the projected population growth. Moreover, an assessment of the local community showed strong local employment sectors, lower unemployment rates than the state's average, and specific areas of socio-economic disadvantage which would be improved through significant investment in underutilised land.

The report's findings highlighted that Forbes currently has sufficient social infrastructure, especially concerning open spaces and educational facilities. Despite its relatively small population, Forbes is well-equipped with a library, community centre, TAFE NSW campus, and a hospital. The concept masterplan will largely make use of the existing infrastructure, while the addition of recreational spaces will benefit both current and future residents.

Economically, the proposed development would support 5,161 job years during construction and 122 full-time jobs once operational, contributing positively to the local economy. Furthermore, a thorough social impact assessment concluded that while the proposal might result in some typical construction-related disruptions, like noise and traffic, these can be largely mitigated. In contrast, the potential social benefits, such as improved access to amenities and increased employment opportunities, are significant.

In conclusion, the proposal would result in a social and economic benefit, especially considering Forbes' ongoing need for diverse housing options. The proposed development aligns with the Council's vision for the region, promising a net benefit to the Forbes community on both social and economic fronts.

5.10 Heritage

The subject Site is not identified as a heritage item nor is it located within a heritage conservation area. The closest heritage item is *Forbes General Cemetery (including Shaw / Bodell Kurrajong)* which is a local heritage item and contains *The Ben Hall Sites - Grave of Ben Hall* which is a state heritage item. These heritage items are located approximately 700m south of the Site.

An Aboriginal Heritage Constraints Assessment has been prepared by Biosis and is provided at Appendix 9. The archaeological investigation encompassed the entire study area, revealing its dominant Calarie Sandstone geology, with areas potentially useful as grinding and art surfaces. The region, while rich in flora and fauna, has hydrological characteristics indicating an absence of enduring water sources, historically reducing its suitability for prolonged occupation. The flat topography doesn't offer significant vantage points of the surroundings. Historical aerial imagery highlights agricultural activities since 1965, causing extensive ground alteration and lessening the probability of unspoiled archaeological findings. No new Aboriginal sites or objects were discovered in the recent investigation conducted on 25 July 2023.

Given the findings, it's determined that the study area possesses minimal archaeological value, due to previous agricultural interferences and its landscape. Consequently, no additional archaeological assessments are deemed necessary, and work can advance with caution. Nonetheless, should any unexpected Aboriginal artifacts or objects be uncovered during work, immediate cessation of activities is required, and a qualified archaeologist should evaluate the discovery. In the event of encountering potential Aboriginal ancestral remains, operations must halt and the relevant authorities, including the NSW Police and Heritage NSW, must be notified.

5.11 Geotechnical

A Geotechnical Report has been prepared by Core Geotech and can be found in Appendix 4. Fieldwork was conducted over two days, the 29th and 30th of June 2023. During this time, 25 test pits were excavated using a track-mounted excavator. Several tests were undertaken, including Dynamic Cone Penetration and Pocket Penetrometer tests, which helped in gauging the soil's relative density.

Subsequently, samples were gathered and dispatched to NATA Accredited laboratories for detailed analysis. A variety of tests were performed on these samples, including Particle Size Distribution, Atterberg Limit, and Field Moisture Content tests, among others.

The principal findings from the geotechnical investigation were that the site is primarily made up of firm clay/sandy gravelly clay soils with an underlying layer of sandstone rock. There were no indicators of slope instability, suggesting that the risk of hillside instability for the proposed development is low. Aggressivity tests on the soil showed it to be non-aggressive towards both steel and concrete piles.

In terms of site classification, the area was identified as a class P site due to abnormal moisture conditions. It's crucial for the designing engineer to note that most natural soils on this site gravitate towards a Class M (moderately reactive) classification in zones of natural medium plasticity clays and shallow rock. Alternatively, they can be classified as Class H1 and H2 (highly reactive) in regions with deep high plasticity natural clays. Anticipated characteristic surface movement under standard moisture conditions is estimated to be between 40mm to 75mm.

Additional site observations revealed the presence of three dams, which must be decommissioned before the commencement of any earthworks. Groundwater issues were not foreseen to be a challenge during excavation processes.

The report also included a set of recommendations. These covered various aspects of construction, such as specific guidelines for excavation characteristics, subgrade preparation, the use of engineered fill, edge compaction techniques, and procedures for trench backfilling. A highlight was the need for retaining structures for excavations going beyond a depth of 1.5m, which should be designed following the AS 4678-2002 standards. For projects necessitating high-level footings, the report advised an allowable bearing pressure of 100kPa. In situations where pile foundations are considered, bored piles were proposed as a suitable choice. The report concluded with a discussion on pavement design parameters, driven by the findings from five CBR samples. This indicated potential requirements for subgrade stabilization in specific areas of the site.

5.12 Bushfire

The Site is not identified as being located within the bushfire prone land. As such, no further investigation considered necessary.

6.0 Conclusion

The proposed amendments to the FLEP 2013 to rezone the Site to facilitate the development of the concept masterplan. The desired development outcome for the Site is consistent with the LSPS and Forbes Housing Strategy. In summary, the proposed FLEP 2013 amendments are considered appropriate for the following reasons:

- The proposed rezoning from RU1 Primary Production, RE1 Public Recreation and R5 Large Lot Residential to R1 General Residential, E1 Local Centre, RE1 Public Recreation and E3 Environmental Management would facilitate the development of a high quality masterplan in the Forbes LGA.
- The amendments to the minimum subdivision lot size, height of buildings and land reserved for acquisition would also assist in ensuring the viability of the project.
- The Forbes Housing Strategy has identified the subject Site for future rezoning and represents significant fiscal investment into underutilised land identified for future residential development. The rezoning of this land would enable private investment within Forbes which will assist in taking the pressure of Council who are presently trying to cater for the increasing housing demand in the LGA and the Central West region through the rezoning and subdivision of their own sites.
- The proposal would provide for a diverse range of lots and housing typologies at varying price points to cater for an array demographics. More specifically, the concept masterplan highlights areas for small lots within proximity to the neighbourhood centre. Through the supply and diversity of new housing the proposal will provide greater housing choice and contribute to affordability.
- The neighbourhood centre would provide facilities to meet the day-to-day needs of the future residents whilst preserving the existing commercial hierarchy and not detracting from the Forbes Town Centre.
- Public recreation and conservation areas have been designed to provide enhanced amenity for future residents whilst also preserving important existing vegetation. This avoidance strategy has been supported by the project ecologist.
- No significant environmental planning constraints have been identified that would preclude development on the Site. Additionally, the proposal is considered to result in significant positive social and economic impacts for the Forbes LGA.

On balance, it is requested that the proposed amendment to the FLEP 2013 be favourably considered by Forbes Shire Council to allow the proposal to proceed to Gateway Determination by the Department of Planning and Environment.

Appendix 1 - Survey Plan

SCHEDULE OF LOT AREAS
(BY DP DIMENSIONS)

LOT	AREA (ha)
375	14.476
376	12.607
386	13.360
387	12.218
388	16.263
389	13.024
830	0.651
831	0.811
1272	5.044
1273	4.072

LEGEND

- SV - STOP VALVE
- HYD - HYDRANT
- WMN - WATER MAIN
- WMMP - WATER MAIN MARKER POST
- GV - GAS VALVE
- GMP - GAS MARKER POST
- PP - POWER POLE
- EMP - ELECTRICAL MARKER POST
- OVERHEAD POWER LINES
- TEL - TELSTRA PIT
- TELMP - TELSTRA MARKER POST
- MBX - MAILBOX
- SI - SIGN
- GRT - STORMWATER GRATE
- PU - UNKNOWN PIT
- MHU - UNKNOWN MANHOLE
- INV - INVERT LEVEL
- OBV - OBVERT LEVEL
- FENCE LINE

HORIZONTAL ORIGIN	
COORD. SYSTEM MGA GDA2020	PM 63265 E: 592652.025 N: 6308714.296 AZIMUTH: GNSS ZONE: 55
VERTICAL DATUM	
DATUM AHD	PM 63265 RL: 260.238

REFERENCE: SCIMS 2-06-2023

NOTES:

- THIS SURVEY HAS BEEN CARRIED OUT ON 4/06/2023
- BOUNDARIES HAVE NOT BEEN SURVEYED. THE BOUNDARIES SHOWN HAVE BEEN DERIVED FROM UNCONFIRMED SOURCES USING GNSS
- NO INVESTIGATION OF SERVICES HAS BEEN UNDERTAKEN. SERVICE AUTHORITIES SHOULD BE CONSULTED BEFORE ANY EXCAVATION, DEMOLITION OR CONSTRUCTION COMMENCES.
- ZENITH CONSTRUCTION SURVEYING TAKES NO RESPONSIBILITY FOR LOSSES, DAMAGES OR INJURIES TO ANY PERSON OR ORGANISATION THAT MAY OCCUR DUE TO THE RELIANCE ON THIS PLAN FOR THE LOCATION OF UNDERGROUND SERVICES.



GDA2020 | BEFORE YOU DIG www.byda.com.au Zero Damage · Zero Harm

0 60 120 180 240 300
SCALE 1: 3000 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158
CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1:3000		SHEET 1 OF 8 SHEETS		
DRAWING NUMBER		REV.		A1
8082_001		01		

MGA

SCHOOL STREET

(GRAVEL ROAD)

LOW VOLTAGE

HIGH VOLTAGE

ROAD RESERVE

SCATTERED TREES

TREES

SPLIT LEVEL BRICK DWELLING TILE ROAD

830 DP 750158

831 DP 750158

376 DP 750158

1272 DP 750158

386 DP 750158

EDWARD STREET

(GRAVEL ROAD)

LOW VOLTAGE

ROAD

(GRAVEL ROAD)

TOP OF BANK

LOW VOLTAGE

HIGH VOLTAGE

ROAD RESERVE

TREES

SCATTERED TREES

SCATTERED TREES

SCATTERED TREES

LOW VOLTAGE

SPLIT LEVEL BRICK DWELLING TILE ROAD

TREES

DAM

BOTTOM OF BANK

TOP OF BANK

SHEET 3 ADJOINS

SHEET 4 ADJOINS

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

0 15 30 45 60 75

SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 2 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

SCHOOL ROAD

ROAD RESERVE

ROAD RESERVE

(GRAVEL ROAD)

(GRAVEL ROAD)

BANK

TOP OF BANK

LOW VOLTAGE

HIGH VOLTAGE

LOW VOLTAGE

HIGH VOLTAGE

LOW VOLTAGE

TREES

389
DP 750158

FARNELL STREET

(BITUMEN ROAD)

(BITUMEN ROAD)

SHEET 2 ADJOINS

SHEET 5 ADJOINS

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

0 15 30 45 60 75

SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA
from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 3 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

SHEET 2 ADJOINS

STREET (GRAVEL ROAD)

LOW VOLTAGE

EDWARD (GRAVEL ROAD)

LOW VOLTAGE

386
DP 750158

376
DP 750158

1272
DP 750158

387
DP 750158

SCATTERED TREES

SCATTERED TREES

BANK

BANK

SHEET 5 ADJOINS

SHEET 6 ADJOINS

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

0 15 30 45 60 75

SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA
from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au
ZCS

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED CL	DRAWN MR	CHECKED CL	PASSED CL	STATUS: FOR DESIGN
SCALE 1: 750		SHEET 4 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

SHEET 3 ADJOINS

SHEET 4 ADJOINS

386
DP 750158

387
DP 750158

389
DP 750158

388
DP 750158

STREET (BITUMEN ROAD)

FARNELL (BITUMEN ROAD)

TREES

LOW VOLTAGE

BANK

TOP

BOTTOM

BOT

OF

INV

OBV

SHEET 7 ADJOINS

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage · Zero Harm

0 15 30 45 60 75
SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA
from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 5 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

SHEET 4 ADJOINS

STREET (GRAVEL ROAD)

LOW VOLTAGE

(BITUMEN ROAD)

376
DP 750158

1272
DP 750158

387
DP 750158

DAM

CYPRESS (UNFORMED ROAD) LANE

LOW VOLTAGE

EDWARD

(BITUMEN ROAD)

LOW VOLTAGE

375
DP 750158

1273
DP 750158

UNFORMED ROAD

LOW VOLTAGE

SHEET 7 ADJOINS

SHEET 8 ADJOINS

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage · Zero Harm

0 15 30 45 60 75
SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 6 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

SHEET 5 ADJOINS

SHEET 6 ADJOINS

387
DP 750158

388
DP 750158

FARNELL STREET

CYPRESS LANE

(UNFORMED ROAD)

(BITUMEN ROAD)

TREES

LOW VOLTAGE

BOTTOM

TOP

BANK

OF

TEL

HYD

PP

SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

0 15 30 45 60 75

SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA
from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

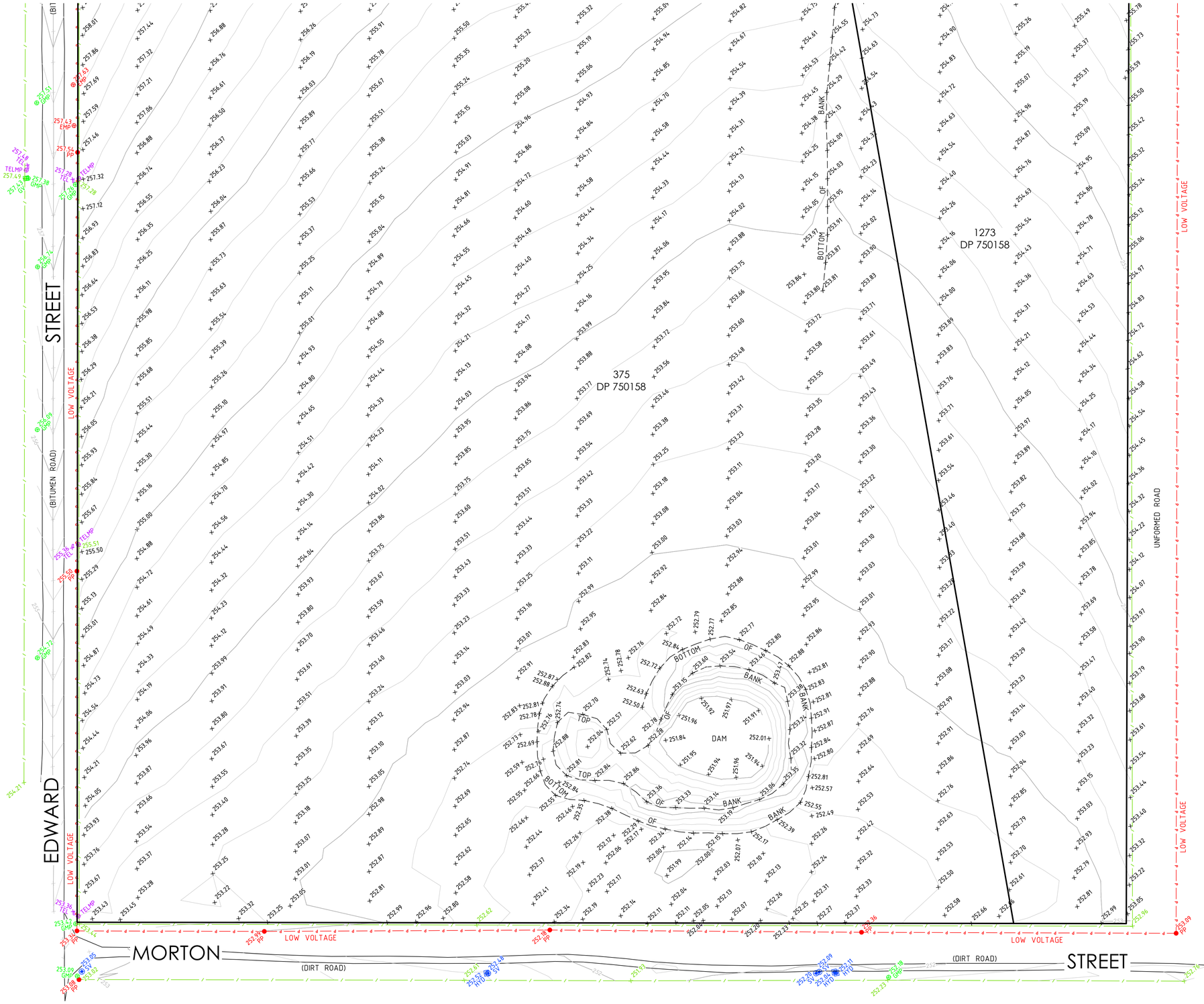
REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158

CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 7 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		



SEE SHEET 1 FOR NOTES AND LEGEND

GDA2020

BEFORE YOU DIG www.byda.com.au Zero Damage - Zero Harm

0 15 30 45 60 75

SCALE 1: 750 @ A1

IMPORTANT NOTE:
This plan is prepared for ALLERA
from a combination of field survey and existing records for the purpose of designing new constructions on the land and should not be used for any other purpose.
The title boundaries have been surveyed and investigated.

A services search of the area surveyed above has not been undertaken. Visible services shown hereon have been located where possible by field survey. Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

REVISION	DATE	DESCRIPTION	REF	APPROVED
01	22-06-23	APPROXIMATE BOUNDARIES ADDED	8082	CL
00	11-06-23	ORIGINAL ISSUE	8082	CL

ZENITH CONSTRUCTION SURVEYING
PO Box 43
Rylstone NSW 2849
t: +61 400 914 794
survey@zenithconstructionsurveying.com.au
ZCS

PROJECT: SCHOOL ROAD, FORBES NSW
DETAIL SURVEY OF LOT 375, 376, 386-389, 830, 831, 1272 & 1273 IN DP750158
CLIENT: ALLERA

SURVEYED	DRAWN	CHECKED	PASSED	STATUS:
CL	MR	CL	CL	FOR DESIGN
SCALE 1: 750		SHEET 8 OF 8 SHEETS		
DRAWING NUMBER		REV.	A1	MGA
8082_001		01		

Appendix 2 - Urban Design Report



Forbesview

SCHOOL RD, FORBES

URBAN DESIGN REPORT

HATCH

for Forbesview Pty Ltd

September 2023



Title: Forbes View - Urban Design Report
Prepared for: Forbes View - Captcha | Allera
Reference: H371649
Status: Draft
Date: September 2023
Prepared by: Hatch - Monique Cowan
Approved by: Hatch - Michael Dickson

DISCLAIMER & COPYRIGHT
This document was prepared for the exclusive use of The clients. Hatch acts in all professional matters as a faithful advisor to its clients and exercises all reasonable skill and care in the provision of its professional services. The information presented herein has been compiled from a number of sources using a variety of methods. Hatch does not attempt to verify the accuracy, validity or comprehensiveness of any information supplied to Hatch by third parties. Hatch makes no warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, validity or comprehensiveness of this document, or the misapplication or misinterpretation by third parties of its contents. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favouring by Hatch. This document cannot be copied or reproduced in whole or part for any purpose without the prior written consent of Hatch.

Images by Hatch unless noted otherwise

© Hatch Pty Ltd, 2023

Hatch
The Barracks, 61 Petrie Terrace, Brisbane
T: +61 7 3166 7777 www.hatchrobertsday.com.au
ABN 59 008 630 500 ACN 008 630 500

Acknowledgement of Country

We acknowledge the Traditional Custodians of the Wiradjuri nation, the land on which Forbes View sits.

We pay our respects to Elders past, present and future, and recognise all Australian First Nation peoples' unique cultural and spiritual relationships to Country and it's rich contribution to our Community.

The Wiradjuri people were a hunter gatherer society comprised of small clans and family groups whose movements followed seasonal food gathering and ritual patterns.

Currently 16% of Forbes' population identify as Aboriginal or Torres Strait Islander and we recognise and respect their continuing connection to country and contributions to community.

1. INTRODUCTION

HATCH | RobertsDay

CONTENTS

1 INTRODUCTION 3

1.0 Report Outline 4

2 CONTEXT 5

2.0 Regional drivers + policy context 6
2.1 Local Drivers Snapshot 9
2.2 Forbes context + policy framework 10
2.3 Climate 12
2.4 Housing 13
2.5 Summary Design Drivers + Influences 14

3 THE SITE 15

3.0 Site location 16
3.1 Site physical characteristics 17
3.2 Site views 18

4 VISION AND DESIGN PRINCIPLES 21

4.0 Vision 22
4.1 Connection to Nature 23
4.2 Walkable Neighbourhoods 24
4.3 Local Cultural Identity 25
4.4 Housing Options 26
4.5 Creating Partnerships 27
4.6 Primary Elements 28
4.7 Connections 29
4.8 Connected Nodes 30
4.9 Growth and Precincts 31
4.10 Concept Masterplan 32

5 MASTERPLAN 33

5.0 Masterplan 34
5.1 Elements 35
5.2 Zoning 36
5.3 Building height 37
5.4 Public land dedication 38
5.5 Minimum lot size 39
5.6 Streets and connection 40
5.7 Precincts 41
5.8 Landscape 42
5.9 Water 44
5.10 Green Spine 45
5.11 Built form strategies 46
5.12 Summary 47

Forbes Lake

1.0 **REPORT OUTLINE**

Executive Summary

Forbesview is a proposed new master planned community situated to the north western edge of Forbes, 5 minutes by car from Forbes Town Centre.

This report has been prepared to inform a *Planning Proposal* specifically by:

- *Gathering* site and project analysis informed by technical studies from consultants, regional and local policy understanding, and visiting and assessing site circumstances to inform an appropriate design response to the site,
- *Establishing* a vision and design principles emerging from the project research to guide the thinking behind the master plan,
- *Proposing* a master plan that draws together the research and proposal through a process of consultation and a process of design reviews.

The *Masterplan* is the result of a rigorous and iterative design process, working closely with the Forbes Shire Council. It is also a proposal that will continue to develop in its sophistication through each stage of development. This *Urban Design Report* unpacks the process and thinking and how they have been incorporated into the master plan.

Report Structure

The urban design report is broken into five chapters:

1. **Introduction:** *Outlines* purpose of the report and project background,
2. **Context:** *Reviews* the constraints and opportunities for the site and project from policy and market perspectives at regional and local levels,
3. **The Site:** *Explores* qualitative, climatic, and physical characteristics of the site on the ground.
4. **Vision and Design Principles:** *Articulates* a framework to guide design decisions when developing the Masterplan design,
5. **The Master Plan:** *Proposes* the final Masterplan and describes strategic and technical elements of the design.

Project vision

Forbes and Parkes are co-located regional towns that will benefit from current and planned investment in central NSW. The region will benefit from the establishment of affordable industrial land with affordable freight connections to Melbourne, Sydney and Brisbane. This will open new markets in bulk handling of materials such as resource recovery from waste, minerals and agricultural processing, served by low emissions energy.

This state led investment will boost investment in the region, generating employment opportunities and intrastate and international migration. Attracted by affordable housing options, Forbes will be a beneficiary this of investment attracted by new jobs with an affordable lifestyle.

The master planned community will provide a diversified housing product, serving the needs of locals seeking new opportunities for better aging in place and small households seeking smaller high amenity housing options.

The master planned community will seek to enshrine walk-ability and open space amenity as a central focus for the project. Proposed partnerships with local builders will unlock the supply of product and focus on house + land rather than land only sales.

This vision will be delivered under a unified land ownership. Forbes View own the whole land parcel, meaning that rezoning will be unencumbered by competing land owner interests and provide a single source of negotiations when planning new infrastructure works.

Forbes View will continue working with Forbes Shire Council (FSC) to develop the project. It will be a significant addition to the town's housing stock and population. Respect for and building on the FSC *Housing strategy* will be a key project driver. The aim is to create a new community that leaves a positive legacy for the town and a positive reflection on all parties involved in the delivery of this new master planned community.

OVERVIEW - POLICY CONTEXT

The policy context frames the brief of the project. Project success is underpinned through the alignment with council strategy and the capacity to tap into medium and long term infrastructure investments.

2. CONTEXT

Victoria Park, Forbes Town Centre

2.0 REGIONAL DRIVERS & POLICY CONTEXT

Regional Context





The Forbes - Parkes region is at the heart of NSW, well connected to Sydney by air and rail, and is poised to become a major inland manufacturing and freight transit hub.

Increased accessibility, access to skilled workers and a lower cost base will open opportunities for existing and new businesses to grow.



2.0 REGIONAL DRIVERS & POLICY CONTEXT

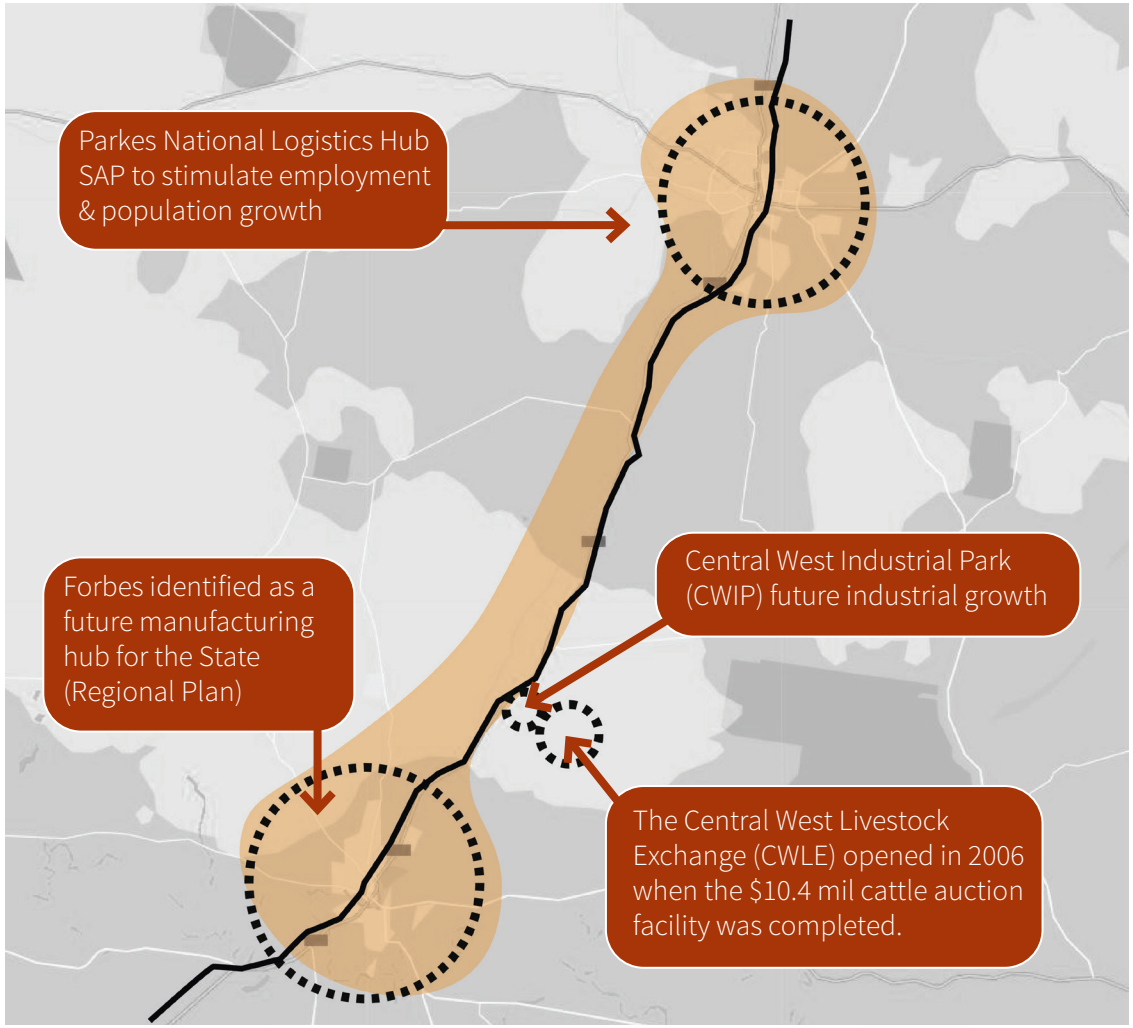
Regional Development

The Central West and Orana Regional Plan 2041 (Regional Plan) establishes strategies to manage housing supply, economy and response to climate change. The region comprises of 19 Local Government Areas (LGA's) including Forbes and Parkes.

More than 290,000 people live in the region with population growth to reach 350,000 by 2041

Relevant highlights to Forbes includes:

- Identifying Forbes as a future manufacturing hub for the State,
- Forbes Central West Industrial Park (CWIP) identified as a location for intensive agriculture, and refrigerated distribution centre,
- In tandem with Parkes, identified as an emerging national strategic centre benefiting from Inland Rail connections,
- Initiatives to flood-proof major infrastructure, including flood immunity of sections of the Newell Highway between West Wyalong and Forbes,
- Benefits from improved links between Forbes and Canberra.



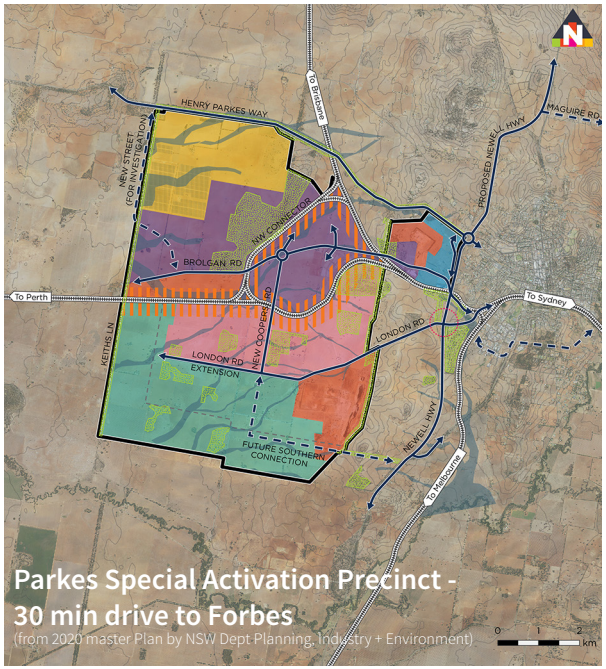
Forbes Regional investments Plan

2.0 REGIONAL DRIVERS & POLICY CONTEXT

The Forbes / Parkes / Condoblin region benefits from investments in mining, freight, energy transition, food processing, and resource recovery from waste. Investment in rail and affordable large scale industrial land will transform Parkes / Forbes into an important manufacturing + logistics hub.

- **Logistics:** Inland Rail to Melbourne will be operational by 2027 and consolidates state investment in the Parkes Special Activation Precinct (SAP) focused on industry.
- **Agriculture:** Is the largest industry sector in Forbes that benefits from better freight connections and access to national and international markets. New industrial land release opens opportunities for new food processing industry to establish in the region.
- **Mining:** The region hosts two operational mines and one under development. The Northparkes Copper and Gold mine to the north of Parkes employs 52 Forbes residents and contracts of $1m of goods and services to local businesses. Evolution Gold mine operates to the South West of Forbes and the proposed Sunrise Nickel, Cobalt, and Scandium to the north east of Forbes, will supply minerals for lithium-ion batteries.
- **New Industry**: With Inland Rail and the development of affordable industrial land at the Parkes SAP, there are opportunities for new industries such as e-waste and plastics resource recovery industries. Aggregating waste from major centres and processing them in a central regional location is made viable by the lower cost of bulk rail transport, lower cost land for processing facilities, and economies of scale of operations.
- **Energy transition**: Regional Australia more generally will benefit from energy transition investment. Parkes Solar "Agri Farm" is a first of its kind combining energy with agricultural production. Policy settings initiated by Forbes Shire Council will drive investment at a local level.
- **Housing:** The housing price point with high quality of life in Forbes is attractive compared to urban and regional NSW, making the region a destination for inter and intra state migration.
- **Culture and Events**: The sculpture down the Lachlan art trail is a nationally significant cultural destination with over 20 large scale installations and pieces distributed along the highway running parallel to the Lachlan River between Forbes and Condobolin. The program of smaller art pieces around Forbes are well represented on social media along with public canvases on infrastructure at Grenfell, Lake Cargelligo, and Tottenham. Extensive public art attract travellers to divert their travel through the region and increase dwell times and overnight stays in local towns. Events in Forbes contribute significant visitation include: Frost and Fire, Elvis Festival, Grazing Down the Lachlan.





Parkes Special Activation Precinct - 30 min drive to Forbes
(from 2020 master Plan by NSW Dept Planning, Industry + Environment)

2.1 FORBES - LOCAL DRIVERS SNAPSHOT

Active Transport

- Shared pathway connecting Edward St along The Bogan Way into Forbes Town Centre (under construction
- Existing shared pathways around Lake Forbes

Community Infrastructure

- 5 schools, 1 preschool and 3 early childhood centres; 2 are just within walking distance (500m-1.5km depending on the site)
- Over 32 community groups and associations including five serviced clubs and an active Business Chamber;
- 13 sporting grounds and 46 sporting groups







Architecture

- Local identity characterised by heritage architecture and small boutique retail/ hospitality offerings



Community Activation & Tourism

- Tourism supports an estimated 146 jobs.
- Key events include the Lachlan River Arts Festival, Grazing down the Lachlan, and the National and World Hang Gliding Championships. Sculpture Down the Lachlan is a permanent public art trail stretching 100 km between Forbes and Condobolin featuring over 20 sculptures in natural settings.



Connection to architectural heritage language through built form and frontage detailing,

Opportunity to connect shared pathways with the wider Forbes pathways network,

Opportunity to tap into events calendar with satellite events,

Opportunity to extend the art trail and public art program to elements in the new community.

Images visitnsw.com, Forbes Shire Council, and Hatch.
Source: Forbes Community Plan; Forbes Local Strategic Plan

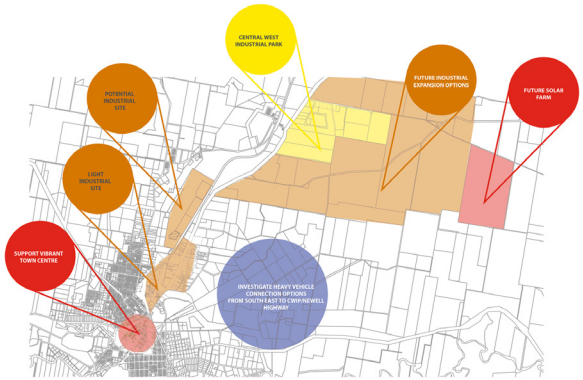
2.2 FORBES CONTEXT & POLICY FRAMEWORK

Forbes Shire Council has published a number of policy and strategic documents informing the masterplan design, specifically:

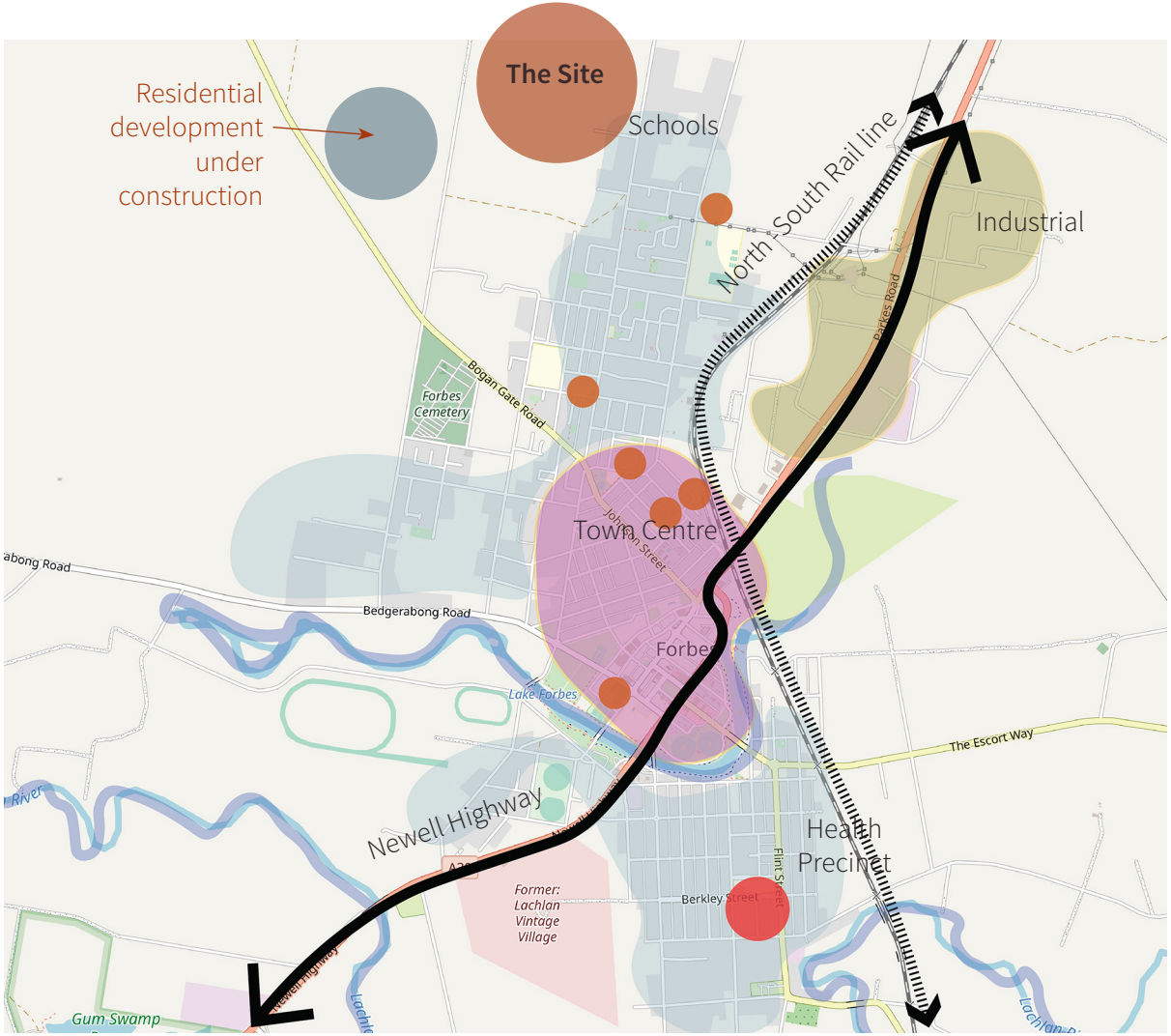
- *The Forbes Local Strategic Planning Statement 2040*
- *Forbes Community Strategic Plan 2018 – 2028*
- *Forbes Shire Council Resilience Plan 2020*
- *Forbes Housing Strategy (2023)*

Forbes Local Strategic Planning Statement 2040

The strategic planning statement sets out a 20-year strategic vision on future growth. It predicts and average 5% growth off the back of increased economic activity in logistics, processing, agriculture, mining, and tourism. Its key tenets revolve around lifestyle, economy, infrastructure growth and environment and heritage.



Forbes industrial expansion



Forbes town structuring elements

2.2 FORBES CONTEXT & POLICY FRAMEWORK

The statement foresees Forbes as becoming an important residential "location of choice" due to its strategic location, local amenity and affordable lifestyle. It celebrates it architectural heritage born out of the 1862 gold rush, its grand buildings, streets and lane ways cultivating "boutique" businesses. Walk-ability and easy access to amenity is cited as a key driver towards its high liveability standards.

The plan targets town expansion to the northern and southern fringes of the town however to note that southern expansion would be subject to flood risk. Additional industrial land is targeted to the north eastern sector of town that includes the site for a future solar farm.

Forbes Community Strategic Plan 2018-2028 and Forbes Council Delivery Program and Operational Plan 2022-2025

The Community Strategic Plan sets a direction informed by community engagement and the guidance from the Local Strategic Planning Statement. The Council Delivery Program and Operational Plan are the delivery actions based off the Strategic Plan.

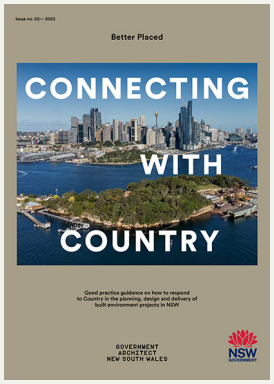
Relevant takeaways include:

- Access to water is central to community identity,
- Forbes Council and community pride itself on its community safety as an attractor;
- Support for 'ageing in place' when designing new residential areas, to develop product that better suits an aging population,
- Identify as a regional tourism and art hub through events and public art;
- Develop and implement measures to enhance urban streetscapes and town entrances;
- Recognise, preserve and enhance local biodiversity and resilience.

Community Resilience Plan 2020

Forbes and the central west region of NSW will become increasingly impacted by the effects of climate change. Forbes in particular is impacted by flooding, with major flood events causing widespread damage to property and cutting town access. This creates issues with evacuations, access to medical facilities, and day to day food security during disasters. Equally the plan anticipates increase severe dry weather events and drought and one off severe events such as sever storms and mini tornadoes.

The Forbes Resilience Plan 2020 sets forth specific strategies to strengthen infrastructure and outline areas of risk, but equally focuses on community resilience and well being. It cites aspects such as the development of community spirit (evidenced by high levels of volunteering), community pride and actions that account for greater community connection and co-reliance.



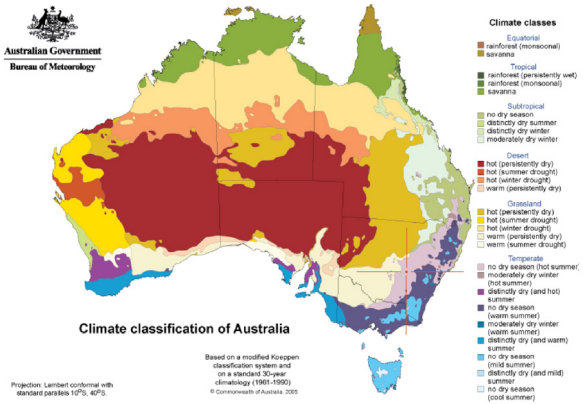
Connecting with Country

First nations connection to country is intrinsic to the development of new communities and is guided by a framework developed by the office of the State Government Architect of NSW. The Connecting with Country Framework premises the importance of undertaking investigations as part of the design process and find ways to include an authentic first nations voice in the process.

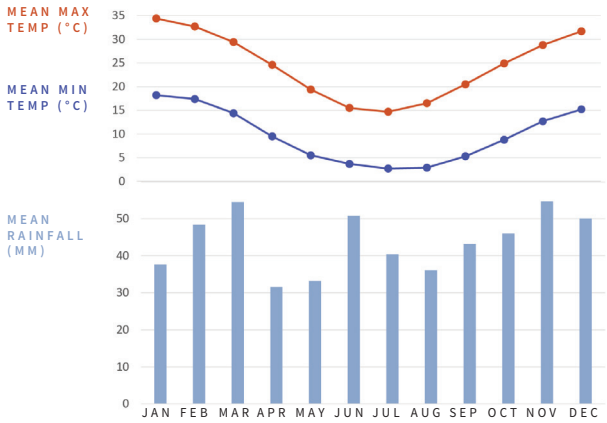
Fundamentally places of first nations cultural significance must be identified and managed with the collaboration of local aboriginal voices. In addition to conservation and management of identified cultural places, working with and respect for country informs a more general approach to site and open space design. Some guidelines evoked by the framework include:

- Orientate buildings and spaces between them to preserve views and sight lines to important cultural features,
- Provide physical and visual connections to external spaces,
- Follow ground contours to minimise excavation and alteration of existing topography,
- Create a range of spaces so community as a whole can discuss shared business.

2.3 CLIMATE



Forbes and the central west has a wet temperate climate with hot summers as per the Koeppen climate classification system. This translates to a situation that is highly contingent on the reliability of rainfall and subject to variations attributed to the oscillation between wetter or dryer annual tenancies.



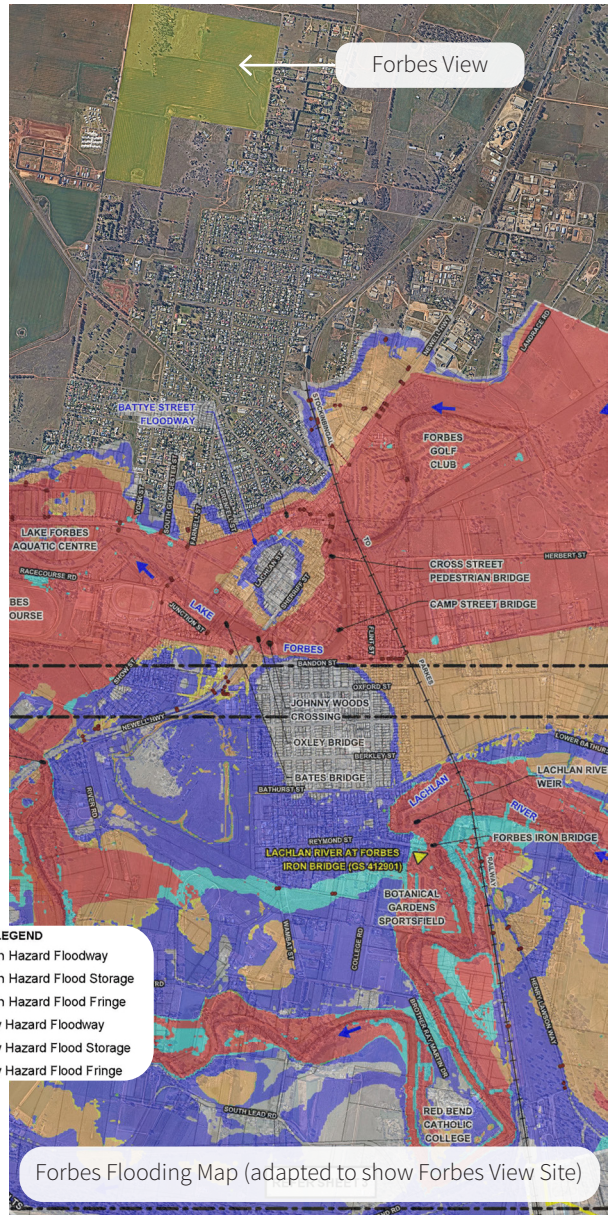
Forbes Climate Data

Australia's climate is changing and new settlements need to understand how to accommodate changing circumstances in master plans. The NSW government research into climate adaptation found that the Central West and Orana region will be impacted through temperature increases (maximum and minimums) with increased autumn rainfall but decreased spring rain.

For the Forbes region the impact to agriculture could be profound but given the vulnerability to flood, heavier autumn rain main impact to an already vulnerable township may be considerable.

Forbes has experienced on average a major flood every seven years since 1887. During the 2016 floods, Forbes was shut off from Newell Highway temporarily which impacted access for goods and services to the town during this time. The diversification of goods and services delivery may be needed. This must be measured and managed to ensure that town centres remain the vibrant heart of the town and that commercial activity on the outskirts of town do not diminish the commercial and cultural vitality of the town centre.

The location outside of the flood zone provides the town a major advantage in opening new stock that is free from flood risk and high insurance premiums. Establishing a small neighbourhood centre provides additional resilience during flood events, providing access to supplies and services.



Forbes Flooding Map (adapted to show Forbes View Site)

2.4 HOUSING

The Forbes Housing Strategy anticipates a population increase of 34% to 2041, roughly equating to 3200 new residents. The strategy unpacks the drivers of housing choice based on extensive community engagement anc maps the location, distribution and projected yield of housing in districts identified around the town. The areas for new housing are identified in the report on page 75 with the land holdings for *Forbesview* shown as precincts 5, 6, and 10 (as shown).

Supply drivers include:

- Migration to Forbes by seasonal workers,
- Tree changers from city to regional migration seeking more affordable higher quality of life,
- Increasing employment and business opportunities.

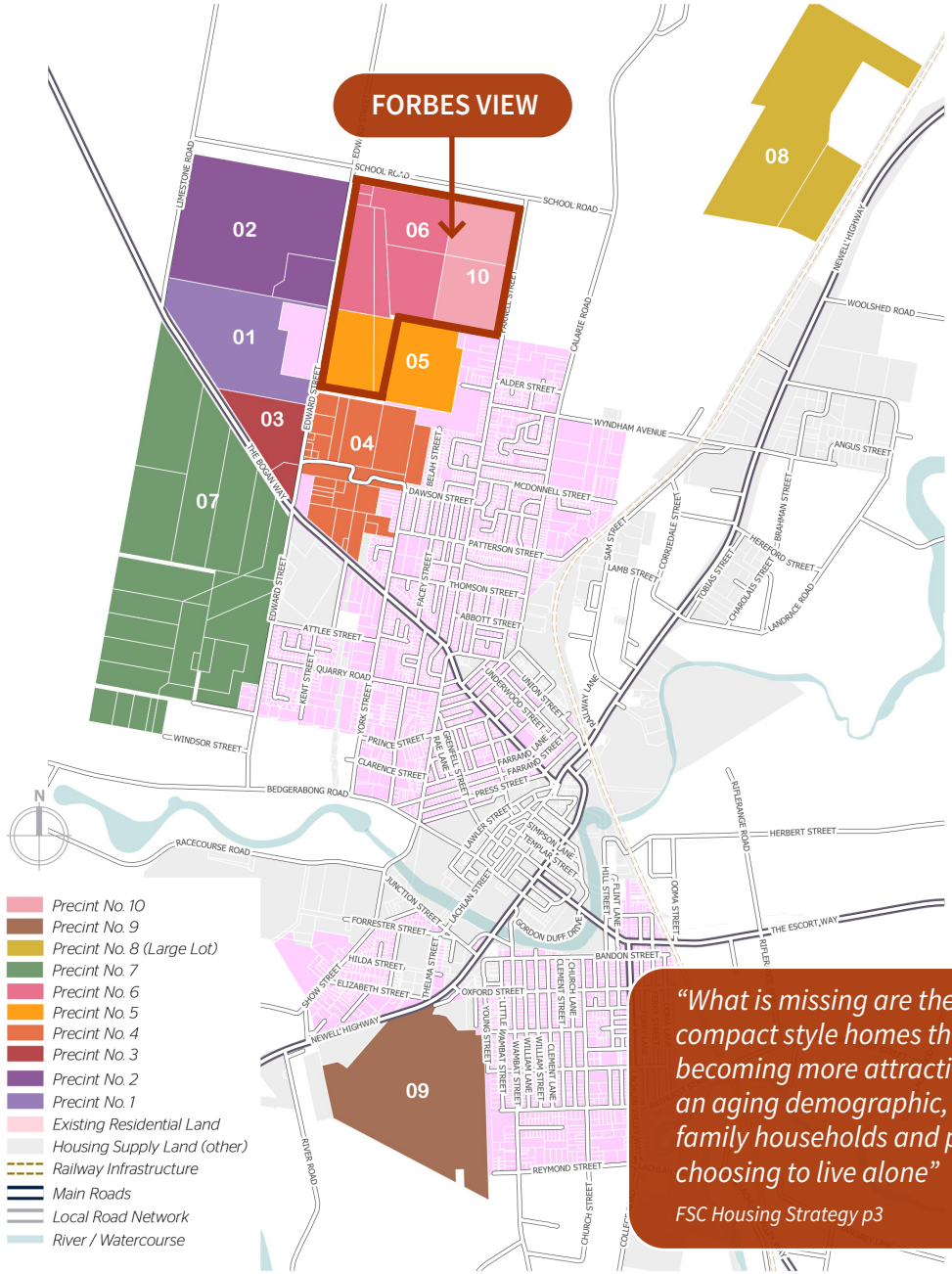
Challenges include:

- As per FSC community consultation, local residents prefer larger lots in contrast to the growing demographic of smaller households,
- The contraction of household size
- Aging population wanting to age in place,
- Housing approvals not keeping up with demand.

Strategy directions impacting design:

- Strengthen connections
- Increase housing choice
- Create resilient neighbourhoods
- Show leadership.

The detail of the housing strategy illustrates an approach predicated on connected open spaces, connection with water, and the adoption of regular and larger sized lots. In response the reference designs do not go far enough in providing a greater choice and diversity of housing product and lot sizes, something that should be revisited to align better with declared strategic directions.



"What is missing are the more compact style homes that are becoming more attractive to an aging demographic, smaller family households and people choosing to live alone"

FSC Housing Strategy p3

2.5 SUMMARY - DESIGN DRIVERS AND INFLUENCES

Regional and economic drivers

Investment in the region will stimulate economic activity. The full benefit of the investment will not be realised in the short terms but will continue to grow as regional infrastructure investment continues to grow. Our changing economy and the emergence of new industries in resource recovery and value adding food processing will be among a growing and diversified regional economy. This will lead to an increase in the regional demand for housing of which Forbes will play a part.

Housing demand and choice

Natural population increase will stimulate a level of housing demand. 30% of the Forbes population will be over 60 by 2041 requiring greater housing choice suited to aging in place. Similarly household size contraction will stimulate growth across parts of the market which are currently not well served by existing housing stock in Forbes.

Prosperity and a great place to live

Local economic growth is tied to the prosperity of the region alongside specific local contextual influences such as tourism and events and a favourable perception as an affordable, safe, and relaxed place to live. Access to good outdoor amenity and public space associated with water will continue to characterise the uniquely Forbes sense of place.

Community and culture

Opportunities to expand on or attach to the program of cultural events programmed in the town. This may be in the development of an art overlay and setting up spaces for event based cultural and memorial activities.

Community resilience is in part driven by improving the robustness of infrastructure on the one hand, and the strengthening of community connection and the support networks that arise from that. A focus on community through the creation of settings that promote coming together and getting citizens out into the community and not in their cars.

Connected communities

Walk-able neighbourhoods are critical to achieving this aim. Having day to day amenity close at hand that is safe, pleasant, and more convenient to access on foot will encourage public space activation and passive community engagement and recognition.

Walk-able networks within the community must connect to the wider network of shared pathways through Forbes, to provide an safe an easy cycle connection into town and longer recreation routes around Lake Forbes.

Climate and Landscape

The climate is changing and there will be seasons of unreliable rainfall. In those instances there will be periods where water flow across the neighbourhood will be small with the risk of smaller water bodies drying up. The aesthetic of dry water courses and seasonal shrinking water bodies needs to be considered.

Equally the prevalence of larger rain events will require consideration relating to water retention and treatment.

Tree and low level shrub and grass selection needs to tolerate periods of dry. Water management must consider how to store water in smaller more sustainable bodies to maintain the amenity of public space whilst allowing storm water runoff management.

Resilience

Town wide resilience can be further enhanced by establishing a secondary neighbourhood retail and services hub that connects the northern side of Forbes and serves as an important hub during major flood events when the centre of town may be isolated.

A landscape focused sense of place

Whilst protecting any remnant places of cultural significance, design for country focuses our attention to working with natural water flows, terrain, orientation, and celebration of landscape elements. Focus on key landforms can generate a focus for the community and help generate a landscape focused sense of place.

OVERVIEW - THE SITE

The following chapter provides an insight to the background physical factors impacting site development. Initial research indicates that the site characteristics are favourable for development and that issues of terrain, overland water flow, biodiversity, and climate resilience and able to be managed cost effectively without specialist strategies.

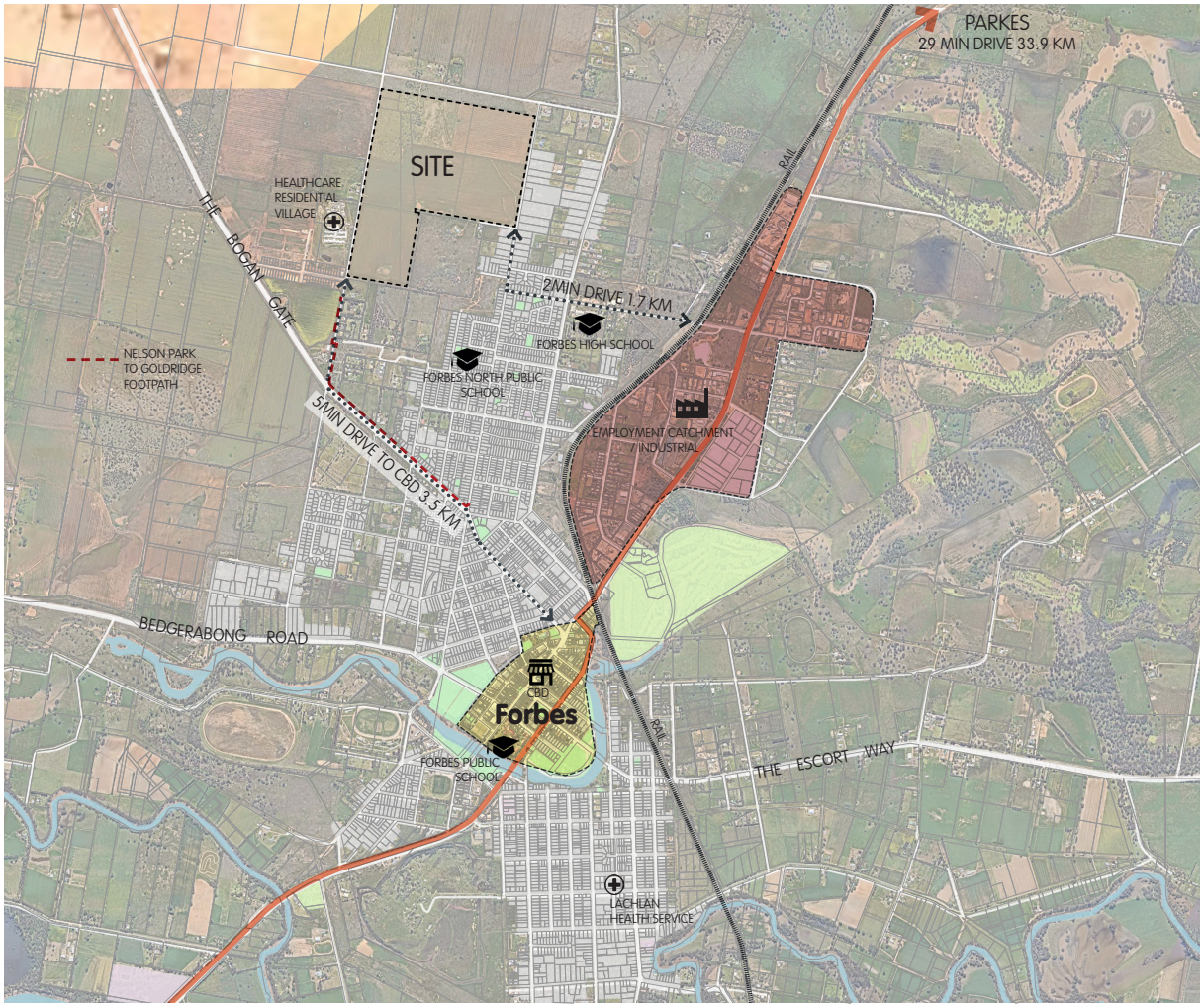
3. THE SITE

Site view looking from Edward Street looking east

3.0 **SITE LOCATION**

The site for *Forbesview* is located to the north west of the town centre. There is a new a residential subdivision and retirement village to the west of the site along Edward Street. Existing large lot suburban development is situated to the south and east with farmland to the north. The site is not impacted by flooding. In addition to adjacent housing the site has:

- 2 schools within walking distance,
- is well connected to enterprise and business areas to the north east of Forbes,
- has easy access to the Newell highway heading north to Parkes,
- will be connected to the town centre by a shared use pathway that is in final stages of design with immanent delivery by the Forbes Shire Council,
- it is at the high point of town fringe, offering great views and an important centre to build Forbes' resilience from future flooding.



Project Site Plan with surrounding context

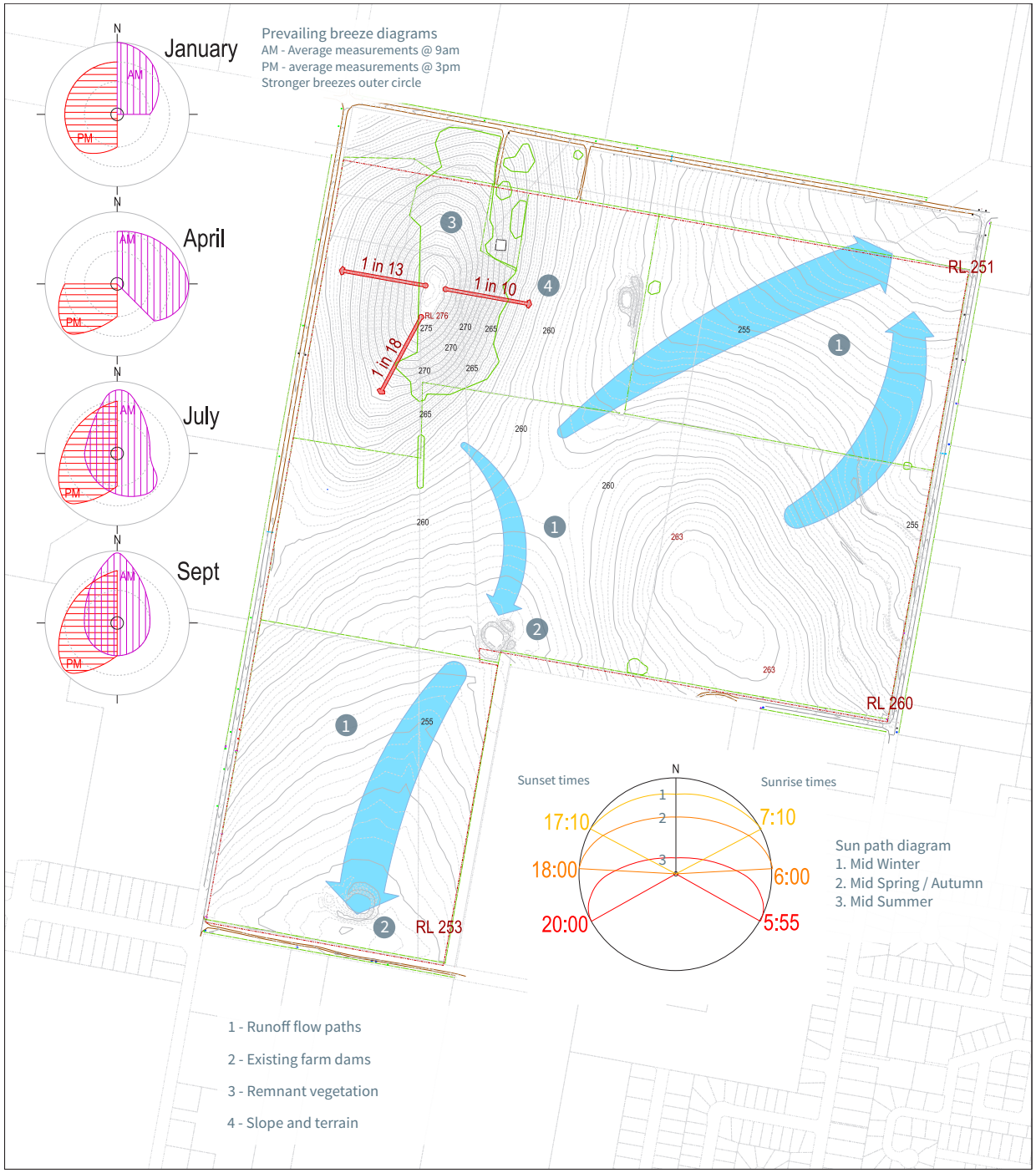
3.1 SITE PHYSICAL CHARACTERISTICS

Currently the site is used for farming. The ground has been well cultivated over time with only a small amount of remnant habitat vegetation remaining, mainly on the top of the hill.

The site slopes are manageable for subdivision and assuming the lot and street layouts work with the terrain, that is streets running perpendicular to slopes with house lots running parallel to slopes, then the cut fill impact to site can be relatively easily managed. Some steeper sides of the hill will present a more challenging cut fill profile with some retaining possibly needed pending the final lot size.

Overland flow and storm water runoff is clearly defined on site and evidenced through the existing land profiling and location of farm dams. Early advice from hydrology engineers indicate that the volume of water flow is not significant as the catchment area is relatively small and contained within the lot.

Prevailing seasonal wind directions and sun path diagrams are shown. To note there is high daily variability in breezes. The impact to planning will be focused more on detailed stages, with landscape strategies focusing on providing some wind breaks, especially from the west where open farmland does not provide much protection. The impact to lot orientation may be a consideration, however the relationship between slope, lot alignment, and frontage at first glance seems to offer a good confluence of circumstances.



3.2 **SITE VIEWS**



Site views from the ground: Cypress Lane and Farnell Streets. Providing a general feel of the slope of the terrain and views to the site high point.













3.2 SITE VIEWS



Site views from the ground: Edward Street and Morton Street. Views to new housing estate and retirement village and views to site high point.





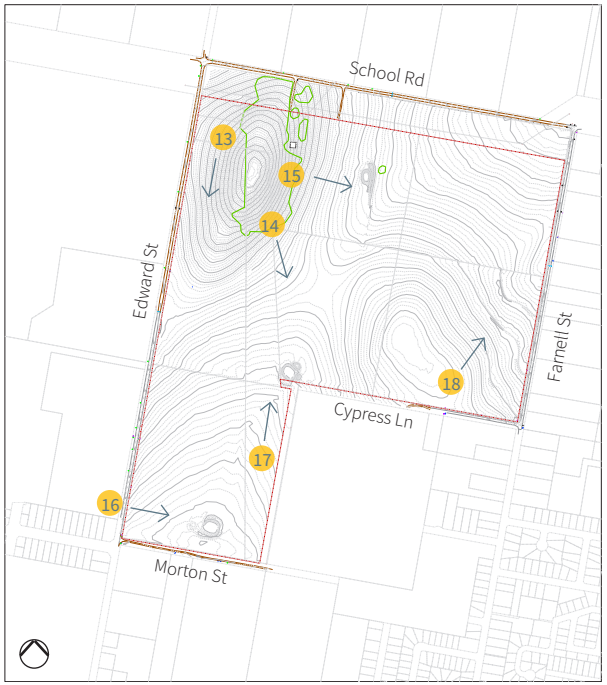








3.2 **SITE VIEWS**



Site views from a drone: General overview to distant views, relationship with Forbes town centre and site dams.















HATCH | RobertsDay

OVERVIEW - VISION AND DESIGN PRINCIPLES

The elements of a great master plan are built on a combination of understanding of the site circumstance, architectural heritage, social and cultural factors that underpin community overlaid with universal themes of good community building that value walk-ability, access to open space, active streetscapes, and opportunities for social connection.

The Forbes Vision document was prepared to collate these factors to understand how the form and shape of the master plan may emerge. Presenting the vision to council provided the opportunity to reveal any obvious blind spots in the research that benefit from local knowledge as well as providing a sounding for early design ideas.

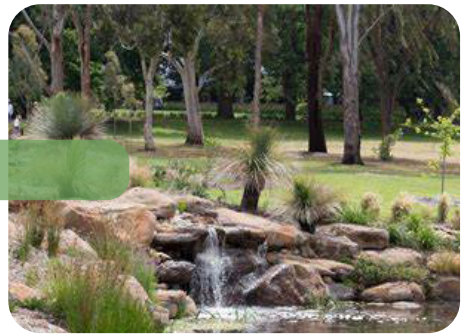
4. VISION + DESIGN PRINCIPLES

4.0 **VISION**

Forbesview is building on strong foundations of regional lifestyle opportunities, connection to nature and cultural identity.

Forbesview will enhance its latent potential by providing housing options that are affordable, walkable neighbourhoods that benefits both new and surrounding community, lifestyle opportunities that offer a point of difference, understanding of the rich cultural and creative place identity.

CONNECTION TO NATURE





WALKABLE NEIGHBOURHOODS

LOCAL CULTURAL IDENTITY





HOUSING CHOICE

CREATING PARTNERSHIPS



Images: kakdutours.com; visitnsw.com; australiayourway.com; propertmash.com; conexpoconagg.com

4.1 CONNECTION TO NATURE

- **Nature all around-** A focus on landscape is an important part of the design of new communities. Just like master landscape painters, we need to consider the landscape at the perspective of the foreground, middle ground, and background. Attention to the design of the thresholds, strategic street trees and providing a view situate thinking about landscape within a rigorous conceptual framework.

- **Town and country -** The site is positioned between town and country, offering a quiet and convivial context with distant views, but with high quality amenity and convenience.

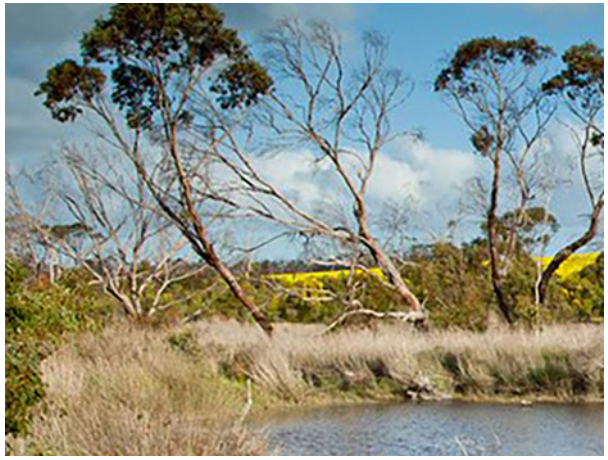
- **Connected water nodes -** Water is an essential element of the regional Australian psyche. It is an ingrained essence of place and fundamental to ecological health and survival. Celebrating water and recognising its modes and capacities provides place making opportunities . Whether they are tuning our public spaces to connected chain of ponds, water sensitive design elements that manage seasonal water flows or celebrating the infrastructure of water, all of these aspects offer important community touch points.



Protecting landscape views



Trees at axis points



Relaxed ornamental ponds



Seasonal flow riparian corridors

4.2 WALKABLE NEIGHBOURHOODS

- **10 minute neighbourhoods** - all amenity and green public space within a 10 minute walking distance of all residents
- **Traffic Safety -** traffic calming devices and pedestrian environment promotes safety on the streets attracting families and elderly investors.
- **Eyes on the street -** Housing frontages looking toward street with allowance for frontage such as porches and/or front gardens to the street promotes ‘eyes on the street’ allowing residents to feel safe.
- **Locality of housing product -** A mix of housing product around central zones of the new community provides good passive surveillance, housing choice, and delivers a product mix that fits with the character of Forbes.
- **Concentration of shared pathways -** active connections will allow for point to point walking and walking for leisure, connecting residents to amenities easily. Promotion of e-mobility will provide residents opportunities to help with active lifestyle that has proven benefits to physical, social and mental health particularly relevant for regional communities typically in more isolated neighbourhoods lacking active access.



Concentration on shared pathways through neighbourhood heart



Cargo bikes for short trips (Lug+Carrie Australia)



Walking for leisure



Personal “final mile” electric scooters

4.3 LOCAL CULTURAL IDENTITY

- **Rich architectural identity -** Forbes is a small town that is big on character and timeless quality built heritage. The town has lovely compact public spaces and elegant buildings that positively address the public domain.
- **Connection with arts and culture -** Regional large scale infrastructure provides opportunities for civic expression and creativity in the regions. Be they painted grain silos, a sound installation for visiting artists, or cultural celebrations projected onto buildings and structures. The proposed hilltop water tower has potential as an artistic and architectural landmark.
- **Quality civic character and compact public spaces -** A creative heart, focus on public art, supporting artists, building local pride, and engaging visitors.



Forbes Hospital



Character Housing South Forbes





Victoria Park (above) and public art (right)

4.4 HOUSING OPTIONS

- **Affordability** - Expanding choice and introducing new product contingent on careful market sounding and community acceptance.
- **Elegant design -** Design guidelines and quality display houses will demonstrate what is possible in Forbes and the value of good design.
- **Integrated energy in design -** Sustainability does not compromise quality. We look after the things we love and this translates to care for the houses we build and how they contribute to the quality of our neighbourhoods.
- **Housing pathway -** A mix of housing product to address housing needs at various stages of life at various points on the housing spectrum.

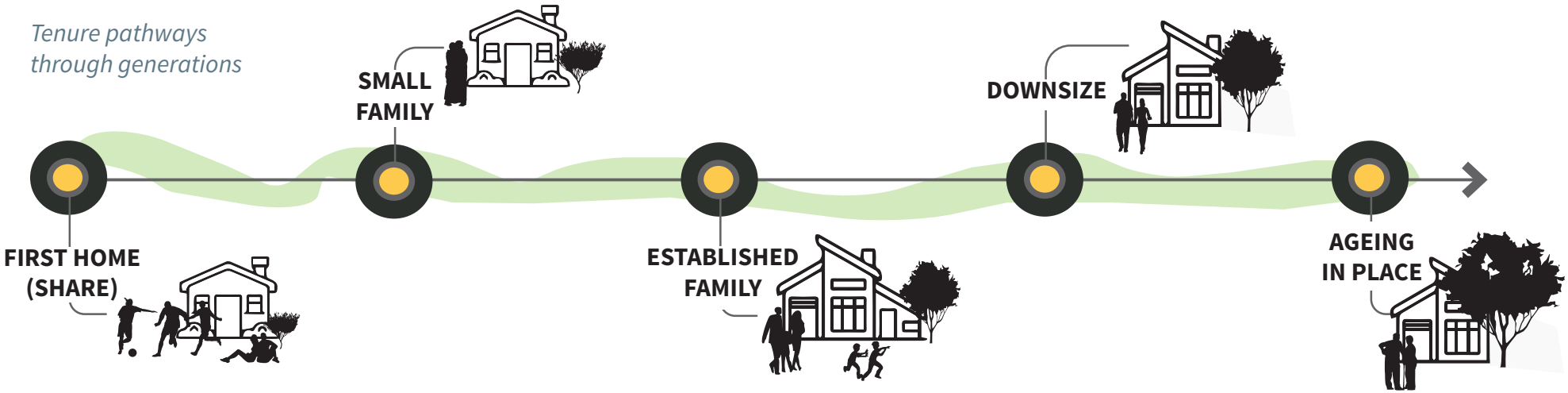


Choice and gentle density



Timeless elegant design

Tenure pathways through generations



4.5 CREATING PARTNERSHIPS

- **Working collaboratively** - Working in partnership with local contractors, *Forbesview* is committed to streamlining house delivery. Selling as house + land will accelerate the market uptake of housing.
- **Modern methods of construction -** Varying levels of prefabrication are already improving the speed and cost effectiveness of house delivery. Expansion of MMC into the regions will help overcome labour shortages and improve house quality.
- **Working collaboratively** - Advocating for enhanced levels of environmental performance using materials that are appropriate to the regional climate. Natural mass based materials and the novel use of timber can enhance aesthetics and performance.



Local delivery



Modern methods of construction



Partnerships



Sustainable materials

4.6 PRIMARY ELEMENTS

1. High point to the north west corner: views and water tower location,

2. Consistent and manageable slope to the south and east,

3. Gentle drainage gullies channel seasonal water flow to several established small dams on site,

4. Adjacent to new estate and retirement community.

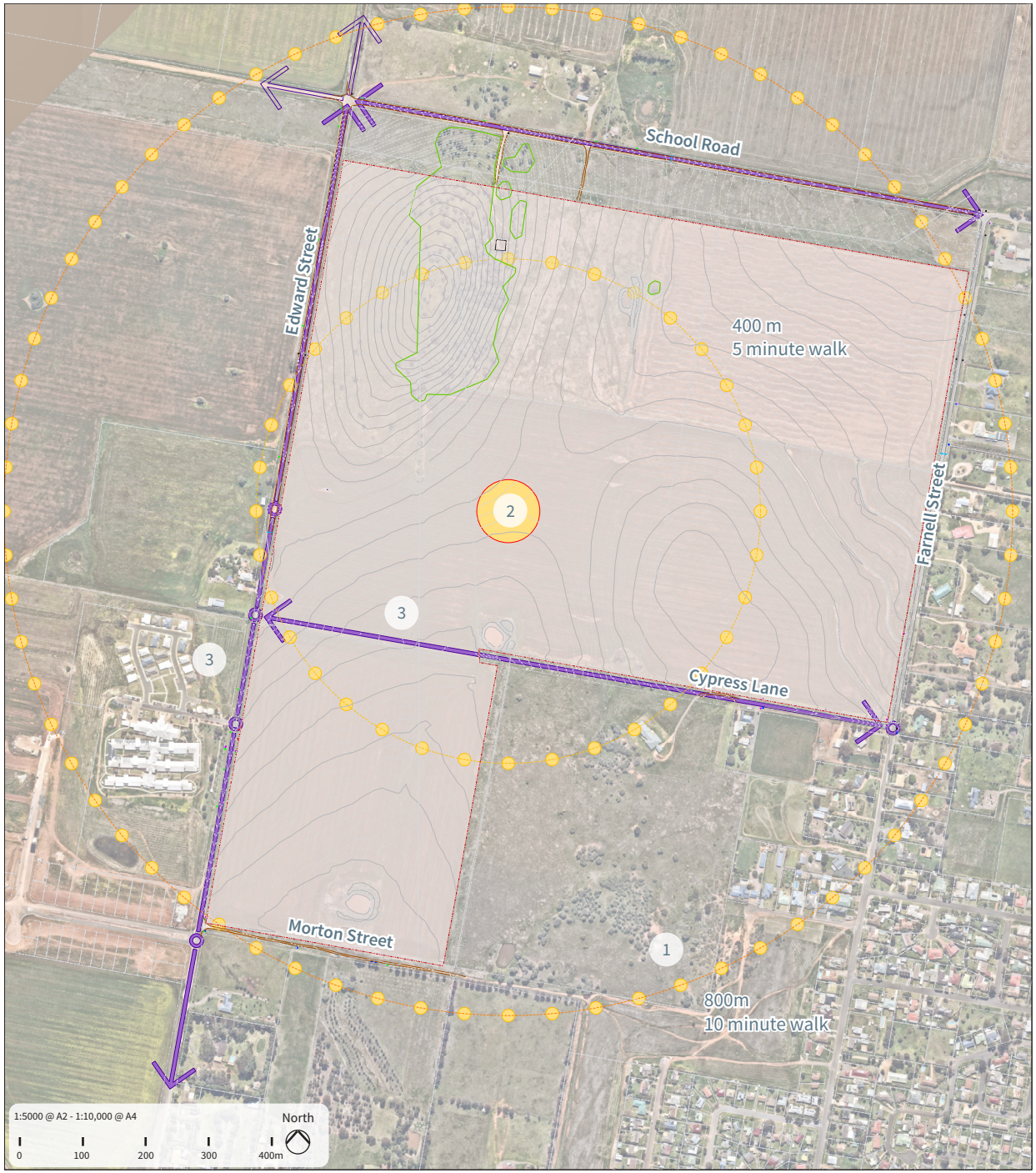


4.7 **CONNECTIONS**

1. Walk-able catchment

2. Centre of walk-able catchment along a flatter saddle on the site,

3. Primary linkages along Edward Street and Cypress Lane.



4.8 CONNECTED NODES

Connected Nodes

Building on latent elements:

1. Water (dams) - chain of ponds,

2. Plateaus and saddles for open space,

3. The view,

4. Open space active pathway connections between.



4.9 GROWTH AND PRECINCTS

Growth and staging

1. Centre of gravity focused on corner of Edward and Morton Streets,

2. Building onto communities currently under development,

3. Emerging centre of growth focused towards the centre of the walk-able catchment and Edward Street frontage.



Council feedback: 21.07.23

- Forbes Shire Council (FSC) are a proactive organisation that act in the capacity of local authorities as well as developers. They understand the technical aspects of delivery very well.
- They acknowledged that slow housing development was attributed to contractor bottlenecks. Selling product as house and land packages was seen as beneficial.
- FSC were supportive of the proposed masterplan design structuring elements,
- Discussion around the variety of housing product resonated and aligned with the *Forbes Housing Strategy*,
- The focus on the walk-able catchment was welcomed,
- The neighbourhood centre needed to be scaled to avoid competition with the town centre. Consider the inclusion of a child care centre,

4.5 FIRST ITERATION MASTERPLAN

Following our presentation of the *Forbesview - Vision Document* to FSC on the 21.07.23, we presented a first iteration master plan via an online meeting on 18.08.23. In principle the primary elements of the master plan that built from the *Vision Document* comprises:

1. Neighbourhood centre at the heart of the walk-able catchment,
2. Chain of ponds as a focus for public outdoor space and manage water runoff,
3. A green spine with a shared pathway running along its length,
4. Stage 1 visitors centre and cafe,
5. Public open recreation spaces,
6. Hilltop park preserving remnant landscape with high biodiversity value and providing an outlook point for the town,
7. New boulevard and walk-able street,
8. New entry boulevard with curved route to slow down traffic and reveal vista to ornamental water body,
9. Smaller lot housing providing housing choice,
10. Opportunity for town house style development,
11. Lots that work with the terrain to minimise cut platforms and provide views. Lot depths are generally consistent to provide scope to adjust frontages as the design evolves,
12. Layout that accommodates future neighbourhood expansion on adjacent lots.



Council feedback

- There was a positive response to the plan,
- Forbes is ready for smaller lot size and laneways,
- Though 800m2 is a typical Forbes lot, there was a suggestion to market sound with local agents,
- The townhouse typology aligns with Forbes draft housing strategy.
- Consider gym and allied health to neighbourhood centre,
- Support for stormwater detention as a community feature. Notes that the capacity of detention needs to be checked,
- Consideration to the wider network of pedestrian pathways through the neighbourhood.



OVERVIEW - MASTERPLAN

Forbesview will be an important new master planned community that will accommodate a lot of the projected growth to 2041. The preparation of the plan is the product of considered evaluation of the policy settings, incorporating the values of the setting, working through an iterative process with council and consultants to arrive at a design that will leave a positive legacy for the town.

The masterplan is based around several key principles:

- Creating a walk-able neighbourhood,
- Enhancing community connection,
- Establishing vistas and enhancing connection to landscape and place.
- Creating a green spine at the community heart,
- Providing choice and diversity of housing,
- Providing community amenity and infrastructure at the heart of the community,
- Preserving the natural qualities and remnant habitat on site.

5. MASTERPLAN

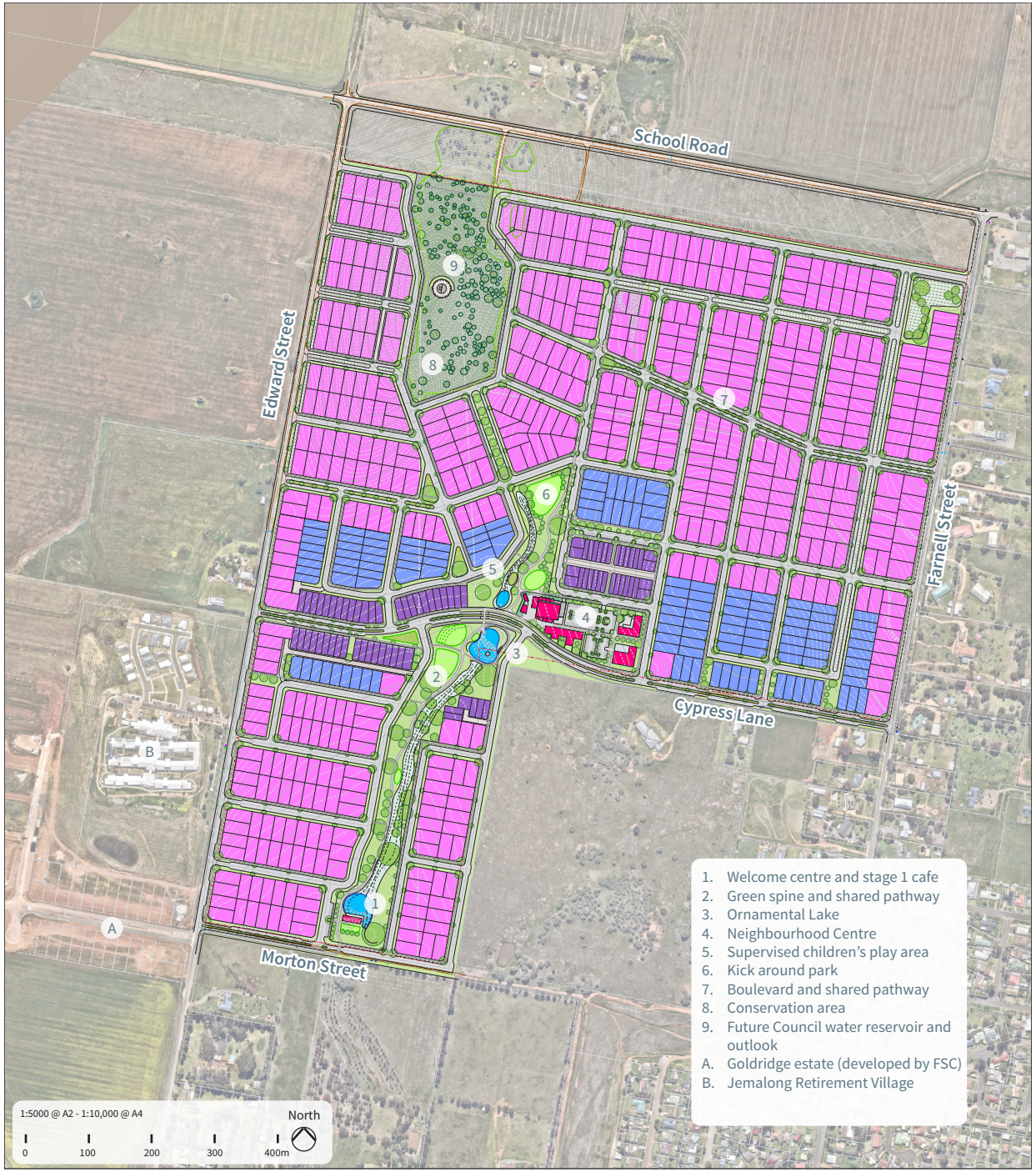
5.0 **MASTERPLAN**

The proposed masterplan consolidates the thinking carried through the vision document and draft master plan. This is a master planned community that draws together elements that are unique to the location into a plan that is focused on creating meaningful connections between residents in a thoughtfully conceived landscape.

The key aspect of the plan is the focus on walk-ability. A central green spine consolidates the open space network with a shared path network and a neighbourhood centre strategically positioned at the centre of the 10 minute walk-able catchment. The green spine realises the vision set out in the *Forbes Housing Strategy* and to create a future pathway connecting town expansion to Forbes Lake.

The green spine extends to a nature reserve at the top of the hill, providing an outlook point, nature trails, conservation area, and a location for a future council water reservoir. The tower will provide another canvas for community focused artworks as will become a destination for Forbes and the surrounding region.

Housing choice is enabled through a diversity of housing lot sizes, increasing choice in the local housing market. Smaller lots are distributed close to the heart of the community, the green spine, and neighbourhood centre. It will provide a housing product attractive to residents seeking more affordable compact living space with opportunities for community interaction.



5.1 ELEMENTS

Though there are many small moves to enhance street activation and community focus, the master plan has 8 key elements underpinning its design.

1. Connection and walk-ability. The neighbourhood is designed around a 10 minute walk-able catchment.

2. The neighbourhood centre will provide the daily needs to the emerging neighbourhood and complement the offer of the main town. Being outside of the flood zone, it will provide a supply point when the main town is impacted by flooding.

3. The east west central boulevard will create a memorable civic entry and establish a urban vista across an ornamental water body at the heart of the neighbourhood.

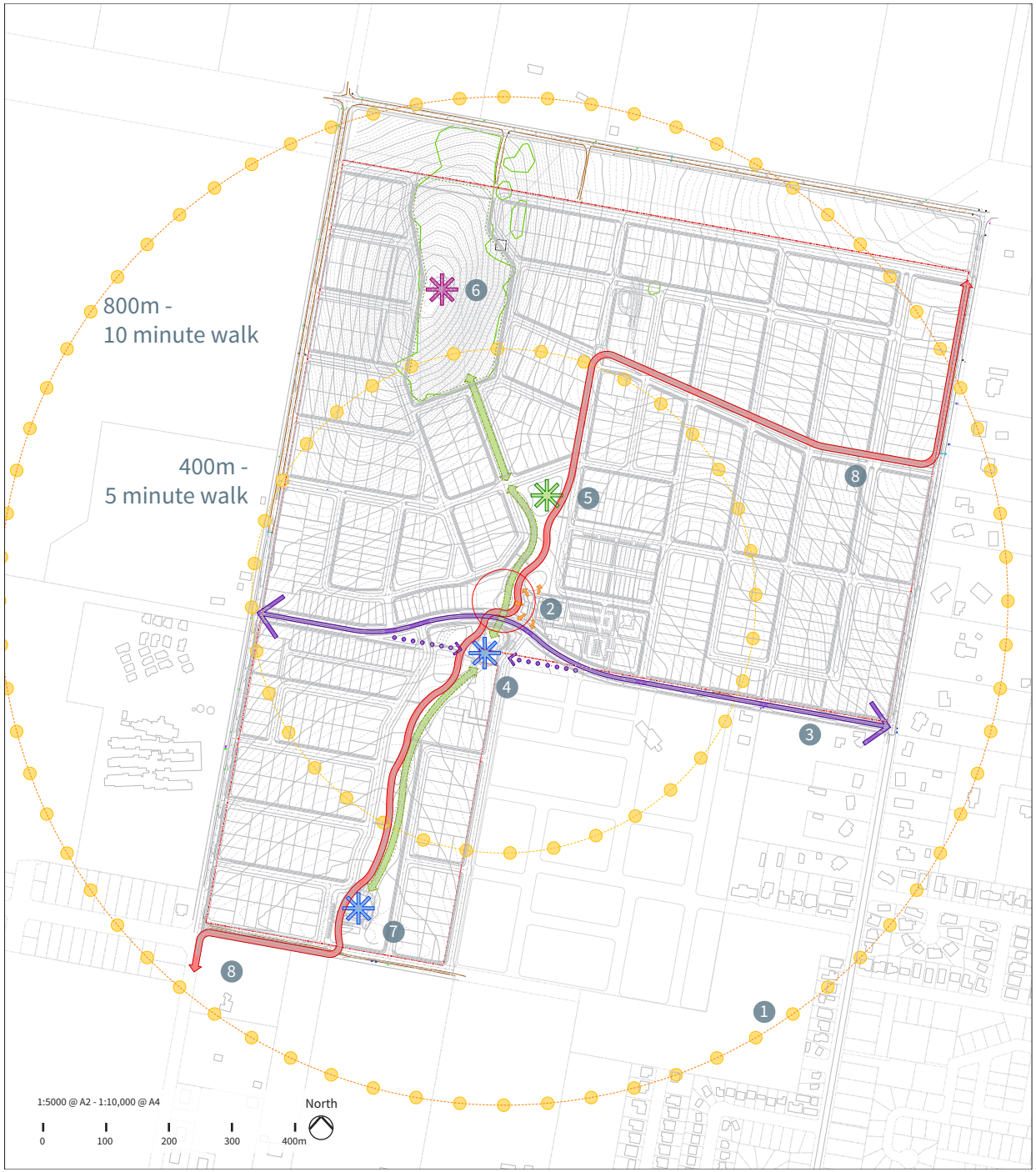
4. Ornamental water bodies will provide public space amenity, storm water management and the opportunity for public art to continue the town's tradition of public sculpture.

5. Outdoor play spaces that are connected to a wider network of green connections and central to the neighbourhood.

6. The prospect from the highest point of the site.

7. A welcome centre and cafe, providing amenity for communities along Edward Street.

8. A north-south shared pathway link, unifying the neighbourhood and integrated with council pathways into the town centre



5.2 **ZONING**

The predominant use is designated residential. All residential land is conveniently located within walking distance to open green space. The neighbourhood centre land is located at the heart of the 10 minute walk-able catchment.

The area of public road reserve along Cypress Lane, Morton Street, and the reserve running in parallel and midway between Edward and Farnell Streets are included in the residential use zoning.



5.3 **BUILDING HEIGHT**

Building heights are appropriately tailored to the land uses previously described.



5.4 PUBLIC LAND DEDICATION

Land designed as public open space will be dedicated to public ownership.



5.5 MINIMUM LOT SIZE

The proposed master plan delivers diversity and flexibility of lot sizes to meet the objectives of the *Forbes Housing Strategy*, by providing greater housing choice and affordability. The design strategy has been to maintain a generally consistent block depth with the flexibility to vary frontages. This provides the opportunity to tailor development through the various staging to fine tune the final lot sizes to market demand.

Smaller lots are concentrated around the green spine and neighbourhood centre, helping to provide a concentration of activity and civic character to the heart of the neighbourhood.

We recognise that the current nominated minimum lot size in Forbes is 550m^2. Through direct consultation and collaboration with council the proposed master plan proposes lot sizes from 250m^2. Lots sizes below 600m^2 comprise just over a quarter of the proposed lots which is a measured introduction of smaller lots to Forbes. Bringing smaller lots to the market as house and land packages will improve market acceptance and improve market adoption of small lots for the added convenience, access to amenity and improved affordability.



5.6 STREET AND CONNECTIONS

The proposed network of streets has been developed to provide clear way-finding and place making identity. There is a hierarchy of four street types proposed in addition to the shared pedestrian cycleway and footpath running through the heart of the neighbourhood.

The shared pathway runs along the green spine landscaped areas, adjacent to front facing housing to provide good access and passive surveillance. The shared pathway limits the number of road crossings and driveway cross overs. Where the shared pathway crosses roadways it is done in locations with good vehicle visibility and slow traffic speed.

Proposed boulevards will become part of the network of memorable Forbes streetscapes with pleasant pedestrian routes and generous street trees. Primary and secondary routes are set out in a logical hierarchy to distribute traffic through the neighbourhood in a logical way. Traffic studies in future stages of development will refine the street hierarchy and required intersection geometries. The designed road reserves conform with the standards set by The Forbes Shire Council with 17m, 18m, and 20m wide reserves including extensive footpaths.

A future site specific DCP will be developed to ensure identity and sense of place are maintained within the context of the master planned community and as a result road reserve standards may change.

A number of lane ways are provided to enable street address per the master plan intentions, to provide front facing housing along boulevards without crossovers. Rear lanes are common within established areas of SW Forbes and this proposal is continuing that language.



5.7 **PRECINCTS**

The master plan precincts are identifiable regions that articulate unique characteristics of the various parts of the new master planned community. Loosely defined the precincts can be characterised as follows:

A: Southern
Expanding on Goldridge Estate and Jemalong retirement community. Providing amenity to these communities and building on the critical mass of existing development.

B: Central
Defined by smaller lot housing and gentle density and activation around the neighbourhood centre.

C: Hilltop
A residential area that extends the character of the sloping land to open views and respect the habitat reserve. The potential for community art and activation associated with the water tower.

D: Eastern
Larger lots connected with Farnell Street with streets and vistas to the hilltop and green spine.

E: Northern
A precinct defined by its proximity to open landscape views.

The precincts will inform indicative staging to some degree, subject to more detailed design development and understanding of the delivery of service infrastructure. The assumption at this stage is that the project will be delivered in 30 lot stages, resulting in approximately 24 stages to final completion.



5.8 **LANDSCAPE**

A continual green spine connects the northern and southern edges of the master planned community. Opportunities are created for active recreation and passive nature spaces for relaxation. A shared pedestrian and cycle pathway runs through the green spine providing safe, pleasant, and direct connections through the heart of the walk-able community.

The green spine provides a continuous biodiversity corridor that connects to the habitat reserve at the top of the hill. The concentrated landscape ribbon provides habitat for local wildlife: insect, birds, and small animals in addition to diversifying and building on local flora and trees.

Special landscaped boulevards set up vistas to landscape elements with shade trees and a pleasant walk-able environment. The boulevards provide an identity to the community at key entry points and will become part of the network of memorable Forbes streets.



5.8 LANDSCAPE

The design of the green spine landscape must account for the capacity of the planting to cope with extended periods of dry appropriate to the place and climate. Like most inland Australia creek and river systems, there will be periods where the creek bed will be dry and must present attractively in all conditions. Ensuring that subsurface water is preserved as much as possible will be important to sustaining plantings.

Exploring dry creek beds and the fringes of water courses provides great nature play opportunities that invite exploration. Elements of fallen logs and other habitat hides also provide opportunity for nesting and protection of local fauna.



Formal feathered edges

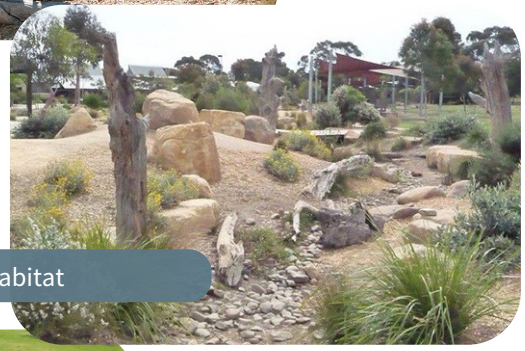


Nature play



Managed water flow and level





Habitat



Structured + nature play



5.9 **WATER**

The volume of water to be managed running across the site is not significant. There are clearly defined overland flow paths that the master plan accommodates as part of the green spine and street-scape treatments. Water runoff will be managed and treated within the site boundary to minimise impacts to the surrounding catchment.

A major north to south corridor manages hilltop runoff to the south. The location of ornamental lakes and ponds is roughly in similar locations to existing farm dams to work with existing flow paths.

Overland flow on the western side of the hilltop is managed through centre verge water sensitive urban design strategies.

Flow paths to the east and north are managed through the street network that works with the general fall of the land and is captured and managed through two major water sensitive urban design strategies along the central street verge. The captured water is directed to a detention basin located to the low point at the north eastern corner of the site.

We are cognisant of the variability of seasonal water flow and will develop landscapes that respond accordingly in subsequent design stages. Additional commentary describing the technical specifications of the overland flow management is contained in companion consultant reports.

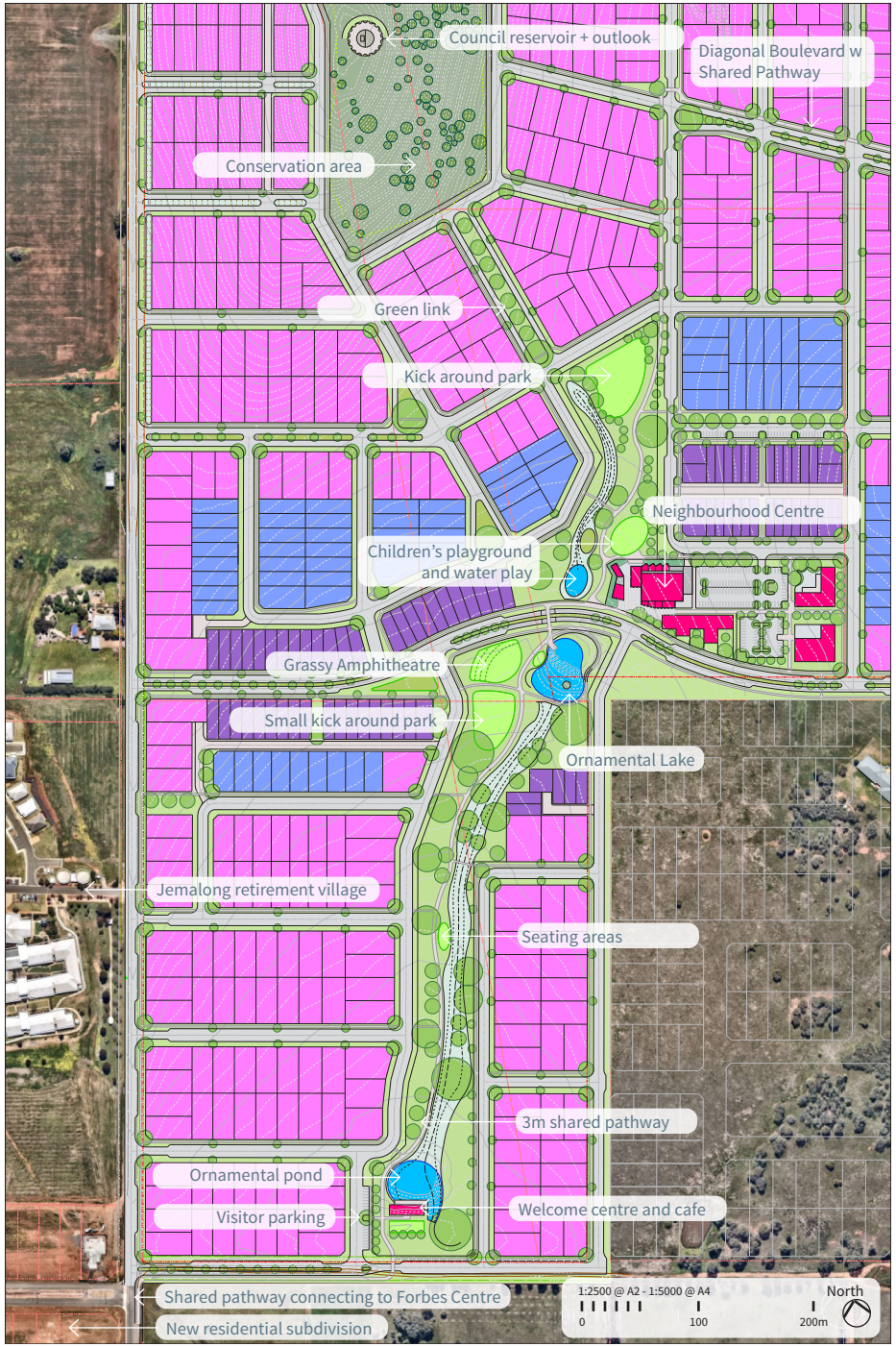


5.10 **GREEN SPINE**

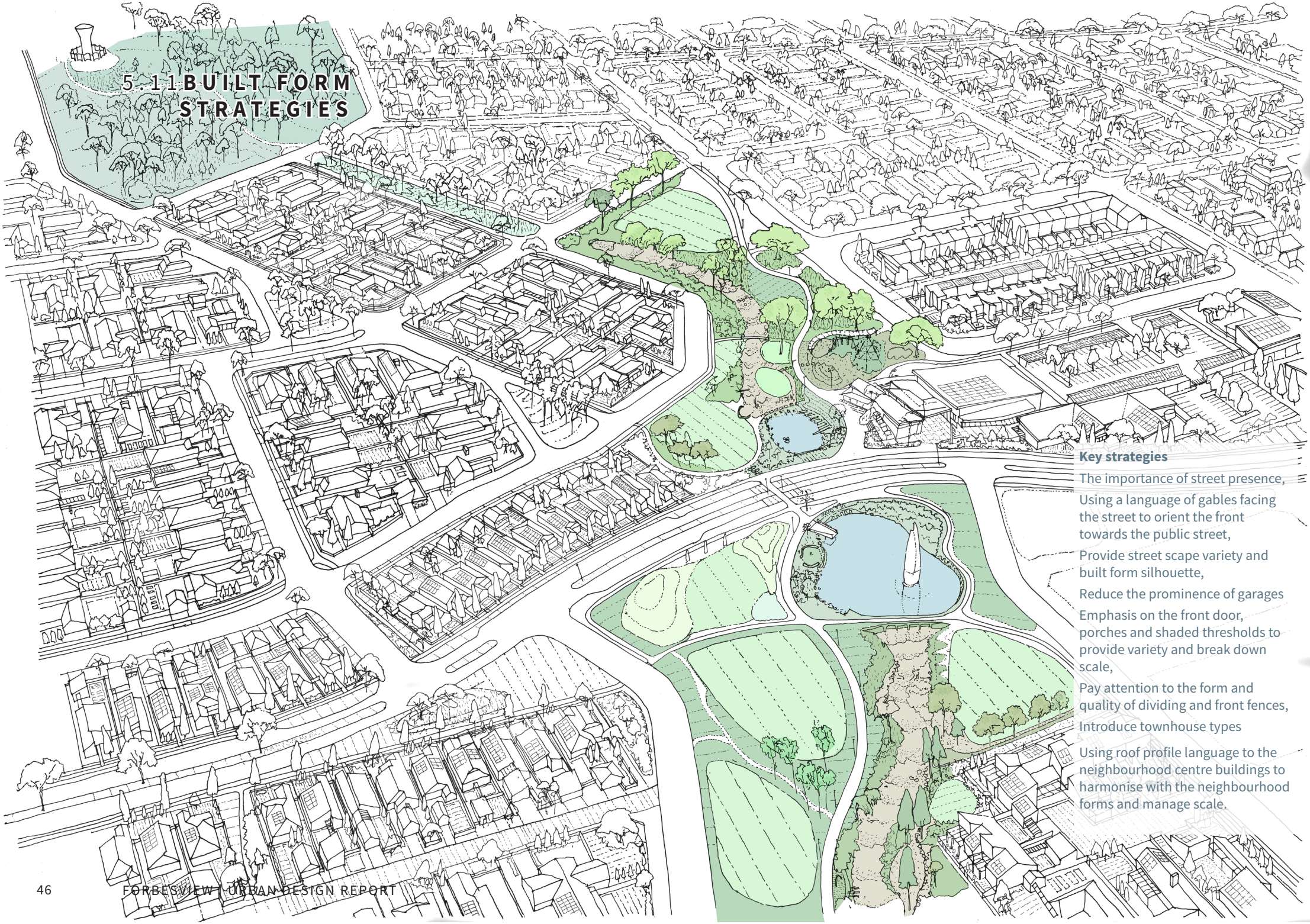
The green spine brings together all the natural and social elements of the master planned community. The concentration of elements provides a level of activation and enhanced community connection.

The green spine provides a variety of passive and active recreation opportunities for kids, young adults and families. The neighbourhood centre provides the everyday needs to local residents within walking distance along the car free shared pathway connecting the green spine.

Central to the Cypress Lane Boulevard is an ornamental lake on axis with the roadway at the main entry points to the community. There is an opportunity to expand the Forbes art trail to a lake location with the potential to use lighting and other ephemeral elements to celebrate annual cultural events (memorial days, Christmas, and other cultural holidays)



5.11 BUILT FORM STRATEGIES



Key strategies

The importance of street presence,

Using a language of gables facing the street to orient the front towards the public street,

Provide street scape variety and built form silhouette,

Reduce the prominence of garages

Emphasis on the front door, porches and shaded thresholds to provide variety and break down scale,

Pay attention to the form and quality of dividing and front fences,

Introduce townhouse types

Using roof profile language to the neighbourhood centre buildings to harmonise with the neighbourhood forms and manage scale.

5.12 SUMMARY

Forbesview promises to be a positive addition to Forbes, accommodating over half of the projected population growth to 2041. It will be a master planned community that fulfils the strategic directions established by The Forbes Shire Council. It is a plan that respects and builds on the latent characteristics of the natural characteristics of the site.

To summarise the guiding design principles:

- Creating a walk-able neighbourhood,
- Enhancing community connection,
- Establishing vistas and enhancing connection to landscape and place.
- Creating a green spine at the community heart,
- Providing choice and diversity of housing,
- Providing community amenity and infrastructure at the heart of the community,
- Preserving the natural qualities.

The team behind *Forbesview* are confident in the economic growth of the region that will be realised once infrastructure works are completed and the full investment flows through. Forbes is central to a wide range of economic opportunities within a 30 minute easy commute. This in combination with a relaxed affordable lifestyle offered by Forbes will increase the attractiveness of the town.

Design strategies will enhance the natural attributes of the site, transforming farmland into a series of connected green open spaces at the heart of the community. Overland flow will managed to create a series of ornamental water bodies as a feature of the open space design. A conservation area at the hilltop with a green connection linking open space through the whole community.

The site is a walk-able catchment, with all corners of the site within an easy 10 minute walk to the heart of the community. A small neighbourhood centre will provide the everyday essentials in addition to some community facilities that may comprise a child care centre and allied health.

Walk-ability is enhanced through a network of shared cycle and pedestrian pathways linking through the green spine heart of the community. The pathways provide a direct, safe, and pleasant way of moving through the community. The pathway networks connect into the wider network of pathways connecting to Forbes town centre and wider networks around Forbes Lake.

At the heart of the walk-able catchment the proposal for small lot gentle density housing will address the aims of the Forbes Housing Strategy and provide a choice in the Forbes market attractive to smaller and aging / downsizer households.

All design elements have come together in balanced and holistic manner. The elements are in balance and create a pleasant and distinctive sense of place appropriate to Forbes.



for | Forbesview Pty Ltd

Appendix 3 - Preliminary Site Investigation

Sydney Environmental Group

Stage 1 - Preliminary Site Investigation

Lots 375, 376, 386-389, 830, 831, 1272 & 1273
DP 750158, School Road, Forbes NSW

ForbesView Pty Ltd (c/- Allera)

Report No: 2116-ACA-01-250723.v3f
Report Date: 29 September 2023



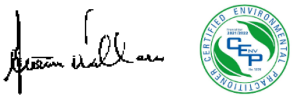
Sydney Environmental Group Pty Ltd PO Box A1420, Sydney South NSW

Info@sydneyenvironmental.com.au

NOTICE: The information in this report is privileged and confidential, intended only for the use of the client above. This publication may not, therefore, be lent, copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form without the express written permission of Sydney Environmental Group.

DOCUMENT RECORD

Revision	Date	Author	Reviewer
v1f	25 July 2023	Mitchell Kirby	Steven Wallace
v2f	15 September 2023	Mitchell Kirby	Steven Wallace
v3f	29 September 2023	Mitchell Kirby	Steven Wallace

Author Signature		**Reviewer Signature**	
Name	Mitchell Kirby	**Name**	Steven Wallace
Credentials	M.Env.Sci., B.Nat.Sc. Licensed Asbestos Assessor LAA002039	**Credentials**	CEnvP, M.Sc.Envir.Sci, B.Sc. Meteorology, Licensed Asbestos Assessor LAA001096
Title	Environmental Scientist	**Title**	Managing Consultant

Document Title:	Stage 1 Preliminary Site Investigation, Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Site Address:	Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Client Name:	ForbesView Pty Ltd (c/- Allera)
Site Size:	≈ 92 ha
Reference Number:	2119-PSI-01-250723.v3f
Project Type:	Stage 1 Preliminary Site Investigation
Project Type Abbreviation:	PSI
Document Draft:	FINAL
Document Revision No.	v3

Prepared by Sydney Environmental Group Pty Ltd ABN: 14 631 026 214

EXECUTIVE SUMMARY

Sydney Environmental Group Pty Ltd (SE) was engaged by ForbesView Pty Ltd (c/- Allera) to undertake a Preliminary Site Investigation of the site located at Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW (refer to **Figure 1** and **Figure 2**).

SE has the following project appreciation:

- The site comprises broad scale agriculture, with limited residential structures;
- This report has been prepared to support a planned proposal for rezoning, and subsequent demolition of existing structures, subdivision and construction of approximately seven hundred and forty-five (745) dwellings, parkland, commercial precinct and associated roads and infrastructure;
- The project was undertaken to meet council residential development requirements as per Council's Draft Local Housing Strategy (LHS) 2021-2024; and
- A contamination assessment of the site is required to identify any contamination that may be present and provide advice on the suitability of the site for the proposed future land-use.

The objectives of this project were to:

- Assess the potential for contamination to be present on the site as a result of past and current land use activities; and
- Provide advice on whether the site would be suitable (in the context of land contamination) for the proposed future mixed land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

SE undertook the following activities to address the project objectives:

- A desktop review of relevant information pertaining to the site;
- A site walkover to understand current site conditions; and
- Data assessment and reporting.

Based on SE's assessment of the desktop review information and fieldwork data, in the context of the proposed redevelopment, SE makes the following conclusions:

- Six (6) potential areas of environmental concern (PAECs) have been identified for the site, albeit highly localised and/ or low risk in nature, consistent with the land-use as a commercial scale horticulture site;
- The site is not situated within a potential NOA region per the NSW Government SEED NOA database. However, localities within the vicinity of the site are identified as low-medium potential NOA. Based on a limited investigation by SE, NOA has not been identified in shallow (< 1 m) soils during a limited intrusive investigation;
- All PAECs are considered to be highly localised in nature and/ or present a relatively low contamination risk to current and future site users;
- Based on the assessments undertaken as part of this investigation, SE has concluded that the site is generally considered to be suitable (from a land contamination perspective) for the proposed future land use setting subject to a targeted Stage 2 Detailed Site Investigation (DSI) to be undertaken within the identified Areas of Environmental Concern (AEC) during development approval process;
- It is the opinion of SE that any contamination identified within the future targeted DSI is likely to be localised, and will not preclude any redevelopment of the site following remediation (if/where warranted).

Based on these conclusions, SE makes the following recommendations:

- Given the context of the findings, a DSI is not considered to be necessary as part of the Planning Propose. However, a targeted Detailed Site Investigation must be carried out to characterise potential contamination within the Areas of Environmental Concern identified as part of the detailed design and development approval;

- A Dam Dewatering Assessment must be carried out prior to any dewatering activities;
- A Pre-Demolition Hazardous Building Materials Survey must be carried out prior to any proposed demolition works;
- Following any demolition of on-site structures, a suitably qualified and experienced environmental consultant must be engaged to assess the residual soil footprint;
- Any soils proposed for excavation and disposal off-site must be done so with the appropriate waste classification, and in accordance with relevant NSW EPA Waste Classification Guidelines (2014); and
- Records of the transport and disposal of any materials off-site must be maintained.

This report, including its conclusions and recommendations, must be read in conjunction with the limitations presented in **Section 11**.

TABLE OF CONTENTS

DOCUMENT RECORD I

EXECUTIVE SUMMARY II

1. INTRODUCTION 7

1.1. Background 7
1.2. Proposed Development 7
1.3. Objectives 7
1.4. Scope of Work 7

2. SITE IDENTIFICATION 8

3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY 9

4. PREVIOUS CONTAMINATION ASSESSMENTS 10

4.1. SE (2023) 10

5. SITE HISTORY AND LAND USE 11

5.1. Land Titles 11
5.2. Aerial Imagery 15
5.3. Anecdotal Information 16
5.4. Incident Reports / Complaints History 16
5.5. Previous Contamination Assessments 16

6. REGULATORY RECORDS 17

6.1. NSW EPA CLM Act Record of Notices 17
6.2. NSW EPA POEO Act Register of Licences, Applications and Notices 17
6.3. NSW EPA CLM Act Register of Notified Sites 17
6.4. Section 10.7 Planning Certificate 17

7. SITE WALKOVER 19

7.1. Current Land Use Activity 19
7.2. Buildings and General Infrastructure 19
7.3. Boundary Fencing 20
7.4. Adjacent Land Use Activities 21
7.5. Odours and Staining 21
7.6. Chemical Storage 21
7.7. Underground and Aboveground Storage Tanks 21
7.8. Fill Material 22
7.9. Wastes 24
7.10. Asbestos Containing Materials 24
7.11. Phytotoxicity 24
7.12. Surface Water and Site Drainage 24
7.13. Adjacent Receptors 25

8. DATA INTEGRITY ASSESSMENT 26

9. CONCEPTUAL SITE MODEL 27

9.1. Potential Areas of Environmental Concern 27
9.2. Land Use Setting 27
9.3. Drinking Water Use 28
9.4. Recreational Water Use 28
9.5. Aquatic Ecosystems 28
9.6. Direct Contact – Human Health 28
9.7. Inhalation / Vapour Intrusion – Human Health 28
9.8. Aesthetics 28
9.9. Ecological Health - Terrestrial Ecosystems 29
9.10. Management Limits for Petroleum Hydrocarbon Compounds 29

10. CONCLUSIONS AND RECOMMENDATIONS 30

11. STATEMENT OF LIMITATIONS 31

12. REFERENCES 32

FIGURES
Figure 1 - Site Locality
Figure 2 - Site Layout
Figure 3 - Sampling Plan
Figure 4 - Areas of Environmental Concern

APPENDICES
A Groundwater
B Land Titles
C Historical Aerial Imagery
D NSW EPA
E Planning Certificate

ABBREVIATIONS

AHD	Australian Height Datum
AEC	Area of Environmental Concern
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground storage tank
Bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btoc	Below top of casing
CoC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EC	Electrical conductivity
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
GS	Geological Survey of NSW
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
LOR	[Laboratory] Limit of reporting
NATA	National Association of Testing Laboratories
N/A	Not applicable
ND	Not detected
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW EPA	NSW Environment Protection Authority
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAEC	Potential Area of Environmental Concern
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PID	Photo-ionisation detector
PSH	Phase separated hydrocarbon
PSI	Preliminary Site Investigation
QA/QC	Quality assurance/Quality control
RPD	Relative percentage difference
SAQP	Sampling Analysis and Quality Plan
SE	Sydney Environmental Group Pty Ltd
SVOC	Semi-volatile organic compound
TPH	Total petroleum hydrocarbon
USCS	Unified Soil Classification System
UST	Underground storage tank
VOC	Volatile organic compound

1. INTRODUCTION

1.1. Background

Sydney Environmental Group Pty Ltd (SE) was engaged by ForbesView Pty Ltd (c/- Allera) to undertake a Preliminary Site Investigation of the site located at Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW (refer to **Figure 1** and **Figure 2**).

SE has the following project appreciation:

- The site is currently in use as rural residential and agricultural, in a combined Large Lot Residential, Public Recreation and Primary Production setting;
- This report has been prepared to support a planned proposal for rezoning, and subsequent demolition of existing structures, subdivision and construction of approximately seven hundred and forty-five (745) dwellings, parkland, commercial precinct and associated roads and infrastructure;
- The project was undertaken to meet council residential development requirements as per Council's Draft Local Housing Strategy (LHS) 2021-2024;
- A contamination assessment of the site is required to identify any contamination that may be present and provide advice on the suitability of the site for the proposed future land-use.

1.2. Proposed Development

This report has been prepared to support a planning proposal for rezoning and subsequent demolition of existing structures, subdivision and development of approximately seven hundred and forty-five (745) residential dwellings, a riparian corridor and usable parkland, commercial precinct, and associated roads and infrastructure.

1.3. Objectives

The objectives of this project were to:

- Assess the potential for contamination to be present on the site as a result of past and current land use activities;
- Provide advice on whether the site would be suitable (in the context of land contamination) for the continued residential land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

1.4. Scope of Work

SE undertook the following activities to address the project objectives:

- A desktop review of relevant information pertaining to the site;
- A site walkover to understand current site conditions; and
- Data assessment and reporting.

2. SITE IDENTIFICATION

The site identification details and associated information are presented in **Table 2.1.**

Table 2.1. Site Identification Information

Attribute	Description
Street Address	Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Lot and Deposited Plan (DP)	Lot 375, 376, 386, 387, 388, 389, 830, 831, 1272 & 1273 DP 750158
Geographical Coordinates	34°12'56.6"S 150°34'39.92"E (Centre of site)
Site Area	≈ 92.0 ha
Local Government Area (LGA)	Forbes Shire Council
Parish	Forbes
County	Ashburnham
Zoning	R5 – Large Lot Residential (Eastern boundary of site); RE1 – Public Recreation (Central portion of site to southern boundary); and RU1 – Primary Production (Remainder of site). *Forbes Local Environmental Plan (2013)*

The locality of the site is set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

Regional geology, topography, soil landscape and hydrogeological information are presented in **Table 3.1.**

Table 3.1. Regional Setting Information

Attribute	Description
Climate	A review of the closest weather station to the site (Forbes Airport NSW, Station Number: 065103) indicated that the climate is relatively mild with average maximum temperatures ranging from 14.7 – 34.4 °C and minimum temperatures ranging from 2.7 – 18.2 °C. Rainfall is relatively varied across the year, ranging from 3.2 days of rain per month in April, to 6.1 average days of rainfall per month in June. Average monthly rainfall varied from 31.6 mm in April up to 54.7 mm in November.
Geology	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 28 June 2023), indicated that the majority of the site is likely to be underlain by The Ordovician to Silurian Cotton Formation, Calaire Sandstone and Mumbidgle Formation. Minor volcanics belonging to the Daroobalgie Volcanics. Sandstones are the dominant lithology with minor shales, mudstones, limestones and volcanics.
Acid Sulfate Soils	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 14 November 2022), indicates that the site lies in an area mapped as ***'No Known Occurrence'*** with respect to acid sulfate soils. This infers that land management activities are not likely to be affected by acid sulfate soil materials. Further assessment of acid sulfate soils in the context of this investigation is considered by SE as not warranted.
Topography	Generally, the local landscape consists of Narrow, convex elongated crests and ridges, and gently inclined sideslopes. Slope gradients range from 3 to 8%. Elevation is 220-340 m. Ridges are generally orientated in a north/north-east, south/south-west direction. Rock outcrop is typical on crests and upper slopes. SE understands that the site is located at an elevation approximately 274 m to 254 m Australian Height Datum (AHD), sloping to the east and south from the north-western corner.
Hydrology and Hydrogeology	Surface water courses proximal to the site include dams located within the site boundaries, followed by an unnamed tributary to Lake Forbes, located approximately 580 m south-east of the site and several dams on the neighbouring properties. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the site is considered likely to be towards the southeast. A review of the NSW Office of Water groundwater database undertaken on 4 July 2023 indicated there were no registered groundwater features located within a 500m radius of the site.
Adjacent Sensitive Receptors	A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Map was undertaken to determine the closest sensitive ecological receptors. The closest ecological receptor is Forbes Wetlands, located approximately 2.4 km to the south-east of site. The closest sensitive human receptors are the residential properties surrounding the site's boundary and any future onsite construction workers/ builders.
Naturally Occurring Asbestos (NOA)	The Orange Local Government Area is located within a region containing serpentinite rock belts. Some of these belts contain NOA (Chrysotile / Actinolite / Tremolite / Anthophyllite asbestiform). The site is located within an area mapped as a geological unit with low NOA potential. Although asbestos is a commercial term, all asbestos is of natural origin. The term 'naturally occurring asbestos' (NOA) seeks to differentiate natural sources of fibre from commercial or industrial sources. It refers to fine fibrous minerals of the serpentine and amphibole groups that occur in rocks or soil that may be disturbed by human activities or weathering processes. NOA also includes other fine fibrous minerals that are not strictly asbestiform. A representative Asbestos Characterisation Assessment was undertaken for the site (SE 2023), which did not detect the presence of NOA. However, sampling undertaken was limited and representative only, with respect to NOA veins and minerology that may occur between sampling points. All works occurring onsite must be undertaken with respect to an Asbestos Management Plan for NOA.

A copy of the NSW Office of Water search record is presented in **Appendix A**.

4. PREVIOUS CONTAMINATION ASSESSMENTS

The following reports were reviewed during the project:

- Sydney Environmental Group (SE 2023), 'Asbestos Characterisation Assessment, Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW', dated 28 July 2023, Ref: 2119-ACA-01-250723.v1f.

A summary of the previous contamination assessment is presented in **Section 4.1** below.

4.1. SE (2023)

Sydney Environmental Group Pty Ltd (SE) was engaged by ForbesView Pty Ltd (c/- Allera) to (hereafter referred to as the 'client') to undertake an asbestos characterisation assessment to investigate potential Naturally Occurring Asbestos (NOA) within the site at Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW.

The primary objective of the investigation was to provide a representative assessment of the presence of naturally occurring asbestos within the site. SE note that limited sampling was undertaken as part of the assessment.

The key findings of the ACA were as follows:

- The site is not situated within an area identified to have known NOA, however nearby localities within Forbes range from low to moderate potentials of NOA occurrence;
- Known asbestos forms occurring within the Forbes Shire Local Government Area are in relation to serpentine rock belts and consist of Chrysotile, Actinolite, Tremolite and Anthophyllite Asbestiform;
- A total of twenty-five (25) test pits were extended across the site to depths of up to 2.0 m bgs;
- A total of twenty-five (25) soil samples were collected from the twenty-five (25) test pits and submitted to Eurofins, a NATA accredited laboratory for Quantitative Asbestos (0.001%);
- A 10 L bulk soil sample was collected from each test pit and screened for the presence of potential asbestos greater than 7 mm in size;
- Asbestos was not detected in any of the soil samples submitted for analysis;
- SE notes that only a very small number of test-pits were undertaken across the site, and the investigation is therefore indicative. NOA may be present at deeper depths, and in veins of minerology that may occur between sampling points. All future works must be undertaken with the consideration of the low potential NOA, and must therefore occur under an Asbestos Management Plan to manage unexpected finds of NOA to manage risk identified within the site and provide manage strategies to mitigate risks posed by NOA.

5. SITE HISTORY AND LAND USE

5.1. Land Titles

A search of historical land title ownership was undertaken by Infotrack Pty Ltd. The results of which indicated that the land had been owned by a number of private individuals (refer to **Table 5.1.1** to **Table** 5.1.9).

Table 5.1.1 Land Titles Records Summary (As regards Lot 387 DP 750158)

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1890/29 Forbes (Book 1097 No. 30) Now Volume 2997 Folio 216
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 2997 Folio 216
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 2997 Folio 216
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 2997 Folio 216
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 2997 Folio 216 Now 387/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	387/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	387/750158

Table 5.1.2 Land Titles Records Summary (As regards Lot 376 DP 750158)

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1891/65 Forbes (Book 1097 No. 30) Now Volume 3000 Folio 145
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 3000 Folio 145
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 3000 Folio 145
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 3000 Folio 145
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 3000 Folio 145 Now 376/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	376/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	376/750158

Table 5.1.3 Land Titles Records Summary (As regards Lot 386 DP 750158 excluding part resumed for road))

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1890/28 Forbes (Book 1097 No. 30) Now Volume 2803 Folio 75
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 2803 Folio 75
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 2803 Folio 75
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 2803 Folio 75 Now Volume 9805 Folio 151
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 9805 Folio 151 Now 376/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	Volume 9805 Folio 151 Now 386/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	386/750158

Table 5.1.4 Land Titles Records Summary (As regards Lot 387 DP 750158)

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1890/29 Forbes (Book 1097 No. 30) Now Volume 2997 Folio 216
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 2997 Folio 216
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 2997 Folio 216
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 2997 Folio 216
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 2997 Folio 216 Now 387/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	387/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	387/750158

Table 5.1.5 Land Title Records Summary (As regards Lot 388 DP 750158)

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1893/27 Forbes (Book 1097 No. 30) Now Volume 3343 Folio 202
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 3343 Folio 202
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 3343 Folio 202
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 3343 Folio 202
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 3343 Folio 202 Now 388/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	388/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	388/750158

Table 5.1.6 Land Title Records summary (As regards Lot 389 DP 750158 (excluding part resumed for road))

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1893/25 Forbes (Book 1097 No. 30) Now Volume 2997 Folio 217
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 2997 Folio 217
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 2997 Folio 217
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 2997 Folio 217
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 2997 Folio 217 Now 389/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	389/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	389/750158

Table 5.1.7 Land Title Records summary (As regards Lot 830 & 831 DP 750158 (Excluding part taken out for road of Lot 830)).

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
08.12.1885 (1885 to 1973	Victor Tarrail (Grantee) (& his deceased estate)	Volume 767 Folios 172 & 173
19.01.1973 (1973 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 767 Folios 172 & 173
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 767 Folios 172 & 173 Now 830/750158 & 831/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	830/750158 & 831/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	830/750158 & 831/750158

Table 5.1.8 Land Title Records summary (As regards Lot 1272 DP 750158).

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
02.11.1916 (1916 to 1952)	Thomas Henry Rath (Baker)	Crown Tenure Conditional Purchase 1893/25 Forbes (Book 1097 No. 30) Now Volume 4577 Folio 205
30.09.1952 (1952 to 1952)	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Re the Estate of Thomas Henry Rath)	Volume 4577 Folio 205
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 4577 Folio 205
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 4577 Folio 205
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 4577 Folio 205 Now 1272/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	1272/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	1272/750158

Table 5.1.9 Land Title Records summary (As regards Lot 1273 DP 750158).

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
18.06.1910 (1910 to 1952(	Thomas Henry Rath (Baker)	Volume 1433 Folio 87 Now Volume 6572 Folio 248
30.09.1952 (1952 to	Vincent Rath (Chemist) Reginald Arthur Rath (Chemist) (Transmission Application not investigated)	Volume 6572 Folio 248
06.10.1952 (1952 to 1963)	William Herbert Black (Farmer & Grazier)	Volume 6572 Folio 248

Date of Acquisition (Term Held)	Registered Proprietor/s and Occupations	Reference to Title at Acquisition and Sale
13.12.1963 (1963 to 1979)	John Walter Dawes (Farmer & Grazier)	Volume 6572 Folio 248
23.10.1979 (1979 to 2017)	Robyn Janet Dawes (Widow)	Volume 6572 Folio 248 Now 1273/750158
31.01.2017 (2017 to 2022)	Peter Huxley Dayhew Michelle Gowan Behan (Executors of the Estate of Robyn Janet Dawes)	1273/750158
31.08.2022 (2022 to date)	Michelle Gowan Behan (Surviving Executor of the Estate of Robyn Janet Dawes)	1273/750158

There were no leases or easements reported for the site.

Based on the land title ownership search, SE conclude that there is a low to moderate potential for land contaminating activities to have been undertaken on the site related to agricultural and horticultural activities. Further assessment of these potential land contaminating activities, in the context of other historical information identified during this investigation and site walkover observations, is considered warranted.

A copy of the land title search record is presented in **Appendix B**.

5.2. Aerial Imagery

A review of selected historical aerial imagery of the site was undertaken. Observations made of the imagery considered relevant to this investigation, are presented in **Table 5.2** below.

A copy of the historical aerials is presented in **Appendix C**.

Table 5.2. Aerial Imagery Observations

Image Date	Site Features	Surrounding Land Use Settings
1965	The site appears to be predominately cleared of vegetation and vacant with limited tree cover in the north-western portion of the site. Three (3) dams are located on site, one (1) in the central northern portion, one (1) in the central portion and one (1) on the southern boundary. Primary use appears to be pastoral lands.	Surrounding landuse observed to be agricultural, consisting largely of pastoral lands. Train line is located to the east of site, Forbes town centre is located south of site.
1982	Residential structure appears in north-eastern corner of site.	Further residential development to of town to south. Land to east of site being cleared surrounding train corridor.
1996	Eastern and central portions of site appears to have been tedded.	Further residential development in surrounding region, areas directly to south and south-east have agricultural land replaced with low-density residential. Lot to north has rural residential structures constructed.
2016	Southern, central and eastern portion of site tilled.	Further low-density residential development appears to east of site.
2022	No significant changes.	No significant changes to surrounding land use.

The aerial imagery review indicated a low to moderate potential for land contaminating activities to have occurred on the site including agricultural activities. Further consideration of this value is deemed warranted.

5.3. Anecdotal Information

There was no anecdotal information provided to SE during the site investigation.

5.4. Incident Reports / Complaints History

There was no incident reports or complaints history information provided to SE as part of this project.

5.5. Previous Contamination Assessments

There were no previous contamination assessments provided to SE during the investigation.

6. REGULATORY RECORDS

6.1. NSW EPA CLM Act Record of Notices

A search of the publicly available online NSW EPA CLM Act Record of Notices was completed on 2 July 2023. The results indicated that the site was not the subject of any notifications under Section 58 of the *Contaminated Land Management Act 1997*.

A copy of the CLM Act Record of Notices search record is presented in **Appendix D**.

6.2. NSW EPA POEO Act Register of Licences, Applications and Notices

A search of the publicly available online NSW EPA Record of Notices was completed on 24 July 2023. The results indicated that the site was not the subject of any licences, applications, notices, audits or pollution studies or reduction programs under Section 308 of the *Protection of the Environment Operations Act 1997*. However, the following sites were noted within Forbes:

- An s.91 Clean Up Notice was issued on 3 May 2022 to JLW Services Pty Ltd on Limestone Road, Forbes in relation to a waste tyre fire pollution incident, located approximately 1.6 km north-west of the site. SE considers the pollution incident to be site specific and unlikely to be of impact to site of investigation; and
- A Penalty Notice was issued on 16 July 2020 to Loris H Hassal Trading Pty Ltd at Forbes Brincecure, Newell Highway Parks Road, Forbes in relation to contravene condition of license relating to offensive smells and effluents, located approximately 2 km north-east of the site. SE considers the pollution incident to be site specific and unlikely to be of impact to site of investigation.

A copy of the POEO Act Register of Licences, Applications and Notices search record is presented in **Appendix D**.

6.3. NSW EPA CLM Act Register of Notified Sites

A search of the publicly available online register of sites notified to the NSW EPA under Section 60 of the *Contaminated Land Management Act 1997*, was undertaken on 24 July 2023. The results indicated one (1) site requiring regulation under Section 60 of the *Contaminated Land Management Act 1997*.

- A former Gasworks, at 24-26 Union Street, Forbes requiring regulation under the CLM Act is located approximately 2.1 km south-east of the site. Due to the distance from the site, SE considers no further consideration warranted.

A copy of the NSW EPA CLM ACT Register of Notified Sites is presented in **Appendix D**.

6.4. Section 10.7 Planning Certificate

The site consists of multiple land use zones in accordance with the *Forbes Local Environmental Plan 2013.*

- *R5* – Large Lot Residential (eastern boundary of the site)
- RE1 – Public Recreation (central portion of the site to southern boundary)
- RU1 – Primary Production (remainder of site)

The proposed development is permissible under this State Environmental Planning Policy.

The certificates indicated that, within the meaning of the Contaminated Land Management Act, the site was not:

- Significantly contaminated land;

- Subject to a management order;
- The subject of an approved voluntary management proposal;
- Subject to an ongoing maintenance order; or
- The subject of a site audit statement.

A copy of the section 10.7 planning certificate is presented in **Appendix E**.

7. SITE WALKOVER

A site walkover was undertaken on 30 June 2023 by a suitably experienced environmental consultant. The purpose of the site walkover was to make observations of land use activities on the site, and on properties immediately adjacent to the site.

7.1. Current Land Use Activity

The land use setting on the site appeared to be rural residential in the northern portion, with the remainder of site in use for large-scale agricultural purposes.

Adjacent land use is observed to be a combination of low-density residential rural residential and large-scale agricultural activities.

7.2. Buildings and General Infrastructure

The following buildings and infrastructure were observed within the investigation areas:

- One (1) brick residential dwelling in the north-eastern portion of site, situated within Lot 386.

The remainder of the site consisted of tilled paddocks.



Site Photograph 7.2.1 Single storey residential dwelling, as observed on 30 June 2023, facing south.



Site Photograph 7.2.2 Tilled fields encountered across the site, as observed 30 June 2023, facing east from centre of site.



Site Photograph 7.2.2 Northern portion of site, as observed 30 June 2023, facing north.

7.3. Boundary Fencing

The site was observed to be fenced along all boundaries.

7.4. Adjacent Land Use Activities

Observations made during the site walkover indicated the following land use activities adjacent to the site:

- North - Large-Scale Agricultural;
- East - Low-Density Residential, followed by Agricultural
- West - Large-Scale Agricultural, followed by The Bogan Way; and
- South - Rural Residential, followed by Low-Density Residential and Commercial.

7.5. Odours and Staining

There was no olfactory or visual evidence of contamination observed on the site, during the site walkover.

7.6. Chemical Storage

Chemical drums were observed to be stored within the site, most of which were scattered across the centre and southern boundary of the site.

Chemicals observed within Lot 386 and 387 include:

- Alcohol Alkoxylate;
- Oxyfluofren;
- Ethyl Hexylester;
- Triasulfuron;
- Clethodim; and
- Ethyl and Methyl Esters



Site Photograph 7.6.1 Stored chemical containers observed within the central portion of the site.

7.7. Underground and Aboveground Storage Tanks

One (1) above ground water storage tank was observed along the southern boundary of the residential structure. No below ground septic tank was observed during the walkover, however SE considers that due to

the remote location of the site, that a belowground tank is highly likely to be situated within the vicinity of the residence in the north-western portion of the site.



Site Photograph 7.7.1 Concrete above ground rainwater storage tank, observed on the southern boundary of the residence, as observed on 30 June 2023.

7.8. Fill Material

Widespread fill material was not observed across site during the site walkover, with the exception of soil materials observed surrounding the on-site dams. SE observed the materials within the dam embankments and noted no odours, staining or visual sign of contamination were observed. As the dams were designed in a turkey nest style, SE consider it likely that embankment materials are sourced from the centre of the dam. Revision of historical aerials indicate the dam has existed since approximately 1982, with little alterations, it is unlikely that they contain contamination. Therefore, no further consideration is warranted.



Site Photograph 7.8.1 Fill materials encountered within dam embankment, as observed 30 June 2023, facing south.



Site Photograph 7.8.2 Representative fill materials encountered within dam embankment, as observed 30 June 2023.

7.9. Wastes

Widespread storage of waste was not observed across site, with the exception of chemical drums observed scattered within the central portion and southern boundary of the site.



Site Photograph 7.9.1 Empty chemical drums located on the southern portion of the site, observed 30 June 2023, as viewed facing south

7.10. Asbestos Containing Materials

There was no visual evidence of potential asbestos containing materials (ACM) on the surface of the site during the site walkover.

Based on the presumed age of the residence, ACM is likely to be present within the building materials. A pre-demolition hazardous building materials survey was not within the scope of this site investigation, but is recommended prior to any demolition activities occurring on the site.

7.11. Phytotoxicity

There was no visual evidence observed to suggest significant or widespread phytotoxic impact (in the form of dieback or plant stress) in the vegetation at the site. Similar observations were made of visible vegetation on land adjacent to the site.

7.12. Surface Water and Site Drainage

Visual observations made in the context of site drainage during the walkover, indicated that drainage mechanisms on the site are likely to include:

- Infiltration into underlying soils, where soil permeability permits (including onsite dams); and
- Stormwater systems from the use of downpipes on structures.

7.13. Adjacent Receptors

Adjacent ecological receptors included onsite dams, followed by an unnamed tributary to Lake Forbes and dams on neighbouring properties.

The closest sensitive human receptors are current and future onsite residential land users, and those on neighbouring sites.

8. DATA INTEGRITY ASSESSMENT

SE has relied on the following sources of data while undertaking this investigation:

- SE field observations during the site walkover;
- Australian Soil Resource Information System;
- Department of Land and Water Conservation;
- Department of Minerals and Energy;
- Department of Primary Industries – Water;
- Forbes Shire Council;
- Google Earth;
- Infotrack Pty Ltd;
- National Environment Protection Council;
- Nearmap Pty Ltd;
- NSW Environment Protection Authority;
- NSW Land and Property Information; and
- Water NSW.

Based on SE's experience and professional judgement, the data obtained from the sources relied upon, is considered to be adequately precise, accurate, representative, complete and comparable within the objectives of this investigation and for the purpose of drawing conclusions regarding land contamination risks at the site.

9. CONCEPTUAL SITE MODEL

9.1. Potential Areas of Environmental Concern

The site history data collected and site walkover observations made were assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AEC) and contaminants of potential concern (COPC) which have the potential to be present on site. The AEC and associated COPC identified are presented in **Table 9.1.1** below.

Table 9.1.1 PAEC and COPC

ID	Potential Area of Environmental Concern	Land Use Activity	Contaminants of Potential Concern
PAEC02	On-site Structures	Hazardous Building Materials	Asbestos, Lead, SMF & PCB
PAEC03	Hardstand / Structure Footprints	Uncontrolled Filling	Heavy metals, TRH, BTEX, PAH, OCP, PCB & Asbestos
PAEC04	Localised Chemical Storage	Chemical Storage	Metals, PAH, TRH, OCP & OPP
PAEC05	On-Site Dams	Uncontrolled Filling / Runoff from Adjacent Activities	Metals, PAH, TRH, BTEX, OPPs, OCPs, Asbestos, E. Coli and Thermotolerant Coliforms
PAEC06	Agricultural Activities	Fertilisers, Herbicides, Pesticides & Fungicides	Asbestos, Metals, PAH, TRH, BTEX, OCP, OPP and PCB
PAEC07	Septic System	Septic Tank and Respiration System	Metals, PAH, TRH, BTEX, OPPS, PCB, E. Clo and Thermotolerant Coliforms

The potential contamination pathways are considered to be as follows:

- Inhalation/ingestion of contaminants released in dust during redevelopment;
- Direct contact, ingestion or inhalation of soil; and
- Migration of contaminants within surface and groundwater to neighbouring properties and water bodies.

Relevant potential receptors are considered to include:

- Onsite construction and maintenance workers;
- Third parties during construction (adjacent site users and adjacent residents);
- Onsite flora and fauna;
- Groundwater and surface water;
- Future residents/end users; and
- Neighbouring residential land users.

9.2. Land Use Setting

SE understands that the site currently utilised as a rural residential premises with accessible soils land use setting and will continue to be utilised within a low-density residential land use setting.

As the proposed future site use is proposed to remain as demolition of existing structures, subdivision and development of approximately seven hundred and forty-five (745) dwellings, parkland, commercial precinct and associated roads and infrastructure, SE considers it reasonable to adopt the 'HIL A – Low-Density Residential' per guidance provided in Section 2.2 of Schedule B (1) of the National Environment Protection Measure

(Assessment of Site Contamination) 2013 (NEPM ASC 2013), in order to conservatively assess the site for any future proposed land use as well as the current land use.

9.3. Drinking Water Use

There are no groundwater bores onsite or down-gradient of the site, registered for drinking water use. It is noted that a reticulated mains potable water supply is available in the area. Therefore, further assessment of this groundwater drinking water value is considered not warranted.

9.4. Recreational Water Use

Surface water courses proximal to the site included on-site dams, followed by an unnamed tributary to Lake Forbes approximately 580 m south-east of the site.

There is a potential, albeit low, that the usage of these surface water courses within proximity to the site would include swimming, fishing for consumption and / or water sports. and as such consideration of this pathway is considered warranted.

9.5. Aquatic Ecosystems

Surface water courses proximal to the site included on-site dams, followed by an unnamed tributary to Lake Forbes approximately 580 m south-east of the site.

Based on historical and ongoing land-use there is a potential, for surface / groundwater contamination. As a conservative measure, consideration of this value is deemed warranted.

9.6. Direct Contact – Human Health

SE understands that a future proposed development will mostly consist of residential and recreational structures across the current site, which would act as a direct contact barrier between potential land contamination and onsite receptors during operation of the site. The rest of the site would generally consist of open space landscaped areas and parkland. In these areas, it is considered that a direct contact exposure pathway may be present between potential contamination and onsite receptors.

SE considers that further consideration of direct contact human health risks is considered warranted.

9.7. Inhalation / Vapour Intrusion – Human Health

In order for a potentially unacceptable inhalation / vapour intrusion human health exposure risk to exist, a primary vapour source (e.g. underground storage tank) or secondary vapour source (e.g. significantly contaminated soil or groundwater) must exist.

The historical evidence reviewed indicated a low likelihood for a potential primary source to be present on the site.

Potential sources of groundwater contamination in the immediate vicinity of the site was not observed. A groundwater source of vapours was therefore considered unlikely at the site.

SE consider the need for further inhalation / vapour intrusion human health risk assessment to be not warranted.

9.8. Aesthetics

Section 3.7 of Schedule B1 NEPM ASC advises that there are no specific numerical aesthetic guidelines, however site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

No aesthetic risks identified, no further assessment warranted.

9.9. Ecological Health - Terrestrial Ecosystems

Section 3.4.2 of Schedule B (1) NEPM ASC 2013 suggests that a pragmatic risk-based approach be taken in applying ecological investigation levels and ecological screening levels in residential and commercial/ industrial land use settings.

SE understand that the proposed development includes the construction of a road within the south-west of site, which would act as a direct contact barrier between potential land contamination and onsite receptors during operation of the site. The rest of the site would generally consist of open space and landscaped areas. In these areas, it is considered that a direct contact exposure pathway may be present between potential contamination and onsite receptors.

Due to the presence of these open space areas further ecological assessment is considered warranted.

9.10. Management Limits for Petroleum Hydrocarbon Compounds

NEPM ASC 2013 notes that there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosive hazards; and
- Effects on buried infrastructure (e.g. penetration of or damage to, in-ground services by hydrocarbons).

Section 2.9 of Schedule B (1) NEPM ASC 2013 includes 'management limits' to avoid or minimise these potential effects. Application of the management limits requires consideration of site-specific factors such as the depth of building basements and services and depth to groundwater, to determine the maximum depth to which the limits should apply. Section 2.9 of Schedule B (1) NEPM ASC 2013 also notes that management limits may have less relevance at operating industrial sites which have no or limited sensitive receptors in the area of potential impact, and when management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

10. CONCLUSIONS AND RECOMMENDATIONS

Based on SE's assessment of the desktop review information and fieldwork data, in the context of the proposed redevelopment, SE makes the following conclusions:

- Six (6) potential areas of environmental concern (PAECs) have been identified for the site, albeit highly localised and/ or low risk in nature, consistent with the land-use as a commercial scale horticulture site;
- The site is not situated within a potential NOA region per the NSW Government SEED NOA database. However, localities within the vicinity of the site are identified as low-medium potential NOA. Based on a limited investigation by SE, NOA has not been identified in shallow (< 1 m) soils during a limited intrusive investigation;
- All PAECs are considered to be highly localised in nature and/ or present a relatively low contamination risk to current and future site users;
- Based on the assessments undertaken as part of this investigation, SE has concluded that the site is generally considered to be suitable (from a land contamination perspective) for the proposed future land use setting subject to a targeted Stage 2 Detailed Site Investigation (DSI) to be undertaken within the identified Areas of Environmental Concern (AEC) during development approval process;
- It is the opinion of SE that any contamination identified within the future targeted DSI is likely to be localised, and will not preclude any redevelopment of the site following remediation (if/where warranted).

Based on these conclusions, SE makes the following recommendations:

- Given the context of the findings, a DSI is not considered to be necessary as part of the Planning Propose. However, a targeted Detailed Site Investigation must be carried out to characterise potential contamination within the Areas of Environmental Concern identified as part of the detailed design and development approval;
- A Dam Dewatering Assessment must be carried out prior to any dewatering activities;
- A Pre-Demolition Hazardous Building Materials Survey must be carried out prior to any proposed demolition works;
- Following any demolition of on-site structures, a suitably qualified and experienced environmental consultant must be engaged to assess the residual soil footprint;
- Any soils proposed for excavation and disposal off-site must be done so with the appropriate waste classification, and in accordance with relevant NSW EPA Waste Classification Guidelines (2014); and
- Records of the transport and disposal of any materials off-site must be maintained.

This report, including its conclusions and recommendations, must be read in conjunction with the limitations presented in **Section 11**.

11. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Sydney Environmental Group Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, SE reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to SE's engagement. The report must not be used for any purpose other than the purpose specified at the time SE was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual SE consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, SE reserves the right to review and amend this report.

12. REFERENCES

National Environment Protection Council (NEPC) 2013A, 'Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

National Environment Protection Council (NEPC) 2013B, 'Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

NSW EPA 2017, '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)'.*

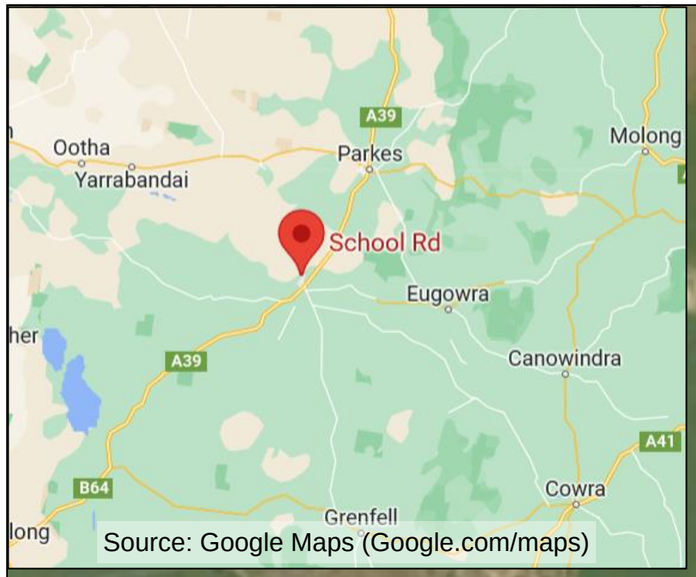
NSW EPA 2022, '*Contaminated Sites: Sampling Design Guidelines'.*

NSW EPA 2012, *'Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases'*

NSW EPA 2020, '*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'*.

WA DOH 2021, '*Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia'* dated July 2021.

FIGURES



Source: Google Maps (Google.com/maps)

Site Location
Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW

Source: Nearmap (apps.nearmap.com.au)

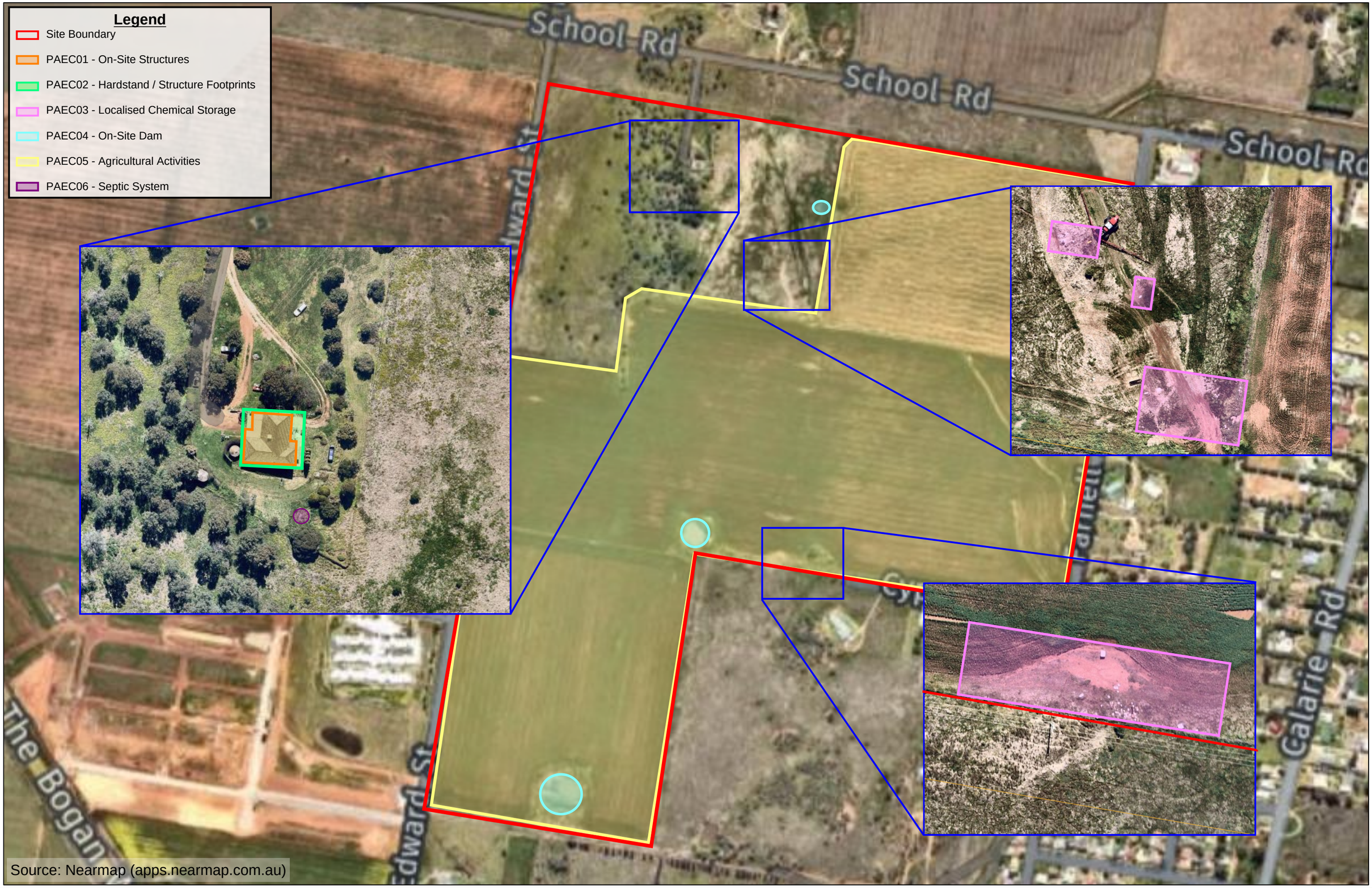
Sydney Environmental Group

Scale:	500 m	Site Location	
Client Name:	ForbesView Pty Ltd (c/- Allera)	Figure Number:	1
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-PSI-01-250723.v3f

N



Sydney Environmental Group	Scale:	250 m	Site Layout	
	Client Name:	ForbesView Pty Ltd (c/- Allera)	N	Figure Number: 2
	Project Name:	Stage 1 Preliminary Site Investigation		Figure Date: 24 July 2023
	Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW		Report Number 2119-PSI-01-250723.v3f



Sydney Environmental Group

Scale:	250 m	Areas of Environmental Concern	
Client Name:	ForbesView Pty Ltd (c/- Allera)	Figure Number:	3
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number	2119-PSI-01-250723.v3f

N

APPENDIX A

GROUNDWATER

home help contact customise

State Overview

State Overview

Rivers and Streams

favourites search download sites find a site

⊞ Real Time Data - Rive...

Daily River Reports

⊞ Daily River Reports

Dams

favourites search download sites find a site

All Groundwater Site Details

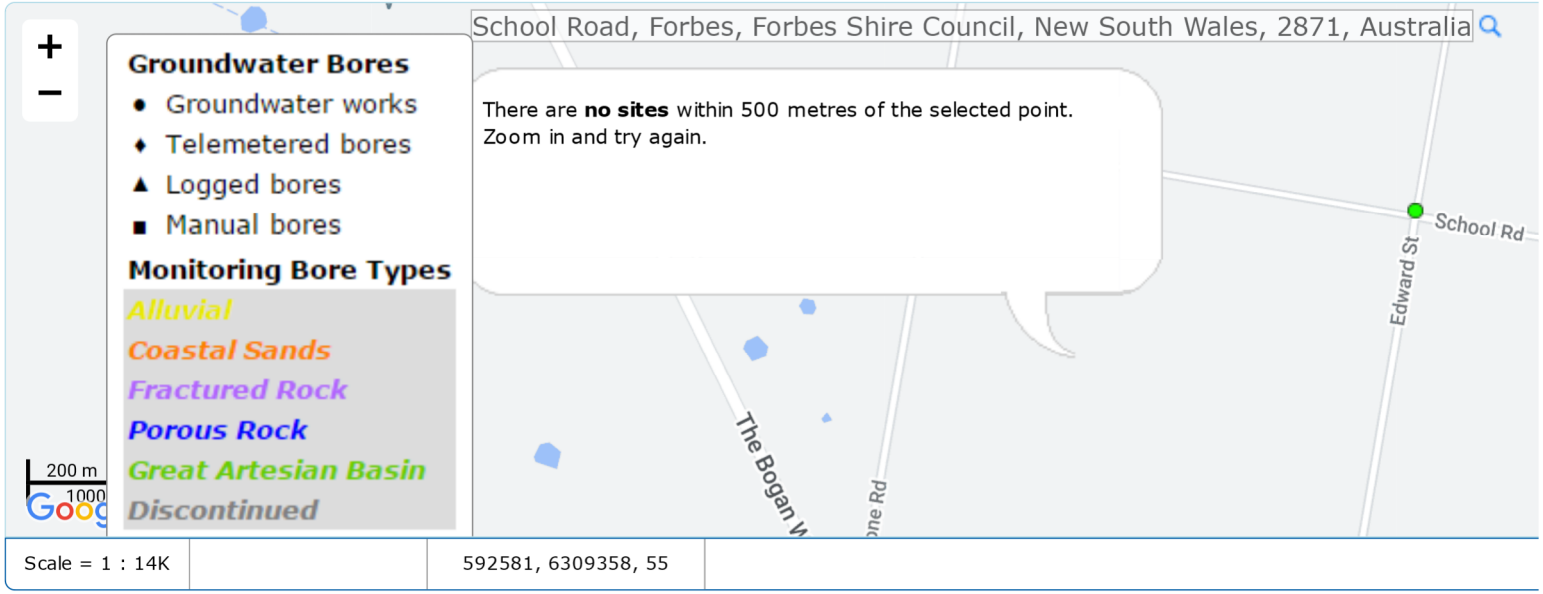
ALL GROUNDWATER MAP

bookmark this page

All data times are Eastern Standard Time

Map Info

current site: GW804819



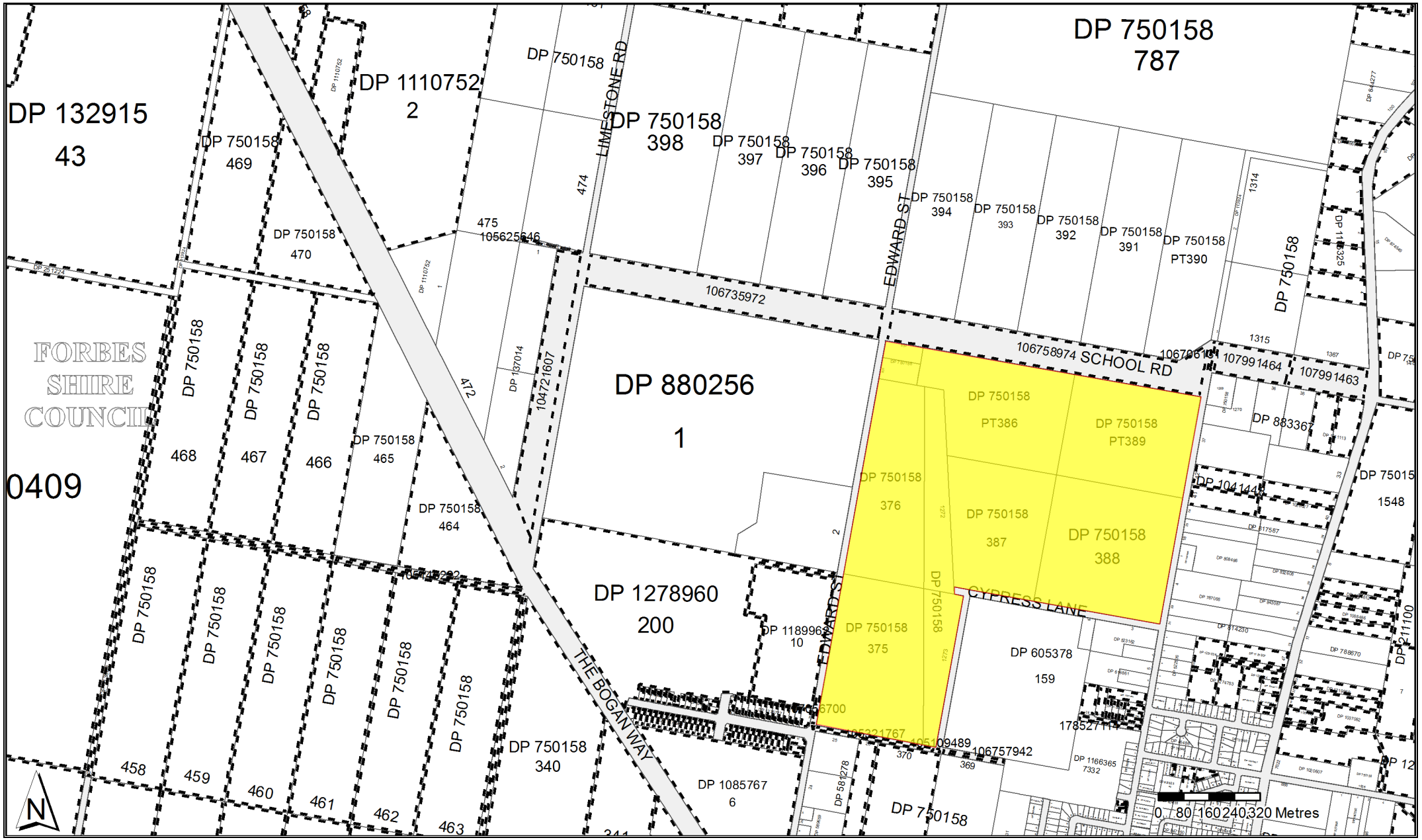
contact WaterNSW

APPENDIX B

LAND TITLES

Cadastral Records Enquiry Report : Lot 1 DP 880256

Locality : FORBES
Parish : FORBES
LGA : FORBES
County : ASHBURNHAM



Copyright © Crown in right of New South Wales, 2017

This information is provided as a searching aid only.Whilst every endeavour is made to ensure that current map, plan and titling information is accurately reflected, the Registrar General cannot guarantee the information provided. For ALL ACTIVITY PRIOR TO SEPTEMBER 2002 you must refer to the RGs Charting and Reference Maps

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 375/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 3627 FOL 95

Recorded	Number	Type of Instrument	C.T. Issue
18/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
28/6/1990		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
31/8/2022	AS432314	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

Req:R902323 /Doc:DL AK832837 /Rev:03-Feb-2017 /NSW LRS /Pgs:ALL /Prt:18-Jul-2023 20:45 /Seq:1 of 3
© Office of the Registrar-General /Src:InfoTrack /Ref:School Road? Forbes

Form: 03AE
Licence: 01-05-051
Licensee: LEAP Legal Software Pty Limited
Firm name: McGroders Solicitors & Conveyancers

TRANSMISSION APPLICATION

by an Executor, Administrator or Trustee

AK832837X

New South Wales
Section 93 Real Property Act 1900

PRIVACY NOTE: Section 31B of the Real Property Act 1900 (RP Act) authorises the Registrar General to collect the information required by this form for the establishment and maintenance of the Real Property Act Register. Section 96B RP Act requires that the Register is made available to any person for search upon payment of a fee, if any.

(A) **TORRENS TITLE** See Annexure A

(B) **REGISTERED DEALING**

NUMBER	TORRENS TITLE

(C) **LODGED BY**

Extra fee +20 titles $136.30.

DOCUMENT COLLECTION BOX	NAME, ADDRESS OR DX, TELEPHONE, AND CUSTOMER ACCOUNT NUMBER IF ANY	CODE
BOX 582W	SERVICE FIRST REGISTRATION DX 189 SYDNEY LLPN123426A PH 9299 8000 FAX 9279 2185 REFERENCE: mcgrod - Dawes	AE

(D) **DECEASED REGISTERED PROPRIETOR** ROBYN JANET DAWES

(E) **APPLICANT** PETER HUXLEY DAYHEW AND MICHELLE GOWAN BEHAN

(F) The abovementioned applicant, being entitled as executor of the will of the deceased registered proprietor (who died on 04/07/2014) pursuant to Probate No. 2014/00213128 granted on 28 April 2016 to (the original of which is lodged herewith) hereby applies to be registered as proprietor of the estate or interest of the deceased registered proprietor in the abovementioned land

DATE

(G) I certify that I am an eligible witness and that the applicant signed this dealing in my presence. [See note* below]

Signature of witness:

Name of witness:

Address of witness:

DARRAN WYATT
2 Old South Head Road Vaucluse
Justice of the Peace No. 201351

Certified correct for the purposes of the Real Property Act 1900 by the applicant.

Signature of applicant:

Authorised to make amendments as Solicitor for Applicants Sarah Black 18/10/2016

CT SIGHTED CANC. & RET. SD 17 mm 31/1/17

(H) *This section is to be completed where a notice of sale is required and the relevant data has been forwarded through eNOS.*
The applicant certifies that the eNOS data relevant to this dealing has been submitted and stored under eNOS ID No. 1140763 Full name: SARAH BLACK Signature:

*s117 RP Act requires that you must have known the signatory for more than 12 months or have sighted identifying documentation

ALL HANDWRITING MUST BE IN BLOCK CAPITALS.

Evidence sighted and returned (office use only): SD 17 mm

Req:R902323 /Doc:DL AK832837 /Rev:03-Feb-2017 /NSW LRS /Pgs:ALL /Prt:18-Jul-2023 20:45 /Seq:2 of 3
© Office of the Registrar-General /Src:InfoTrack /Ref:School Road? Forbes

TRANSMISSION APPLICATION

APPLICANT: PETER HUXLEY DAYHEW & MICHELLE GOWAN BEHAN

DATED:

I certify that the person signing opposite, with whom I am personally acquainted or as to whose identity I am otherwise satisfied, signed this instrument in my presence:

Certified correct for the purposes of the Real Property Act 1900 by the Applicant

Signature of witness:

Name of witness: SARAH BLACK

Address of witness: 155 Jedda Street
Forbes NSW 2871

Signature of Applicant
MICHELLE GOWAN BEHAN

Req:R902323 /Doc:DL AK832837 /Rev:03-Feb-2017 /NSW LRS /Pgs:ALL /Prt:18-Jul-2023 20:45 /Seq:3 of 3
© Office of the Registrar-General /Src:InfoTrack /Ref:School Road? Forbes

Annexure A to Transmission Application by Executors

Deceased Proprietor: Robyn Janet Dawes

(A) TORRENS TITLE

Lot 2 DP 113924
Lot 3 DP 113924
Lot 7 DP 534886
Lot 8 DP 534886
Lot 3 DP 784659
Lot 4 DP 784659
Lot 11 DP 750158
Lot 48 DP750158
Auto Consol 12767-11
Auto Consol 4816-74
Lot 406 DP 750158
Lot 684 DP 750158
Lot 1314 DP 750158
Lot 1315 DP 750158
Vol 9826 Fol 239 NOW BEING 3/222598
Vol 4577 Fol 205 NOW BEING 1272/750158
Vol 4344 Fol 137 NOW BEING 392/750158
Vol 3627 Fol 95 NOW BEING 375/750158
Vol 3000 Fol 145 NOW BEING 376/750158
Vol 9805 Fol 151 NOW BEING 386/750158
Vol 2997 Fol 216 NOW BEING 387/750158
Vol 3343 Fol 202 NOW BEING 388/750158
Vol 2997 Fol 217 NOW BEING 389/750158
Vol 3451 Fol 100 NOW BEING 390/750158
Vol 3464 Fol 96 NOW BEING 391/750158
Vol 4806 Fol 143 NOW BEING AUTO CONSOL 4806-143
Vol 767 Fol 172 NOW BEING 830/750158
Vol 767 Fol 173 NOW BEING 831/750158
Vol 6572 Fol 248 NOW BEING 1273/750158
Lot 7 DP 722313
Lot 8 DP 722313
~~Lot 3 DP 784659~~
Vol 12766 Fol 6 NOW BEING 5/248263

Authorised to make amendments as Solicitor for Applicants. SACHA BLACK 18/10/2016

CTS 48/750158
AUTO CONSOL 12767-11
AUTO CONSOL 4816-74
406/750158
684/750158

PROD BY STOE MARSDONS 28/9/16

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 375/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	31/8/2022

LAND

LOT 375 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 375)
TITLE DIAGRAM CROWN PLAN 4342.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432314)

SECOND SCHEDULE (1 NOTIFICATION)

---

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:07

LAND REGISTRY SERVICES Historical Search

InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE

18/7/2023 9:04AM

FOLIO: 376/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 3000 FOL 145

Recorded	Number	Type of Instrument	C.T. Issue
18/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
9/5/1989		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
31/8/2022	AS432314	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:54

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 376/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	31/8/2022

LAND

LOT 376 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 376)
TITLE DIAGRAM CROWN PLAN 4342.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432314)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:06

Req:R902609 /Doc:CT 09805-151 CT /Rev:05-Sep-2007 /NSW LRS /Pgs:ALL /Prt:19-Jul-2023 05:58 /Seq:1 of 2
© Office of the Registrar-General /Src:InfoTrack /Ref:School Road? Forbes

09805151

[redacted]IFICATE OF TITLE

[redacted]ERTY ACT, 1900, as amended.

NEW SOUTH WALES :

Crown Grant (Prior Title)
Volume 2803 Folio 75

Vol. 9805 Fol. 151

1st Edition issued 14-9-1964

EH J562034

Fol. 151 9805 (Page 1) Vol.

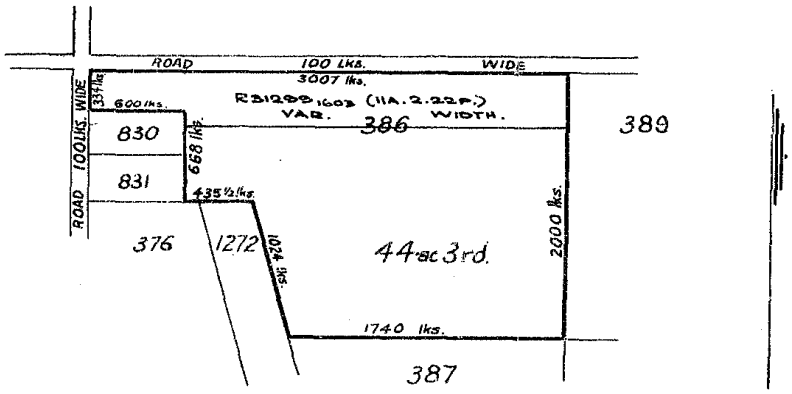
I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness B.B. Bailey

CANCELLED Janwatson
Registrar General.

REGISTRAR GENERAL NEW SOUTH WALES

PLAN SHOWING LOCATION OF LAND SEE AUTO FOLIO



J562034 Dy

Scale: 10 Chains to one inch.

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Portion 386 in the Shire of Jemalong Parish of Forbes and County of Ashburnham
Excepting thereout the minerals reserved by the Crown Grant.

Janwatson
Registrar General.

FIRST SCHEDULE (continued overleaf)

~~JOHN WALTER DAWES, of Forbes, Farmer and Grazier.~~

Janwatson
Registrar General.

GRM

SECOND SCHEDULE (continued overleaf)

1. Reservations and conditions, if any, contained in the Crown Grant(s) above referred to.

Janwatson
Registrar General.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED.

ST 1608 V. C. N. PLIGHT, GOVERNMENT PRINTER

Vol. 9805 Fol. 151

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General
Robyn Janet Davies of Forbes, Widow	Transmission	R432183	———	23-10-1979	

CANCELLED

SEE AUTO FOLIO

J562035 M/G

N/R

R432181 P/Mt. R—
R432183 T/A R

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
~~Mortgage~~	~~J562035~~	~~18-12-1963~~	~~to Bank of New South Wales~~	~~12-10-1944~~		Discharged	R432181	
Resumption	446310	———	the land shown by "var. width" in the plan hereon is public road	27-6-1969				

FORM No. 62

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Req:R902609 /Doc:CT 09805-151 CT /Rev:05-Sep-2007 /NSW LRS /Pgs:ALL /Prt:19-Jul-2023 05:58 /Seq:2 of 2
© Office of the Registrar-General /Src:InfoTrack /Ref:School Road? Forbes

LAND REGISTRY SERVICES Historical Search

InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 386/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 9805 FOL 151

Recorded	Number	Type of Instrument	C.T. Issue
3/12/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
6/1/1989		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
4/9/2013	AH992755	DEPARTMENTAL DEALING	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:53

Title Search

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 386/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 386 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 386)
TITLE DIAGRAM CROWN PLAN 4342.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (2 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2 L463110 PART OF THE LAND ABOVE DESCRIBED SHOWN IN CROWN PLAN 31299.1603 IS NOW PUBLIC ROAD

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:06

LAND REGISTRY SERVICES Historical Search

InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 387/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 2997 FOL 216

Recorded	Number	Type of Instrument	C.T. Issue
18/1/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
7/11/1990		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:52

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 387/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 387 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 387)
TITLE DIAGRAM CROWN PLAN 4342.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:05

LAND REGISTRY SERVICES Historical Search

InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 388/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 3343 FOL 202

Recorded	Number	Type of Instrument	C.T. Issue
18/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
20/6/1990		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:52

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 388/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 388 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 388)
TITLE DIAGRAM CROWN PLAN 5414.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:05

LAND REGISTRY SERVICES Historical Search

InfoTrack

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 389/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 2997 FOL 217

Recorded	Number	Type of Instrument	C.T. Issue
18/1/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
7/11/1990		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:51

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 389/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 389 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 389)
TITLE DIAGRAM CROWN PLAN 5415.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (2 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

2 LAND EXCLUDES THE ROAD(S) SHOWN IN CROWN PLAN R31299.1603

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:04

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 830/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 767 FOL 172

Recorded	Number	Type of Instrument	C.T. Issue
15/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
25/1/1991		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:51

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 830/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 830 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 830)
TITLE DIAGRAM CROWN PLAN 3746.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (2 NOTIFICATIONS)

---

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2 LAND EXCLUDES THE ROAD(S) SHOWN IN CROWN PLAN 31299.1603

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:04

LAND REGISTRY SERVICES Historical Search

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 831/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 767 FOL 173

Recorded	Number	Type of Instrument	C.T. Issue
15/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
25/1/1991		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:50

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 831/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 831 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 831)
TITLE DIAGRAM CROWN PLAN 3746.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (1 NOTIFICATION)

---

1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:03

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE

18/7/2023 9:04AM

FOLIO: 1272/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 4577 FOL 205

Recorded	Number	Type of Instrument	C.T. Issue
20/2/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
22/12/1994		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
5/6/1996		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
31/8/2022	AS432314	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:04:50

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1272/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	31/8/2022

LAND

LOT 1272 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 1272)
TITLE DIAGRAM CROWN PLAN 5898.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432314)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

Received: 18/07/2023 09:03:03

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
18/7/2023 9:04AM

FOLIO: 1273/750158

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 6572 FOL 248

Recorded	Number	Type of Instrument	C.T. Issue
23/1/1989		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
10/4/1989		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
2/4/1991		AMENDMENT: TITLE DIAGRAM	
31/1/2017	AK832837	TRANSMISSION APPLICATION (EXECUTOR, ADMINISTRATOR, TRUSTEE)	EDITION 1
30/8/2022	AS432324	NOTICE OF DEATH	EDITION 2

*** END OF SEARCH ***

School Road, Forbes PRINTED ON 18/7/2023

Copyright © Office of the Registrar-General 2023

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1273/750158

SEARCH DATE	TIME	EDITION NO	DATE
18/7/2023	9:03 AM	2	30/8/2022

LAND

LOT 1273 IN DEPOSITED PLAN 750158
LOCAL GOVERNMENT AREA FORBES
PARISH OF FORBES COUNTY OF ASHBURNHAM
(FORMERLY KNOWN AS PORTION 1273)
TITLE DIAGRAM CROWN PLAN 5934.1770

FIRST SCHEDULE

MICHELLE GOWAN BEHAN (ND AS432324)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

* Any entries preceded by an asterisk do not appear on the current edition of the Certificate of Title. Warning: the information appearing under notations has not been formally recorded in the Register. InfoTrack an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with Section 96B(2) of the Real Property Act 1900.

Copyright © Office of the Registrar-General 2023

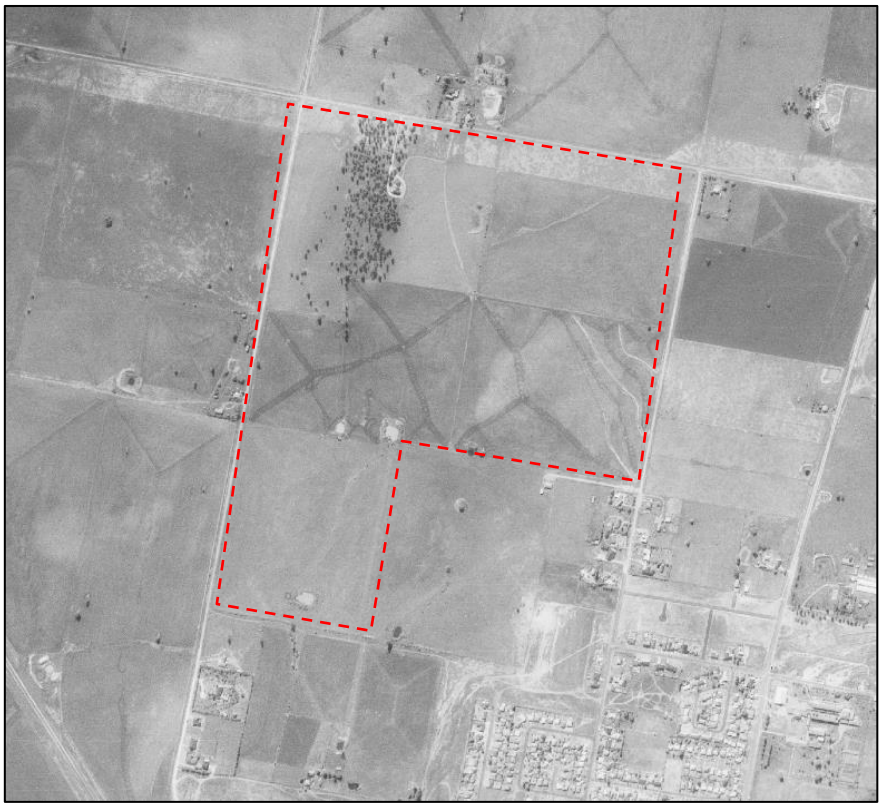
Received: 18/07/2023 09:03:02

APPENDIX C

HISTORICAL AERIAL IMAGERY



Historical Aerial Photograph 1 1965 Historical aerial image of site



Historical Aerial Photograph 2 1982 Historical aerial image of site.



Historical Aerial Photograph 3 1996 Historical aerial image of the site



Historical Aerial Photograph 4 2016 Historical aerial image of the site



Historical Aerial Photograph 5 2023 Historical aerial image of the site

APPENDIX D

NSW EPA

Search results

Your search for:Suburb: FORBES

Matched 2 notices relating to 1 site.

Search Again

Refine Search

Suburb	Address	Site Name	Notices related to this site
FORBES	24-26 Union STREET	Former Gasworks	2 former

Page 1 of 1

20 July 2023

Search results

Your search for: **General Search** with the following criteria

Suburb - forbes

returned 120 results

Export to excel 1 of 6 Pages Search Again

Number	Name	Location	Type	Status	Issued date
1587110		DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	19 Dec 2019
1601709		2 ANGUS ST, FORBES, NSW 2871	s.80 Surrender of a Licence	Issued	04 Dec 2020
1611563		DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Oct 2021
1614435		NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	14 Feb 2022
1626453		N/A, FORBES, NSW 2871	s.58 Licence Variation	Pending	01 Feb 2023
1626941		GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	30 Mar 2023
3749	ABL RED MEAT PTY LTD	"THE MOUNT", FORBES, NSW 2871	POEO licence	Issued	10 Apr 2000
1536993	ABL RED MEAT PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	29 Apr 2016
1575091	ABL RED MEAT PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	30 Jan 2019
435	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	POEO licence	Issued	06 Jan 2000
4813	FORBES SHIRE COUNCIL	PARKES ROAD, FORBES, NSW 2871	POEO licence	Surrendered	12 Jan 2000
4809	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	POEO licence	Issued	10 Feb 2000
6118	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	POEO licence	Issued	06 Mar 2001
1005938	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	25 May 2001
1008463	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	06 Jun 2001
1009058	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	29 Jun 2001
1011009	FORBES SHIRE COUNCIL	PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Aug 2001
1012251	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	Load Reduction Agreement	Issued	28 Nov 2001
1012086	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Nov 2001
1008462	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	18 Dec 2001

1 2 3 4 5 6

20 July 2023

For business and industry
For local government
Contact us

131 555 (tel:131555)

Online (https://www.epa.nsw.gov.au/about-us/contact-us/feedback)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on
(https://au.linkedin.com/company/nsw-environment-protection-
(https://www.youtube.com/channel/UCSwaEPA5jrgAEsHicGz
(https://twitter.com/NSWEPA)

Search results

Your search for: **General Search** with the following criteria

Suburb - forbes

returned 120 results

Export to excel 2 of 6 Pages Search Again

Number	Name	Location	Type	Status	Issued date
1014378	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	18 Jan 2002
1012852	FORBES SHIRE COUNCIL	PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	22 Jan 2002
1014092	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	20 Feb 2002
1009575	FORBES SHIRE COUNCIL	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	17 May 2002
1018769	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	05 Jul 2002
1028460	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	Load Reduction Agreement	Issued	19 Sep 2003
1029455	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	21 Oct 2003
1032112	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	03 Dec 2003
1030835	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	Load Reduction Agreement - Termination	Issued	28 Apr 2004
1034719	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Apr 2004
1037496	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 May 2004
1036491	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	04 Jun 2004
1042375	FORBES SHIRE COUNCIL	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	22 Nov 2004
12375	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	POEO licence	Issued	30 Sep 2005
1051646	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Apr 2006
1060899	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	30 May 2006
1063661	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	01 Aug 2006
1068713	FORBES SHIRE COUNCIL	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	15 Jan 2007
1083258	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Mar 2008
1093726	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	06 Jan 2009

1 2 3 4 5 6

24 July 2023

For business and industry

For local government

Contact us

131 555 (tel:131555)

Online (https://www.epa.nsw.gov.au/about-us/contact-us/feedback)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on

Search results

Your search for: **General Search** with the following criteria

Suburb - forbes

returned 120 results

Export to excel 3 of 6 Pages Search Again

Number	Name	Location	Type	Status	Issued date
1093264	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	09 Mar 2009
1098179	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	14 May 2009
1109086	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	15 Dec 2009
1110522	FORBES SHIRE COUNCIL	PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	08 Jan 2010
1125640	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	08 Jun 2011
1505280	FORBES SHIRE COUNCIL	PARKES ROAD, FORBES, NSW 2871	s.80 Surrender of a Licence	Issued	02 Apr 2012
1505887	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	04 Jun 2012
1506424	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Jun 2012
1505565	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	27 Jun 2012
1505418	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	14 Aug 2012
1510446	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	Compliance Audit	Complete	07 Dec 2012
1512356	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	19 Mar 2013
1512423	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	20 Mar 2013
1514149	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	16 May 2013
1515805	FORBES SHIRE COUNCIL	BACK YAMMA ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Oct 2013
1520730	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Apr 2014
1521615	FORBES SHIRE COUNCIL	126-132 FLINT STREET, FORBES, NSW 2871	s.58 Licence Variation	Issued	12 Jun 2014
1529387	FORBES SHIRE COUNCIL	DAROOBALGIE ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	01 Apr 2015
1536173	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	04 Jan 2016
1536983	FORBES SHIRE COUNCIL	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	08 Feb 2016

1 2 3 4 5 6

24 July 2023

131 555 (tel:131555)

Online (https://www.epa.nsw.gov.au/about-us/contact-us/feedback)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Search results

Your search for: **General Search** with the following criteria

Suburb - forbes

returned 120 results

Export to excel 5 of 6 Pages Search Again

Number	Name	Location	Type	Status	Issued date
1524458	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	Compliance Audit	Complete	20 Aug 2014
1537132	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	24 Feb 2016
1551321	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	04 May 2017
1564843	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	30 May 2018
1572372	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	18 Dec 2018
1575481	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Feb 2019
1578480	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	17 Apr 2019
1581600	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	27 Jun 2019
1586428	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	01 Oct 2019
1573980	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	Mandatory Environmental Audit	Complete	14 Jan 2020
3173529251	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	Penalty Notice	Issued	16 Jul 2020
3173529260	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	Penalty Notice	Issued	16 Jul 2020
1598829	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	30 Sep 2020
1609515	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	02 Jul 2021
1617127	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Mar 2022
1624404	LORIS H HASSALL TRADING PTY LTD	NEWELL HIGHWAY PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	15 Nov 2022
1101529	MANSO HOLDINGS PTY. LTD.	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	06 Jul 2009
1108156	MANSO HOLDINGS PTY. LTD.	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	29 Oct 2009
1126993	MANSO HOLDINGS PTY. LTD.	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	13 Jul 2011
1506412	MANSO HOLDINGS PTY. LTD.	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	07 Jun 2012

1 2 3 4 5 6

24 July 2023

For business and industry
For local government
Contact us

131 555 (tel:131555)

Online (https://www.epa.nsw.gov.au/about-us/contact-us/feedback)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on
(https://au.linkedin.com/company/nsw-environment-protection-
(https://www.youtube.com/channel/UCSwaEPA5jrgAEsHicGz
(https://twitter.com/NSWEPA)

Search results

Your search for: **General Search** with the following criteria

Suburb - forbes

returned 120 results

Export to excel 6 of 6 Pages Search Again

Number	Name	Location	Type	Status	Issued date
1559618	MANSO HOLDINGS PTY. LTD.	GAYMARDS LANE, FORBES, NSW 2871	s.58 Licence Variation	Issued	03 Jan 2018
3876	MICHELL AUSTRALIA PTY LTD	PARKES ROAD, FORBES, NSW 2871	POEO licence	Surrendered	09 Mar 2000
1014997	MICHELL AUSTRALIA PTY LTD	PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	14 Feb 2002
1026525	MICHELL AUSTRALIA PTY LTD	PARKES ROAD, FORBES, NSW 2871	s.58 Licence Variation	Issued	08 May 2003
1036229	MICHELL AUSTRALIA PTY LTD	PARKES ROAD, FORBES, NSW 2871	s.80 Surrender of a Licence	Issued	10 Jun 2004
1474	REGIONAL HARDROCK (FORBES) PTY LIMITED	GAYMARDS LANE, FORBES, NSW 2871	POEO licence	Issued	17 Jul 2000
1848	SWIFT AUSTRALIA (SOUTHERN) PTY LIMITED	NEWELL HIGHWAY, FORBES, NSW 2871	POEO licence	Surrendered	11 Sep 2000
1036597	SWIFT AUSTRALIA (SOUTHERN) PTY LIMITED	NEWELL HIGHWAY, FORBES, NSW 2871	s.58 Licence Variation	Issued	04 May 2004
1057067	SWIFT AUSTRALIA (SOUTHERN) PTY LIMITED	NEWELL HIGHWAY, FORBES, NSW 2871	s.80 Surrender of a Licence	Issued	24 Mar 2006
21509	TOPSOIL ORGANICS PTY LTD	N/A, FORBES, NSW 2871	POEO licence	Issued	11 May 2021
3501600	TOPSOIL ORGANICS PTY LTD	N/A, FORBES, NSW 2871	s.91 Clean Up Notice	Issued	14 Dec 2021
1618785	TOPSOIL ORGANICS PTY LTD	N/A, FORBES, NSW 2871	s.58 Licence Variation	Issued	10 Jun 2022
1626937	TOPSOIL ORGANICS PTY LTD	N/A, FORBES, NSW 2871	Compliance Audit	Complete	14 Mar 2023
1003199	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	08 Dec 2000
1024444	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	28 Apr 2003
1031755	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	16 Oct 2003
1036489	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	03 Sep 2004
1074741	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	24 Jul 2007
1098940	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	27 Mar 2009
1506253	TWYNAM PASTORAL CO PTY LTD	"THE MOUNT", FORBES, NSW 2871	s.58 Licence Variation	Issued	31 May 2012

1 2 3 4 5 6

24 July 2023

For business and industry

For local government

Contact us

131 555 (tel:131555)

Online (https://www.epa.nsw.gov.au/about-us/contact-us/feedback)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on (https://au.linkedin.com/company/nsw-environment-protection-authority-epa) (https://www.youtube.com/user/NSWEPA) (https://twitter.com/NSWEPA)

Suburb	SiteName	Address	ContaminationActivityType	ManagementClass	Latitude	Longitude
FIVE DOCK	Caltex Five Dock Service Station	47 Ramsay Road, corner Fairlight STREET	Service Station	Regulation under CLM Act not required	-33.87002804	151.1301835
FORBES	BP (Former Mobil) Depot Forbes	3-15 Union STREET	Other Petroleum	Regulation under CLM Act not required	-33.37751977	148.0101422
FORBES	Former Gasworks	24-26 Union STREET	Gasworks	Contamination currently regulated under CLM Act	-33.37752036	148.0090064
FORBES	Woolworths (Former Save on Fuel) Service Station	26 Dowling STREET	Service Station	Regulation under CLM Act not required	-33.38148764	148.0109845
FORBES	BP Service Station Forbes	29 Dowling STREET	Service Station	Regulation under CLM Act not required	-33.38121776	148.0100351
FORBES	Former Shell Depot	Stephen STREET	Other Petroleum	Regulation under CLM Act not required	-33.37704755	148.0103001
FORBES	Caltex Service Station Forbes	Parkes ROAD	Service Station	Regulation under CLM Act not required	-33.36333714	148.0223727
FORESTVILLE	BP Service Station, Forestville	632 Warringah ROAD	Service Station	Contamination formerly regulated under the CLM Act	-33.75997969	151.2142944
FORESTVILLE	Shell Service Station	667 Warringah ROAD	Service Station	Contamination formerly regulated under the CLM Act	-33.76035336	151.2184929
FORRESTERS BEACH	Caltex Service Station	The Entrance Rd Cnr Bellevue ROAD	Service Station	Regulation under CLM Act not required	-33.40057818	151.4687631
FORSTER	Caltex Service Station	16-18 Lake STREET	Service Station	Regulation under CLM Act not required	-32.18306967	152.5162492
FORSTER	Shell (Kneebone's) Service Station	2-6 The Lakes WAY	Service Station	Regulation under CLM Act not required	-32.1946108	152.5145662
FORSTER	Enhance (Former Mobil) Service Station	86-88 Macintosh STREET	Service Station	Regulation under CLM Act not required	-32.19079468	152.5154847
FREDERICKTON	Former Service station	2-4 Great North ROAD	Service Station	Regulation under CLM Act not required	-31.03513998	152.8794105
FRENCHS FOREST	Former BP Service Station	Russell AVENUE	Service Station	Regulation under CLM Act not required	-33.75018093	151.2245005

APPENDIX E

PLANNING CERTIFICATE

PLANNING CERTIFICATE UNDER SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Supplied in accordance with Subsection 2

Applicant: Sydney Environmental Group
63 /45 Huntley
Alexandria Nsw 2015

Your Reference:

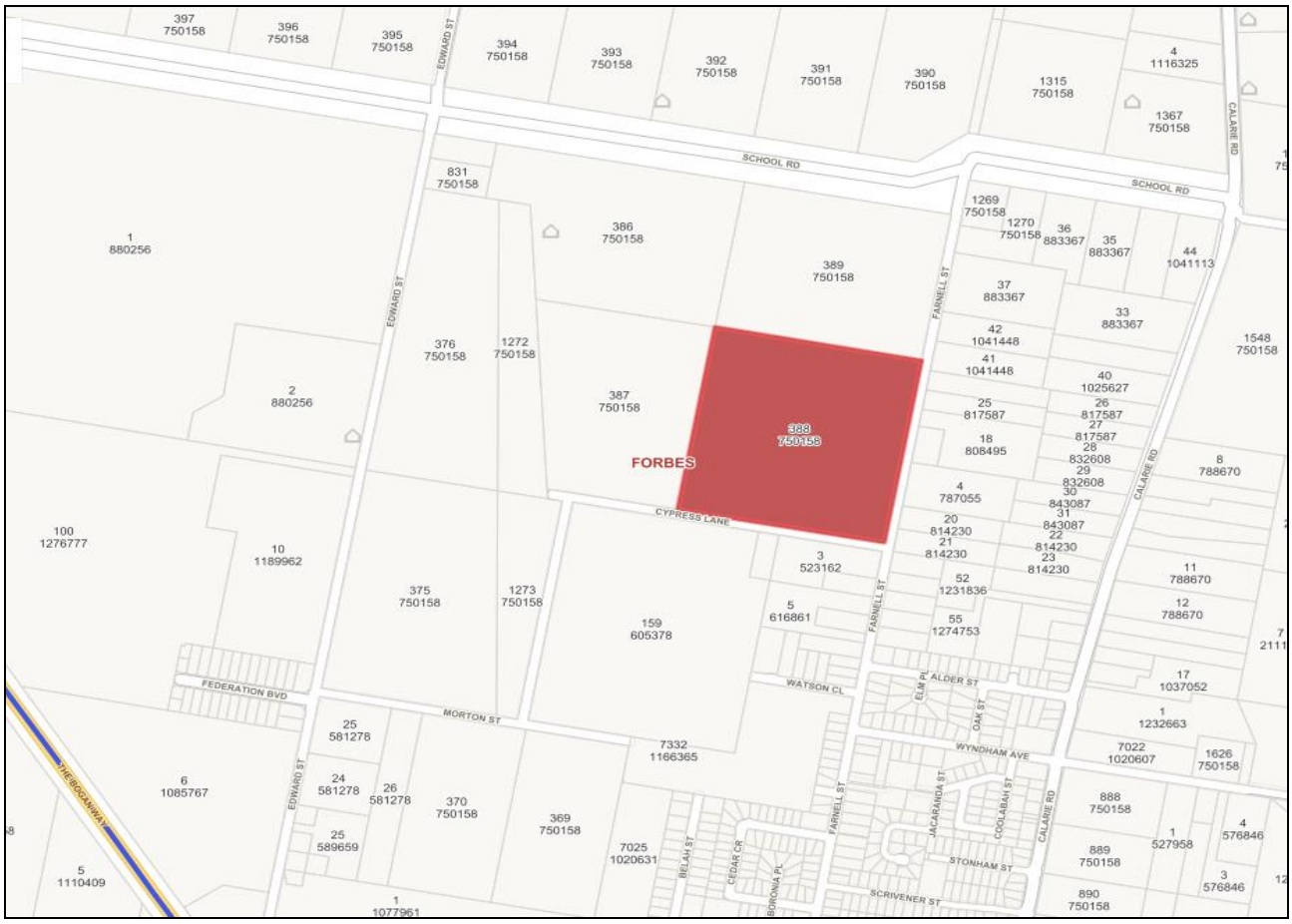
Certificate No: 9921 **Date:** 5 July 2023

Assessment Number: 2006543

Subject Land: Lot: 388 DP: 750158, School Road FORBES

Owners: Michelle Gowan Behan

Location Map: As shown on the map below, with parcel/property edged in red



Note *This drawing is provided by Forbes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details*

1	**Names of relevant planning instruments and DCPs** (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	*The Forbes Local Environmental Plan 2013 (FLEP 2013) (as amended) and the following State Environmental Planning Polices:* *State Environmental Planning Policy (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Transport and Infrastructure) 2021*
	(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	***Name of proposed policy:*** *The Fun SEPP* ***When publicly released:*** *Exhibited 29.10.2021 – 30.11.2021* ***Further Information:*** *The Fun SEPP is available for viewing on the NSW Planning Portal website.*
	(3) The name of each development control plan that applies to the carrying out of development on the land.	Forbes Development Control Plan 2013
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument.	Noted
2	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes the land in any zone (however described):	*R5 – Large Lot Residential*

(a) the identity of the zone	
(b) the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	*Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems*
(c) the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	*Bed and breakfast accommodation; Building identification signs; Business identification signs; Dual occupancies; Dwelling houses; Home industries; Roadside stalls; Any other development not specified in responses 2 (b) or (d)*
(d) the purposes for which the instrument provides that development is prohibited within the zone,	*Agriculture; Air transport facilities; Airstrips; Amusement centres; Animal boarding or training establishments; Biosolids treatment facilities; Boat building and repair facilities; Car parks; Cemeteries; Charter and tourism boating facilities; Commercial premises; Correctional centres; Crematoria; Entertainment facilities; Exhibition homes; Exhibition villages; Forestry; Freight transport facilities; Function centres; Heavy industrial storage establishments; Helipads; Highway service centres; Industrial retail outlets; Industrial training facilities; Industries; Marinas; Mooring pens; Moorings; Mortuaries; Open cut mining; Passenger transport facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major); Registered clubs; Research stations; Residential accommodation; Resource recovery facilities; Restricted premises; Rural industries; Service stations; Sewage treatment plants; Sex services premises; Signage; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Waste disposal facilities; Water treatment facilities; Wharf or boating facilities; Wholesale supplies*
(e) Whether additional permitted uses apply to the land	There are no additional permitted uses that apply to the land.
(f) whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so,	1Ha

	the minimum land dimensions so fixed,	
	(g) whether the land is in an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016*	No, the land is not an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016.*
	(h) whether the land is in a conservation area (however described),	No, the land is not located within a Heritage Conservation Area
	(i) whether an item of environmental heritage (however described) is situated on the land.	No, the land does not contain any item of environmental heritage
3	**Contributions plans** The name of each contributions plan applying to the land.	The Forbes Shire Council Section 7.12 Contribution Plan 2021 applies to the land.
4	**Complying development** (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land. (4) If the complying development codes are varied, under that Policy, clause 1.12, in relation to the land.	Development MAY be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

5	**Exempt Development** If the land is land on which exempt development may be carried out under each of the exempt development codes under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, because of that Policy, clause 1.16(1)(b1)–(d) or 1.16A. If exempt development may not be carried out on the land because of 1 of those clauses, the reasons why it may not be carried out under the clause. If the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land, a statement that— o a restriction applies to the land, but it may not apply to all of the land, and o the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land. o If the exempt development codes are varied, under that Policy, clause 1.12, in relation to the land.	Exempt Development may occur on the property in accordance with the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. Any person wishing to make use of this code should rely on their own investigations as to whether their proposal complies with the development standards of this code.
6	**Affected building notices and building product rectification orders** Whether the council is aware that— o an affected building notice is in force in relation to the land, or o a building product rectification order is in force in relation to the land that has not been fully complied with, or o a notice of intention to make a building product rectification order given in relation to the land is outstanding.	Council is not aware of any affected building notices in force that applies to the land. Council is not aware of any building product rectification order in force that applies to the land. Council is not aware of any intention to make a product rectification order that applies to the land.
7	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority,	No the subject land is not land reserved for acquisition

	as referred to in section 3.15 of the Act.	
8	**Road widening and road realignment** Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the *Roads Act 1993*, or	No
	(b) any environmental planning instrument, or	Council is not aware of any environmental planning instrument that may designate the subject site for future road widening or alignment
	(c) any resolution of the council.	There are currently no resolutions of council designating the subject site for future road widening or alignment.
9	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls. (2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. **Note** Words and expressions in this clause have the same meanings as in the Standard Instrument.	The subject property is not subject to flood related development controls as it is not flood liable.
10	**Council and other public authority policies on hazard risk restrictions** Whether any of the land is affected by an adopted policy that restricts the development of the land because of the likelihood of land slip, bush fire, tidal inundation, subsidence, acid sulfate soils, contamination, aircraft noise, salinity, coastal hazards, sea level rise or another risk, other than flooding.	*Salinity: Council is aware that some areas within the Shire are potentially liable to the impact of salinity. The applicant should make their own enquiries from the relevant authorities to establish if the property is suitable for the intended use.* *Contaminated Land: Council has a policy relating to Contaminated Lands, which also nominates relevant controls and a register of effected land. The applicant should rely on their own investigations against this policy.*

		The land subject to this certificate is affected by a policy adopted by the Rural Fire Service known as the 'Forbes LGA – Bush Fire Prone Land Map' that identifies categories which may restrict development of the land because of the likelihood of bush fire.
11	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No, the land is not bushfire prone
12	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on the register that is required to be maintained under that Division, a statement to that effect.	No, council is not aware of any loose fill asbestos NOTE: Some buildings located in the Forbes Local Government Area have been identified as containing loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation. You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the Council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose-fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants. Contact NSW Fair Trading for further information. Loose fill asbestos is easy to disturb and can become airborne and it is then easily inhaled. Inhaling asbestos fibres can result in serious illness including asbestosis, lung cancer and mesothelioma.
13	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*	The land is not proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*
14	**Paper subdivision information** (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed	Not applicable as the land is not part of a paper subdivision.

	to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. **Note** Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	
15	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No, Council is not aware of any property vegetation plans applicable to the subject land
16	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). **Note**. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.	No, Council is not aware of any biobanking agreement applicable to the subject land
17	**Biodiversity certified land** If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect. **Note**. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016.*	No, Council has not been notified that the subject site contains land classified as biodiversity certified land under Part 8 of the Biodiversity Act 2016.
18	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a	No, Council is not aware of any orders under the trees disputes between neighbours act which are applicable to the subject land

	tree on the land (but only if the council has been notified of the order).	
19	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works**	Not Applicable
20	**Western Sydney Aerotropolis**	Not applicable
21	**Site compatibility certificates and conditions for seniors housing** If *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 applies to the land, any conditions of a development consent granted after 11 October 2007 in relation to the land that are of the kind set out in that Policy, section 88(2).	Council is not aware of any valid Site Compatibility Certificate (Seniors Housing) issued in relation to the subject land *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 does not apply to the land.
22	**Site compatibility certificates and conditions for affordable rental housing** (1) A statement of whether there is a former site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) If *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 applies to the land, any conditions of a development consent in relation to the land that are of a kind referred to in that Policy, section 21(1) or 40(1). (3) Any conditions of development consent in relation to land thar are of a kind referred to in State Environmental Planning Policy (Affordable Rental Housing) 2009, Clause 17(1) or 38(1).	Council is not aware of a former site compatibility certificate for affordable rental housing that applies to the land. *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 does not apply to the land.
Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:		Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is significantly contaminated land

	Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to a management order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a voluntary management proposal Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to an ongoing maintenance order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a site audit statement

DISCLAIMERS:

1.1 Other authorities may hold information in respect of the property not contained in the Council's records, and

1.2 The Councils records themselves may not be complete or accurate in respect of the property; and

1.3 The Council cannot and does not accept any liability in respect of any error, inaccuracy or omission in this certificate which relates to any information provided to the Council by another authority or by another person.

2 The instruments referred to in this certificate may contain other important information in respect of the property. In order to understand the effects of the instrument(s) on the property, the Council advises that the whole of each instrument should be read and considered. This certificate cannot be used as a substitute for reading the whole of the instrument(s) referred to in the certificate.

3 It may be appropriate or necessary to obtain legal or other expert advice in respect of the matters contained in the certificate or the instruments referred to in the certificate.

Yours faithfully,



Per

Mathew Teale
DIRECTOR
PLANNING & GROWTH

PLANNING CERTIFICATE UNDER SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Supplied in accordance with Subsection 2

Applicant: Sydney Environmental Group
63 / 45 Huntley Street
Alexandria Nsw 2015

Your Reference:

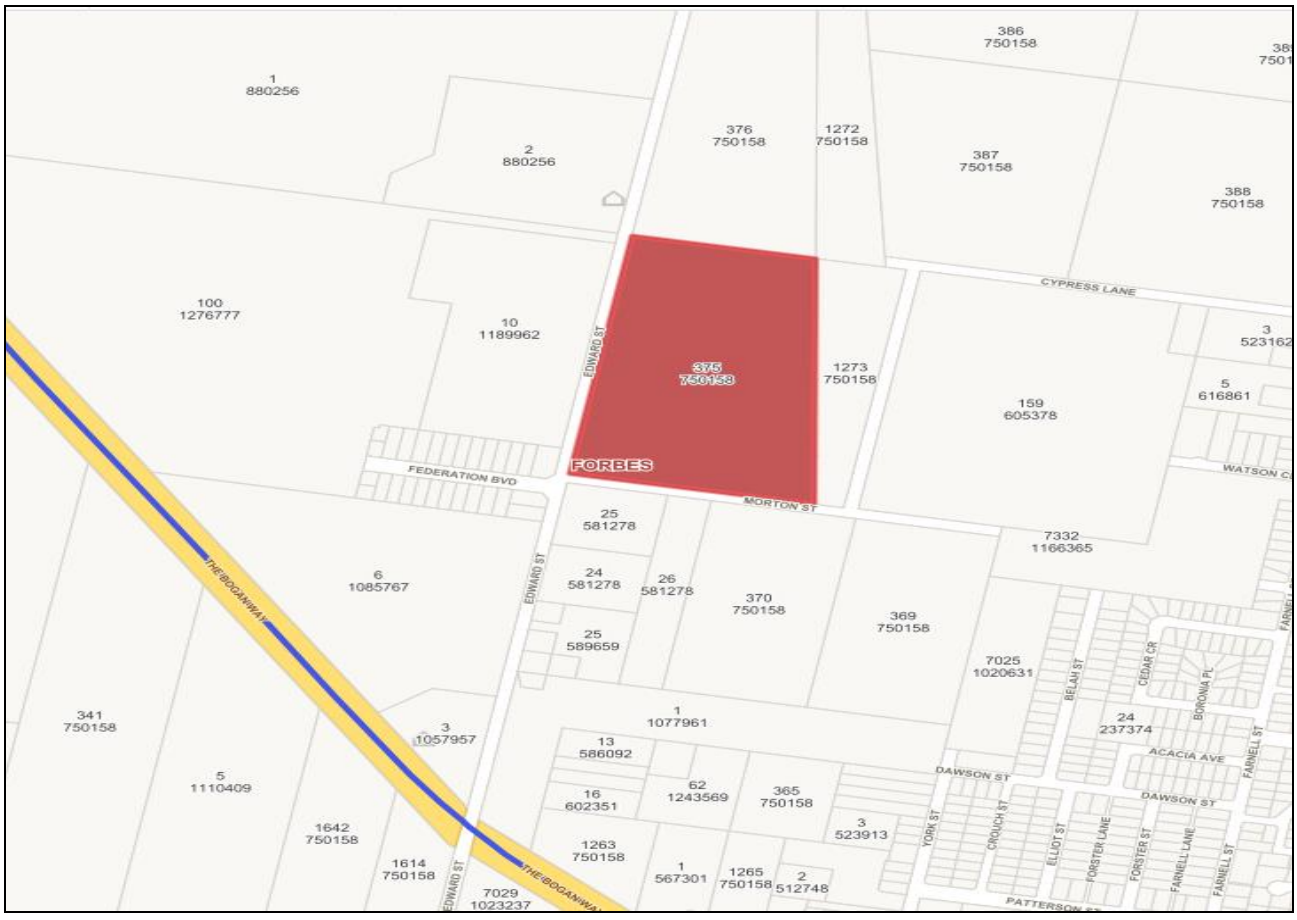
Certificate No: 9919 **Date:** 5 July 2023

Assessment Number: 2006543

Subject Land: Lot: 375 DP: 750158, School Road FORBES

Owners: Michelle Gowan Behan

Location Map: As shown on the map below, with parcel/property edged in red



Note *This drawing is provided by Forbes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details*

1	**Names of relevant planning instruments and DCPs** (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	*The Forbes Local Environmental Plan 2013 (FLEP 2013) (as amended) and the following State Environmental Planning Polices:* *State Environmental Planning Policy (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Transport and Infrastructure) 2021*
	(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	***Name of proposed policy:*** *The Fun SEPP* ***When publicly released:*** *Exhibited 29.10.2021 – 30.11.2021* ***Further Information:*** *The Fun SEPP is available for viewing on the NSW Planning Portal website.*
	(3) The name of each development control plan that applies to the carrying out of development on the land.	Forbes Development Control Plan 2013
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument.	Noted
2	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes	*RU1 – Primary Production* *RE1 – Public Recreation*

the land in any zone (however described): (a) the identity of the zone	
(b) the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	*RU1:* *Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems* *RE1:* *Environmental protection works; Roads; Water reticulation systems*
(c) the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	RU1: *Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Home businesses; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping material supplies; Open cut mining; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Veterinary hospitals; Water recreation structures; Water supply systems* *RE1:* *Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Car parks; Charter and tourism boating facilities; Child care centres; Community facilities; Environmental facilities; Flood mitigation works; Heliports; Information and education facilities; Jetties; Kiosks; Mooring pens; Moorings; Recreation areas; Recreation facilities (indoor);*

	Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Water recreation structures
(d) the purposes for which the instrument provides that development is prohibited within the zone,	*Any development not specified in responses 2 (b) or (c)*
(e) Whether additional permitted uses apply to the land	There are no additional permitted uses that apply to the land.
(f) whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed,	200Ha where the land is RU1 No MLS applies to the land zoned RE1
(g) whether the land is in an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016*	No, the land is not an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016.*
(h) whether the land is in a conservation area (however described),	No, the land is not located within a Heritage Conservation Area
(i) whether an item of environmental heritage (however described) is situated on the land.	No, the land does not contain any item of environmental heritage
3 Contributions plans The name of each contributions plan applying to the land.	The Forbes Shire Council Section 7.12 Contribution Plan 2021 applies to the land.
4 Complying development (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the	Development MAY be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

	provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land. (4) If the complying development codes are varied, under that Policy, clause 1.12, in relation to the land.	
5	**Exempt Development** If the land is land on which exempt development may be carried out under each of the exempt development codes under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, because of that Policy, clause 1.16(1)(b1)–(d) or 1.16A. If exempt development may not be carried out on the land because of 1 of those clauses, the reasons why it may not be carried out under the clause. If the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land, a statement that— o a restriction applies to the land, but it may not apply to all of the land, and o the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land. o If the exempt development codes are varied, under that Policy, clause 1.12, in relation to the land.	Exempt Development may occur on the property in accordance with the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. Any person wishing to make use of this code should rely on their own investigations as to whether their proposal complies with the development standards of this code.

6	**Affected building notices and building product rectification orders** Whether the council is aware that— o an affected building notice is in force in relation to the land, or o a building product rectification order is in force in relation to the land that has not been fully complied with, or o a notice of intention to make a building product rectification order given in relation to the land is outstanding.	Council is not aware of any affected building notices in force that applies to the land. Council is not aware of any building product rectification order in force that applies to the land. Council is not aware of any intention to make a product rectification order that applies to the land.
7	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 3.15 of the Act.	No the subject land is not land reserved for acquisition
8	**Road widening and road realignment** Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the *Roads Act 1993*, or	No
	(b) any environmental planning instrument, or	Council is not aware of any environmental planning instrument that may designate the subject site for future road widening or alignment
	(c) any resolution of the council.	There are currently no resolutions of council designating the subject site for future road widening or alignment.
9	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the	*Flooding development controls apply for all development on the subject site as it is designated as flood prone in accordance with Forbes Development Control Plan 2013 as part of the land is subject to the Cypress Lane Drainage Corridor.*

	purposes of group homes or seniors housing) is subject to flood related development controls. (2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. **Note** Words and expressions in this clause have the same meanings as in the Standard Instrument.	
10	**Council and other public authority policies on hazard risk restrictions** Whether any of the land is affected by an adopted policy that restricts the development of the land because of the likelihood of land slip, bush fire, tidal inundation, subsidence, acid sulfate soils, contamination, aircraft noise, salinity, coastal hazards, sea level rise or another risk, other than flooding.	*Salinity: Council is aware that some areas within the Shire are potentially liable to the impact of salinity. The applicant should make their own enquiries from the relevant authorities to establish if the property is suitable for the intended use.* *Contaminated Land: Council has a policy relating to Contaminated Lands, which also nominates relevant controls and a register of effected land. The applicant should rely on their own investigations against this policy.* *The land subject to this certificate is affected by a policy adopted by the Rural Fire Service known as the 'Forbes LGA – Bush Fire Prone Land Map' that identifies categories which may restrict development of the land because of the likelihood of bush fire.*
11	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No, the land is not bushfire prone
12	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on the register that is required to be maintained under that Division, a statement to that effect.	No, council is not aware of any loose fill asbestos NOTE: Some buildings located in the Forbes Local Government Area have been identified as containing loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation. You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the Council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose-fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants.

		Contact NSW Fair Trading for further information. Loose fill asbestos is easy to disturb and can become airborne and it is then easily inhaled. Inhaling asbestos fibres can result in serious illness including asbestosis, lung cancer and mesothelioma.
13	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*	The land is not proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*
14	**Paper subdivision information** (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. **Note** Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	Not applicable as the land is not part of a paper subdivision.
15	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No, Council is not aware of any property vegetation plans applicable to the subject land
16	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). **Note**. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements	No, Council is not aware of any biobanking agreement applicable to the subject land

	under Part 5 of the *Biodiversity Conservation Act 2016*.	
17	**Biodiversity certified land** If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect. **Note**. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016.*	No, Council has not been notified that the subject site contains land classified as biodiversity certified land under Part 8 of the Biodiversity Act 2016.
18	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).	No, Council is not aware of any orders under the trees disputes between neighbours act which are applicable to the subject land
19	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works**	Not Applicable
20	**Western Sydney Aerotropolis**	Not applicable
21	**Site compatibility certificates and conditions for seniors housing** If *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 applies to the land, any conditions of a development consent granted after 11 October 2007 in relation to the land that are of the kind set out in that Policy, section 88(2).	Council is not aware of any valid Site Compatibility Certificate (Seniors Housing) issued in relation to the subject land *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 does not apply to the land.
22	**Site compatibility certificates and conditions for affordable rental housing** (1) A statement of whether there is a former site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to	Council is not aware of a former site compatibility certificate for affordable rental housing that applies to the land. *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 does not apply to the land.

include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) If *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 applies to the land, any conditions of a development consent in relation to the land that are of a kind referred to in that Policy, section 21(1) or 40(1). (3) Any conditions of development consent in relation to land thar are of a kind referred to in State Environmental Planning Policy (Affordable Rental Housing) 2009, Clause 17(1) or 38(1).	
Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:	Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is significantly contaminated land Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to a management order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a voluntary management proposal Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to an ongoing maintenance order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a site audit statement

DISCLAIMERS:

1.1 Other authorities may hold information in respect of the property not contained in the Council's records, and

1.2 The Councils records themselves may not be complete or accurate in respect of the property; and

1.3 The Council cannot and does not accept any liability in respect of any error, inaccuracy or omission in this certificate which relates to any information provided to the Council by another authority or by another person.

2 The instruments referred to in this certificate may contain other important information in respect of the property. In order to understand the effects of the instrument(s) on the property, the Council advises that the whole of each instrument should be read and considered. This certificate cannot be used as a substitute for reading the whole of the instrument(s) referred to in the certificate.

3 It may be appropriate or necessary to obtain legal or other expert advice in respect of the matters contained in the certificate or the instruments referred to in the certificate.

Yours faithfully,



Per

Mathew Teale
DIRECTOR
PLANNING & GROWTH

PLANNING CERTIFICATE UNDER SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Supplied in accordance with Subsection 2

Applicant: Sydney Environmental Group
63 /45 Huntley
Alexandria Nsw 2015

Your Reference:

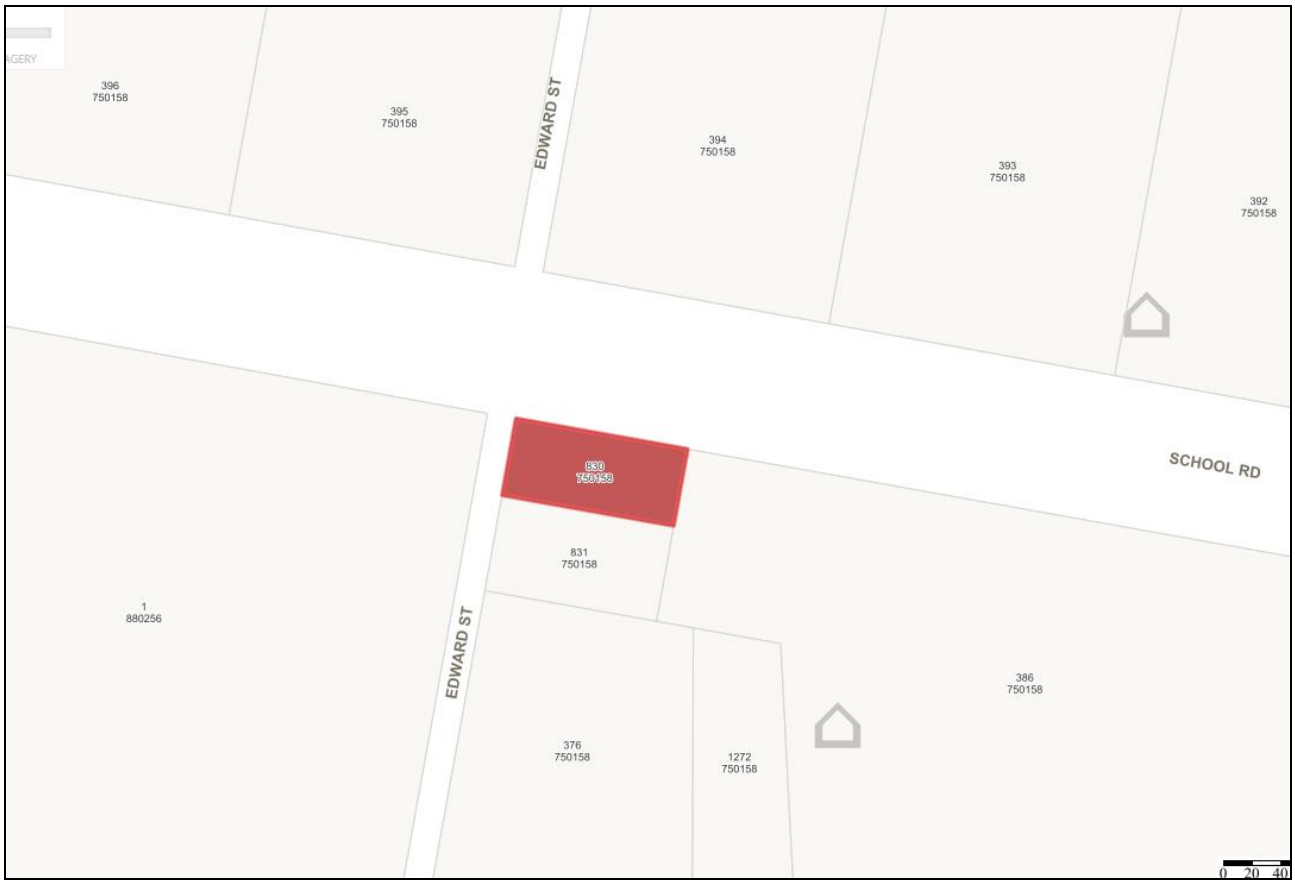
Certificate No: 9922 **Date:** 5 July 2023

Assessment Number: 2006543

Subject Land: Lot: 830 DP: 750158, School Road FORBES

Owners: Michelle Gowan Behan

Location Map: As shown on the map below, with parcel/property edged in red



Note *This drawing is provided by Forbes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details*

1	**Names of relevant planning instruments and DCPs** (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	*The Forbes Local Environmental Plan 2013 (FLEP 2013) (as amended) and the following State Environmental Planning Polices:* *State Environmental Planning Policy (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Transport and Infrastructure) 2021*
	(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	***Name of proposed policy:*** *The Fun SEPP* ***When publicly released:*** *Exhibited 29.10.2021 – 30.11.2021* ***Further Information:*** *The Fun SEPP is available for viewing on the NSW Planning Portal website.*
	(3) The name of each development control plan that applies to the carrying out of development on the land.	Forbes Development Control Plan 2013
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument.	Noted
2	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes the land in any zone (however described):	*RU1 – Primary Production*

(a)	the identity of the zone	
(b)	the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	*Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems*
(c)	the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	*Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Home businesses; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping material supplies; Open cut mining; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Veterinary hospitals; Water recreation structures; Water supply systems*
(d)	the purposes for which the instrument provides that development is prohibited within the zone,	*Any development not specified in responses 2 (b) or (c)*
(e)	Whether additional permitted uses apply to the land	There are no additional permitted uses that apply to the land.
(f)	whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed,	200 Ha

	(g) whether the land is in an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016*	No, the land is not an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016.*
	(h) whether the land is in a conservation area (however described),	No, the land is not located within a Heritage Conservation Area
	(i) whether an item of environmental heritage (however described) is situated on the land.	No, the land does not contain any item of environmental heritage
3	**Contributions plans** The name of each contributions plan applying to the land.	The Forbes Shire Council Section 7.12 Contribution Plan 2021 applies to the land.
4	**Complying development** (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land. (4) If the complying development codes are varied, under that Policy, clause 1.12, in relation to the land.	Development MAY be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
5	**Exempt Development**	Exempt Development may occur on the property in accordance with the State Environmental Planning

	If the land is land on which exempt development may be carried out under each of the exempt development codes under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, because of that Policy, clause 1.16(1)(b1)–(d) or 1.16A. If exempt development may not be carried out on the land because of 1 of those clauses, the reasons why it may not be carried out under the clause. If the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land, a statement that— o a restriction applies to the land, but it may not apply to all of the land, and o the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land. o If the exempt development codes are varied, under that Policy, clause 1.12, in relation to the land.	Policy (Exempt and Complying Development Codes) 2008. Any person wishing to make use of this code should rely on their own investigations as to whether their proposal complies with the development standards of this code.
6	**Affected building notices and building product rectification orders** Whether the council is aware that— o an affected building notice is in force in relation to the land, or o a building product rectification order is in force in relation to the land that has not been fully complied with, or o a notice of intention to make a building product rectification order given in relation to the land is outstanding.	Council is not aware of any affected building notices in force that applies to the land. Council is not aware of any building product rectification order in force that applies to the land. Council is not aware of any intention to make a product rectification order that applies to the land.
7	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 3.15 of the Act.	No the subject land is not land reserved for acquisition
8	**Road widening and road realignment**	No

	Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the *Roads Act 1993*, or	
	(b) any environmental planning instrument, or	Council is not aware of any environmental planning instrument that may designate the subject site for future road widening or alignment
	(c) any resolution of the council.	There are currently no resolutions of council designating the subject site for future road widening or alignment.
9	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls. (2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. **Note** Words and expressions in this clause have the same meanings as in the Standard Instrument.	The subject property is not subject to flood related development controls as it is not flood liable.
10	**Council and other public authority policies on hazard risk restrictions** Whether any of the land is affected by an adopted policy that restricts the development of the land because of the likelihood of land slip, bush fire, tidal inundation, subsidence, acid sulfate soils, contamination, aircraft noise, salinity, coastal hazards, sea level rise or another risk, other than flooding.	*Salinity: Council is aware that some areas within the Shire are potentially liable to the impact of salinity. The applicant should make their own enquiries from the relevant authorities to establish if the property is suitable for the intended use.* *Contaminated Land: Council has a policy relating to Contaminated Lands, which also nominates relevant controls and a register of effected land. The applicant should rely on their own investigations against this policy.* *The land subject to this certificate is affected by a policy adopted by the Rural Fire Service known as the 'Forbes LGA – Bush Fire Prone Land Map' that identifies categories which may restrict development of the land because of the likelihood of bush fire.*

11	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No, the land is not bushfire prone
12	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on the register that is required to be maintained under that Division, a statement to that effect.	No, council is not aware of any loose fill asbestos NOTE: Some buildings located in the Forbes Local Government Area have been identified as containing loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation. You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the Council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose-fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants. Contact NSW Fair Trading for further information. Loose fill asbestos is easy to disturb and can become airborne and it is then easily inhaled. Inhaling asbestos fibres can result in serious illness including asbestosis, lung cancer and mesothelioma.
13	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*	The land is not proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*
14	**Paper subdivision information** (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. **Note** Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	Not applicable as the land is not part of a paper subdivision.

15	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No, Council is not aware of any property vegetation plans applicable to the subject land
16	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). **Note**. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.	No, Council is not aware of any biobanking agreement applicable to the subject land
17	**Biodiversity certified land** If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect. **Note**. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016.*	No, Council has not been notified that the subject site contains land classified as biodiversity certified land under Part 8 of the Biodiversity Act 2016.
18	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).	No, Council is not aware of any orders under the trees disputes between neighbours act which are applicable to the subject land
19	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works**	Not Applicable

20	**Western Sydney Aerotropolis**	Not applicable
21	**Site compatibility certificates and conditions for seniors housing** If *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 applies to the land, any conditions of a development consent granted after 11 October 2007 in relation to the land that are of the kind set out in that Policy, section 88(2).	Council is not aware of any valid Site Compatibility Certificate (Seniors Housing) issued in relation to the subject land *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 does not apply to the land.
22	**Site compatibility certificates and conditions for affordable rental housing** (1) A statement of whether there is a former site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) If *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 applies to the land, any conditions of a development consent in relation to the land that are of a kind referred to in that Policy, section 21(1) or 40(1). (3) Any conditions of development consent in relation to land thar are of a kind referred to in State Environmental Planning Policy (Affordable Rental Housing) 2009, Clause 17(1) or 38(1).	Council is not aware of a former site compatibility certificate for affordable rental housing that applies to the land. *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 does not apply to the land.
Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:		Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is significantly contaminated land Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to a management order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a voluntary management proposal

	Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to an ongoing maintenance order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a site audit statement

DISCLAIMERS:

1.1 Other authorities may hold information in respect of the property not contained in the Council's records, and

1.2 The Councils records themselves may not be complete or accurate in respect of the property; and

1.3 The Council cannot and does not accept any liability in respect of any error, inaccuracy or omission in this certificate which relates to any information provided to the Council by another authority or by another person.

2 The instruments referred to in this certificate may contain other important information in respect of the property. In order to understand the effects of the instrument(s) on the property, the Council advises that the whole of each instrument should be read and considered. This certificate cannot be used as a substitute for reading the whole of the instrument(s) referred to in the certificate.

3 It may be appropriate or necessary to obtain legal or other expert advice in respect of the matters contained in the certificate or the instruments referred to in the certificate.

Yours faithfully,



Per

Mathew Teale
DIRECTOR
PLANNING & GROWTH

PLANNING CERTIFICATE UNDER SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Supplied in accordance with Subsection 2

Applicant: Sydney Environmental Group
63 /45 Huntley
Alexandria Nsw 2015

Your Reference:

Certificate No: 9923 **Date:** 5 July 2023

Assessment Number: 2006543

Subject Land: Lot: 1273 DP: 750158, School Road FORBES

Owners: Michelle Gowan Behan

Location Map: As shown on the map below, with parcel/property edged in red



Note *This drawing is provided by Forbes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details*

1	**Names of relevant planning instruments and DCPs** (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	*The Forbes Local Environmental Plan 2013 (FLEP 2013) (as amended) and the following State Environmental Planning Polices:* *State Environmental Planning Policy (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Transport and Infrastructure) 2021*
	(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	***Name of proposed policy:*** *The Fun SEPP* ***When publicly released:*** *Exhibited 29.10.2021 – 30.11.2021* ***Further Information:*** *The Fun SEPP is available for viewing on the NSW Planning Portal website.*
	(3) The name of each development control plan that applies to the carrying out of development on the land.	Forbes Development Control Plan 2013
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument.	Noted
2	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes the land in any zone (however described):	*RU1 – Primary Production* *RE1 – Public Recreation*

(a)	the identity of the zone	
(b)	the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	*RU1:* *Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems* *RE1:* *Environmental protection works; Roads; Water reticulation systems*
(c)	the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	*RU1:* *Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Home businesses; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping*

	material supplies; Open cut mining; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Veterinary hospitals; Water recreation structures; Water supply systems *RE1:* *Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Car parks; Charter and tourism boating facilities; Child care centres; Community facilities; Environmental facilities; Flood mitigation works; Heliports; Information and education facilities; Jetties; Kiosks; Mooring pens; Moorings; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Water recreation structures*
(d) the purposes for which the instrument provides that development is prohibited within the zone,	*Any development not specified in responses 2 (b) or (c)*
(e) Whether additional permitted uses apply to the land	There are no additional permitted uses that apply to the land.
(f) whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed,	200 Ha
(g) whether the land is in an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016*	No, the land is not an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016.*
(h) whether the land is in a conservation area (however described),	No, the land is not located within a Heritage Conservation Area
(i) whether an item of environmental heritage (however described) is situated on the land.	No, the land does not contain any item of environmental heritage
3 Contributions plans The name of each contributions plan	The Forbes Shire Council Section 7.12 Contribution Plan 2021 applies to the land.

	applying to the land.	
4	**Complying development** (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land. (4) If the complying development codes are varied, under that Policy, clause 1.12, in relation to the land.	Development MAY be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
5	**Exempt Development** If the land is land on which exempt development may be carried out under each of the exempt development codes under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, because of that Policy, clause 1.16(1)(b1)–(d) or 1.16A. If exempt development may not be carried out on the land because of 1 of those clauses, the reasons why it may not be carried out under the clause. If the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land, a statement that— o a restriction applies to the land, but it may not apply to all of the land,	Exempt Development may occur on the property in accordance with the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. Any person wishing to make use of this code should rely on their own investigations as to whether their proposal complies with the development standards of this code.

	and ○ the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land. ○ If the exempt development codes are varied, under that Policy, clause 1.12, in relation to the land.	
6	**Affected building notices and building product rectification orders** Whether the council is aware that— ○ an affected building notice is in force in relation to the land, or ○ a building product rectification order is in force in relation to the land that has not been fully complied with, or ○ a notice of intention to make a building product rectification order given in relation to the land is outstanding.	Council is not aware of any affected building notices in force that applies to the land. Council is not aware of any building product rectification order in force that applies to the land. Council is not aware of any intention to make a product rectification order that applies to the land.
7	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 3.15 of the Act.	Yes, part of the land is reserved for public acquisition.
8	**Road widening and road realignment** Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the *Roads Act 1993*, or	No
	(b) any environmental planning instrument, or	Council is not aware of any environmental planning instrument that may designate the subject site for future road widening or alignment
	(c) any resolution of the council.	There are currently no resolutions of council designating the subject site for future road widening or alignment.

9	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls. (2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. **Note** Words and expressions in this clause have the same meanings as in the Standard Instrument.	*Flooding development controls apply for all development on the subject site as it is designated as flood prone in accordance with Forbes Development Control Plan 2013.*
10	**Council and other public authority policies on hazard risk restrictions** Whether any of the land is affected by an adopted policy that restricts the development of the land because of the likelihood of land slip, bush fire, tidal inundation, subsidence, acid sulfate soils, contamination, aircraft noise, salinity, coastal hazards, sea level rise or another risk, other than flooding.	*Salinity: Council is aware that some areas within the Shire are potentially liable to the impact of salinity. The applicant should make their own enquiries from the relevant authorities to establish if the property is suitable for the intended use.* *Contaminated Land: Council has a policy relating to Contaminated Lands, which also nominates relevant controls and a register of effected land. The applicant should rely on their own investigations against this policy.* *The land subject to this certificate is affected by a policy adopted by the Rural Fire Service known as the 'Forbes LGA – Bush Fire Prone Land Map' that identifies categories which may restrict development of the land because of the likelihood of bush fire.*
11	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No, the land is not bushfire prone
12	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on the register that is required to be	No, council is not aware of any loose fill asbestos NOTE: Some buildings located in the Forbes Local Government Area have been identified as containing loose-fill asbestos insulation, for example in the roof

	maintained under that Division, a statement to that effect.	space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation. You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the Council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose-fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants. Contact NSW Fair Trading for further information. Loose fill asbestos is easy to disturb and can become airborne and it is then easily inhaled. Inhaling asbestos fibres can result in serious illness including asbestosis, lung cancer and mesothelioma.
13	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*	The land is not proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*
14	**Paper subdivision information** (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. **Note** Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	Not applicable as the land is not part of a paper subdivision.
15	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No, Council is not aware of any property vegetation plans applicable to the subject land
16	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that	No, Council is not aware of any biobanking agreement applicable to the subject land

	effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). **Note**. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.	
17	**Biodiversity certified land** If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect. **Note**. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016.*	No, Council has not been notified that the subject site contains land classified as biodiversity certified land under Part 8 of the Biodiversity Act 2016.
18	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).	No, Council is not aware of any orders under the trees disputes between neighbours act which are applicable to the subject land
19	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works**	Not Applicable
20	**Western Sydney Aerotropolis**	Not applicable
21	**Site compatibility certificates and conditions for seniors housing** If *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 applies to the land, any conditions of a development consent granted after 11 October 2007 in relation to the land that are of the kind set out in that Policy, section 88(2).	Council is not aware of any valid Site Compatibility Certificate (Seniors Housing) issued in relation to the subject land *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 does not apply to the land.
22	**Site compatibility certificates and conditions for affordable rental housing** (1) A statement of whether there is a former site compatibility certificate	Council is not aware of a former site compatibility certificate for affordable rental housing that applies to the land. *State Environmental Planning Policy (Housing)*

(affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) If *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 applies to the land, any conditions of a development consent in relation to the land that are of a kind referred to in that Policy, section 21(1) or 40(1). (3) Any conditions of development consent in relation to land thar are of a kind referred to in State Environmental Planning Policy (Affordable Rental Housing) 2009, Clause 17(1) or 38(1).	*2021*, Chapter 2, Part 2, Division 1 or 5 does not apply to the land.
Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:	Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is significantly contaminated land Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to a management order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a voluntary management proposal Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to an ongoing maintenance order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a site audit statement

DISCLAIMERS:

1.1 Other authorities may hold information in respect of the property not contained in the Council's records, and

1.2 The Councils records themselves may not be complete or accurate in respect of the property; and

1.3 The Council cannot and does not accept any liability in respect of any error, inaccuracy or omission in this certificate which relates to any information provided to the Council by another authority or by another person.

2 The instruments referred to in this certificate may contain other important information in respect of the property. In order to understand the effects of the instrument(s) on the property, the Council advises that the whole of each instrument should be read and considered. This certificate cannot be used as a substitute for reading the whole of the instrument(s) referred to in the certificate.

3 It may be appropriate or necessary to obtain legal or other expert advice in respect of the matters contained in the certificate or the instruments referred to in the certificate.

Yours faithfully,



Per

Mathew Teale
DIRECTOR
PLANNING & GROWTH

PLANNING CERTIFICATE UNDER SECTION 10.7 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Supplied in accordance with Subsection 2

Applicant: Sydney Environmental Group
6345 Huntley
Alexandria Nsw 2015

Your Reference:

Certificate No: 9927 **Date:** 5 July 2023

Assessment Number: 2006543

Subject Land: Lot: 386 DP: 750158, School Road FORBES

Owners: Michelle Gowan Behan

Location Map: As shown on the map below, with parcel/property edged in red



Note *This drawing is provided by Forbes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details*

1	**Names of relevant planning instruments and DCPs** (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	*The Forbes Local Environmental Plan 2013 (FLEP 2013) (as amended) and the following State Environmental Planning Polices:* *State Environmental Planning Policy (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Transport and Infrastructure) 2021*
	(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	***Name of proposed policy:*** *The Fun SEPP* ***When publicly released:*** *Exhibited 29.10.2021 – 30.11.2021* ***Further Information:*** *The Fun SEPP is available for viewing on the NSW Planning Portal website.*
	(3) The name of each development control plan that applies to the carrying out of development on the land.	Forbes Development Control Plan 2013
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument.	Noted
2	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes the land in any zone (however described):	*RU1 – Primary Production*

(a) the identity of the zone	
(b) the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	*Environmental protection works; Extensive agriculture; Home-based child care; Home occupations; Roads; Water reticulation systems*
(c) the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	*Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Forestry; Freight transport facilities; General industries; Heavy industrial storage establishments; Heavy industries; Helipads; Home businesses; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Intensive plant agriculture; Jetties; Landscaping material supplies; Open cut mining; Places of public worship; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Veterinary hospitals; Water recreation structures; Water supply systems*
(d) the purposes for which the instrument provides that development is prohibited within the zone,	*Any development not specified in responses 2 (b) or (c)*
(e) Whether additional permitted uses apply to the land	There are no additional permitted uses that apply to the land.
(f) whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling-house on the land and, if so, the minimum land dimensions so fixed,	200ha
(g) whether the land is in an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016*	No, the land is not an area of outstanding biodiversity value under the *Biodiversity Conservation Act 2016.*
(h) whether the land is in a conservation area (however described),	No, the land is not located within a Heritage Conservation Area

	(i) whether an item of environmental heritage (however described) is situated on the land.	No, the land does not contain any item of environmental heritage
3	**Contributions plans** The name of each contributions plan applying to the land.	The Forbes Shire Council Section 7.12 Contribution Plan 2021 applies to the land.
4	**Complying development** (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land. (4) If the complying development codes are varied, under that Policy, clause 1.12, in relation to the land.	Development MAY be carried out under each of the codes for complying development because of the provisions of clauses 1.17A(1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
5	**Exempt Development** If the land is land on which exempt development may be carried out under each of the exempt development codes under State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, because of that Policy, clause 1.16(1)(b1)–(d) or 1.16A. If exempt development may not be carried out on the land because of 1 of those	Exempt Development may occur on the property in accordance with the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. Any person wishing to make use of this code should rely on their own investigations as to whether their proposal complies with the development standards of this code.

	clauses, the reasons why it may not be carried out under the clause. If the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land, a statement that— o a restriction applies to the land, but it may not apply to all of the land, and o the council does not have sufficient information to ascertain the extent to which exempt development may or may not be carried out on the land. o If the exempt development codes are varied, under that Policy, clause 1.12, in relation to the land.	
6	**Affected building notices and building product rectification orders** Whether the council is aware that— o an affected building notice is in force in relation to the land, or o a building product rectification order is in force in relation to the land that has not been fully complied with, or o a notice of intention to make a building product rectification order given in relation to the land is outstanding.	Council is not aware of any affected building notices in force that applies to the land. Council is not aware of any building product rectification order in force that applies to the land. Council is not aware of any intention to make a product rectification order that applies to the land.
7	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 3.15 of the Act.	No the subject land is not land reserved for acquisition
8	**Road widening and road realignment** Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the *Roads Act 1993*, or	No
	(b) any environmental planning instrument, or	Council is not aware of any environmental planning instrument that may designate the subject site for

		future road widening or alignment
	(c) any resolution of the council.	There are currently no resolutions of council designating the subject site for future road widening or alignment.
9	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls. (2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. **Note** Words and expressions in this clause have the same meanings as in the Standard Instrument.	The subject property is not subject to flood related development controls as it is not flood liable.
10	**Council and other public authority policies on hazard risk restrictions** Whether any of the land is affected by an adopted policy that restricts the development of the land because of the likelihood of land slip, bush fire, tidal inundation, subsidence, acid sulfate soils, contamination, aircraft noise, salinity, coastal hazards, sea level rise or another risk, other than flooding.	*Salinity: Council is aware that some areas within the Shire are potentially liable to the impact of salinity. The applicant should make their own enquiries from the relevant authorities to establish if the property is suitable for the intended use.* *Contaminated Land: Council has a policy relating to Contaminated Lands, which also nominates relevant controls and a register of effected land. The applicant should rely on their own investigations against this policy.* *The land subject to this certificate is affected by a policy adopted by the Rural Fire Service known as the 'Forbes LGA – Bush Fire Prone Land Map' that identifies categories which may restrict development of the land because of the likelihood of bush fire.*

11	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No, the land is not bushfire prone
12	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the *Home Building Act 1989*) that are listed on the register that is required to be maintained under that Division, a statement to that effect.	No, council is not aware of any loose fill asbestos NOTE: Some buildings located in the Forbes Local Government Area have been identified as containing loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation. You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the Council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose-fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants. Contact NSW Fair Trading for further information. Loose fill asbestos is easy to disturb and can become airborne and it is then easily inhaled. Inhaling asbestos fibres can result in serious illness including asbestosis, lung cancer and mesothelioma.
13	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*	The land is not proclaimed to be a mine subsidence district within the meaning of section 15 of the *Mine Subsidence Compensation Act 1961.*
14	**Paper subdivision information** (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. **Note** Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	Not applicable as the land is not part of a paper subdivision.

15	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the *Native Vegetation Act 2003* (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No, Council is not aware of any property vegetation plans applicable to the subject land
16	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the *Biodiversity Conservation Act 2016*, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). **Note**. Biodiversity stewardship agreements include biobanking agreements under Part 7A of the *Threatened Species Conservation Act 1995* that are taken to be biodiversity stewardship agreements under Part 5 of the *Biodiversity Conservation Act 2016*.	No, Council is not aware of any biobanking agreement applicable to the subject land
17	**Biodiversity certified land** If the land is biodiversity certified land under Part 8 of the *Biodiversity Conservation Act 2016*, a statement to that effect. **Note**. Biodiversity certified land includes land certified under Part 7AA of the *Threatened Species Conservation Act 1995* that is taken to be certified under Part 8 of the *Biodiversity Conservation Act 2016.*	No, Council has not been notified that the subject site contains land classified as biodiversity certified land under Part 8 of the Biodiversity Act 2016.
18	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).	No, Council is not aware of any orders under the trees disputes between neighbours act which are applicable to the subject land
19	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works**	Not Applicable

20	**Western Sydney Aerotropolis**	Not applicable
21	**Site compatibility certificates and conditions for seniors housing** If *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 applies to the land, any conditions of a development consent granted after 11 October 2007 in relation to the land that are of the kind set out in that Policy, section 88(2).	Council is not aware of any valid Site Compatibility Certificate (Seniors Housing) issued in relation to the subject land *State Environmental Planning Policy (Housing) 2021*, Chapter 3, Part 5 does not apply to the land.
22	**Site compatibility certificates and conditions for affordable rental housing** (1) A statement of whether there is a former site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) If *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 applies to the land, any conditions of a development consent in relation to the land that are of a kind referred to in that Policy, section 21(1) or 40(1). (3) Any conditions of development consent in relation to land thar are of a kind referred to in State Environmental Planning Policy (Affordable Rental Housing) 2009, Clause 17(1) or 38(1).	Council is not aware of a former site compatibility certificate for affordable rental housing that applies to the land. *State Environmental Planning Policy (Housing) 2021*, Chapter 2, Part 2, Division 1 or 5 does not apply to the land.
Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:		Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is significantly contaminated land Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to a management order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a voluntary management proposal

	Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject to an ongoing maintenance order Forbes Shire Council has not been advised by the Department of Environment & Heritage that the land is subject of a site audit statement

DISCLAIMERS:

1.1 Other authorities may hold information in respect of the property not contained in the Council's records, and

1.2 The Councils records themselves may not be complete or accurate in respect of the property; and

1.3 The Council cannot and does not accept any liability in respect of any error, inaccuracy or omission in this certificate which relates to any information provided to the Council by another authority or by another person.

2 The instruments referred to in this certificate may contain other important information in respect of the property. In order to understand the effects of the instrument(s) on the property, the Council advises that the whole of each instrument should be read and considered. This certificate cannot be used as a substitute for reading the whole of the instrument(s) referred to in the certificate.

3 It may be appropriate or necessary to obtain legal or other expert advice in respect of the matters contained in the certificate or the instruments referred to in the certificate.

Yours faithfully,



Per

Mathew Teale
DIRECTOR
PLANNING & GROWTH

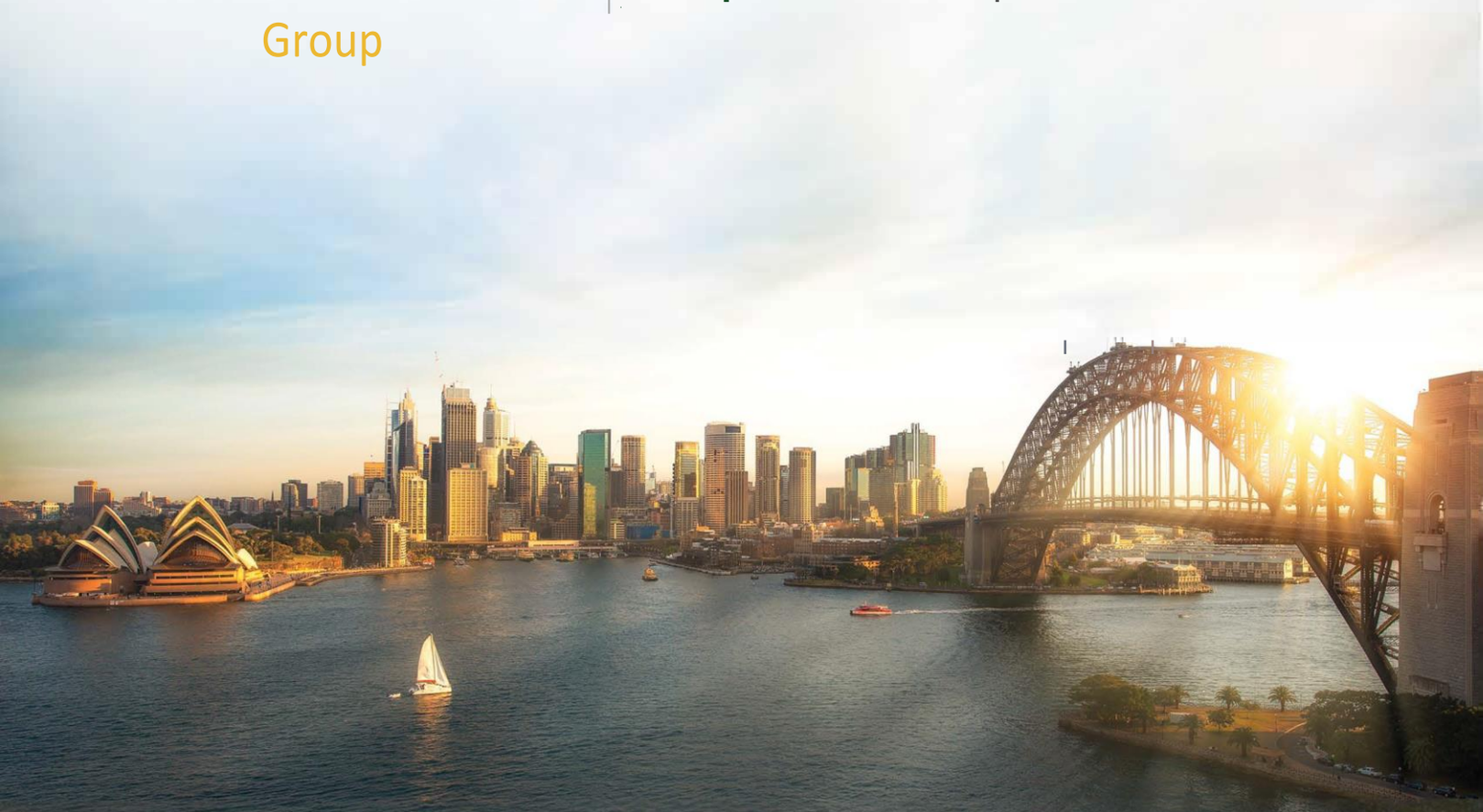
Sydney Environmental Group

Asbestos Characterisation Assessment

Lots 375, 376, 386-389, 830, 831, 1272 & 1273
DP 750158, School Road, Forbes NSW

ForbesView Pty Ltd (c/- Allera)

Report No: 2116-ACA-01-250723.v3f
Report Date: 29 September 2023

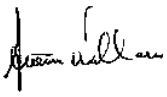


Sydney Environmental Group Pty Ltd PO Box A1420, Sydney South NSW
Info@sydneyenvironmental.com.au

NOTICE: The information in this report is privileged and confidential, intended only for the use of the client above. This publication may not, therefore, be lent, copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form without the express written permission of Sydney Environmental Group.

DOCUMENT RECORD

Revision	Date	Author	Reviewer
v1f	28 July 2023	Mitchell Kirby	Steven Wallace
v2f	14 September 2023	Mitchell Kirby	Steven Wallace
v3f	29 September 2023	Mitchell Kirby	Steven Wallace

Author Signature		**Reviewer Signature**	
Name	Mitchell Kirby	**Name**	Steven Wallace
Credentials	M.Envir.Sci., B.Nat.Sci. Licensed Asbestos Assessor LAA002039	**Credentials**	CEnvP, M.Sc.Envir.Sci, B.Sc. Meteorology, NSW Licensed Asbestos Assessor (LAA) (LAA001096)
Title	Environmental Scientist	**Title**	Managing Consultant

Document Title:	Asbestos Characterisation Assessment, Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Site Address:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Client Name:	ForbesView Pty Ltd (c/- Allera)
Site Size:	≈ 92 ha
Reference Number:	2119-ACA-01-250723.v3f
Project Type:	Asbestos Characterisation Assessment
Project Type Abbreviation:	ACA
Document Draft:	FINAL
Document Revision No.	v3

Prepared by Sydney Environmental Group Pty Ltd ABN: 14 631 026 214

Contents

1. INTRODUCTION 1
1.1. Background 1
1.2. Objectives 1
1.3. Scope of Work 1
1.4. Naturally Occurring Asbestos 1
2. SITE IDENTIFICATION 2
3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY 3
4. FIELDWORK 4
4.1. Soil Sampling 4
4.2. Site Geology 4
4.3. Odours 4
4.4. Staining 4
5. LABORATORY 5
6. RESULTS 6
6.1. Asbestos Characterisation 6
6.1.1. Non-friable asbestos containing materials 6
6.1.2. Asbestos fines and friable asbestos (AF and FA) 6
9. DISCUSSION 7
10. CONCLUSIONS AND RECOMMENDATIONS 8
11. STATEMENT OF LIMITATIONS 9
12. REFERENCES 10

Attachments

A – Figures
B – Site Photographs
C – Laboratory Documentation

1. INTRODUCTION

1.1. Background

Sydney Environmental Group Pty Ltd (SE) was engaged by FrobesView Pty Ltd (c/- Allera) to (hereafter referred to as the 'client') to undertake an asbestos characterisation assessment to investigate potential Naturally Occurring Asbestos (NOA) within the site Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW (refer to **Figure 1**).

SE has the following project appreciation:

- The site is currently occupied in a rural residential and agricultural setting;
- The site is listed as being within a suburb which Safework NSW has identified as Low Potential Area of NOA being present;
- An asbestos characterisation assessment is required to identify the presence of NOA on-site and provide a high-level assessment of the extent of NOA impact.

1.2. Objectives

The objectives of this investigation were to:

- Assess the potential nature and extent of asbestos within the in-situ materials at the site;
- Provide advice on whether materials would be suitable (in the context of land contamination) to remain on site; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

1.3. Scope of Work

The scope of works undertaken to address the investigation objectives, included:

- Fieldwork including intrusive sampling;
- Laboratory analysis; and
- Data assessment and reporting.

1.4. Naturally Occurring Asbestos

The Forbes Local Government Area is located within a region containing serpentinite rock belts. Some of these belts contain NOA (chrysotile asbestiform). The site is located within an area identified as a geological unit with a low NOA potential. Forbes Shire Council has identified The Escort Way, Lachlan Valley Way and Parkes Eugowra Road as having a known presence of NOA, while noting it may occur in other regions of the LGA.

Although asbestos is a commercial term, all asbestos is of natural origin. The term 'naturally occurring asbestos' (NOA) seeks to differentiate natural sources of fibre from commercial or industrial sources. It refers to fine fibrous minerals of the serpentine and amphibole groups that occur in rocks or soil that may be disturbed by human activities or weathering processes. NOA also includes other fine fibrous minerals that are not strictly asbestiform.

2. SITE IDENTIFICATION

The site identification details and associated information are presented in **Table 2.1.**

Table 2.1. Site Identification Information

Attribute	Description
Street Address	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Lot and Deposited Plan (DP)	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158
Geographical Coordinates	34°12'56.6"S 150°34'39.92"E (Centre of site)
Site Area	≈ 92 ha
Local Government Area (LGA)	Forbes Shire Council
Parish	Forbes
County	Ashburnham

The locality of the site is set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

Regional geology, topography, soil landscape and hydrogeological information are presented in **Table 3.1.**

Table 3.1. Regional Setting Information

Attribute	Description
Climate	A review of the closest weather station to the site (Forbes Airport NSW, Station Number: 065103) indicated that the climate is relatively mild with average maximum temperatures ranging from 14.7 – 34.4 °C and minimum temperatures ranging from 2.7 – 18.2 °C. Rainfall is relatively varied across the year, ranging from 3.2 days of rain per month in April, to 6.1 average days of rainfall per month in June. Average monthly rainfall varied from 31.6 mm in April up to 54.7 mm in November.
Geology	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 28 June 2023), indicated that the majority of the site is likely to be underlain by The Ordovician to Silurian Cotton Formation, Calaire Sandstone and Mumbidgle Formation. Minor volcanics belonging to the Daroobalgie Volcanics. Sandstones are the dominant lithology with minor shales, mudstones, limestones and volcanics.
Acid Sulfate Soils	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 28 June 2023), indicates that the site lies in an area mapped as ***'No Known Occurrence'*** with respect to acid sulfate soils. This infers that land management activities are not likely to be affected by acid sulfate soil materials. Further assessment of acid sulfate soils in the context of this investigation is considered by SE as not warranted.
Topography	Generally, the local landscape consists of Narrow, convex elongated crests and ridges, and gently inclined sideslopes. Slope gradients range from 3 to 8%. Elevation is 220-340 m. Ridges are generally orientated in a north/north-east, south/south-west direction. Rock outcrop is typical on crests and upper slopes. SE understands that the site is located at an elevation approximately 274 m to 254 m Australian Height Datum (AHD), sloping to the east and south from the north-western corner.
Hydrology and Hydrogeology	Surface water courses proximal to the site include dams located within the site boundaries, followed by an unnamed tributary to Lake Forbes, located approximately 580 m south-east of the site and several dams on the neighbouring properties. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the site is considered likely to be towards the southeast. A review of the NSW Office of Water groundwater database undertaken on 4 July 2023 indicated there were no registered groundwater features located within a 500m radius of the site.
Adjacent Sensitive Receptors	A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Map was undertaken to determine the closest sensitive ecological receptors. The closest ecological receptor is Forbes Wetlands, located approximately 2.4 km to the south-east of site. The closest sensitive human receptors are the residential properties surrounding the site's boundary and any future onsite construction workers/ builders.

4. FIELDWORK

4.1. Soil Sampling

Soil sampling was undertaken by SE on 28 June 2023 by Mitchell Kirby, an experienced environmental consultant, occupational hygienist, and SafeWork NSW licensed asbestos assessor (LAA002039) representing SE.

A total of twenty-five (25) soil samples were collected for asbestos quantification during the investigation from areas specified by the client, as well as areas determined to contain suspected asbestos mineral bearing rock.

A 10L bulk soil sample was collected from each test pit (or part thereof) encountered at each sampling point. Each bulk soil sample was screened for the presence of potential asbestos containing materials (ACM) greater than 7 mm in size. Potential ACM greater than 7mm was weighed and placed in separate laboratory supplied zip lock bags. Sub samples (500mL) of the bulk samples passing through 7 mm sieve were also collected and placed in separate laboratory supplied zip lock bags.

Samples were collected at each sampling point and placed in laboratory supplied zip lock bags. The bags were labelled with the project number, sample identifier and date the samples were collected on.

The location of each sampling point established was marked on a site plan set out in **Figure 3**.

4.2. Site Geology

The in-situ soils within the site were comprised generally of:

- 0.0 – 0.3 m bgs – Topsoil: silty CLAY, medium red-brown, medium plasticity, soft, trace rootlets, dry-moist;
- 0.0 – 1.4 + m bgs – Residual: CLAY, medium brown / red, medium plasticity, dry-moist; and
- 0.3 – 1.4 + m bgs – Natural: ROCK, Sandstone / granite / quartz.

Foreign materials were not encountered in any soil materials examined.

4.3. Odours

Olfactory evidence of odours was not detected or observed within any of the soil materials.

4.4. Staining

Visual evidence of staining within the soil samples collected was not observed within any of the soil materials.

5. LABORATORY

The samples collected were transported to Eurofins | Environment Testing, a NATA accredited laboratory, using chain of custody (COC) protocols. A selection of these samples was scheduled for analysis, with reference to the asbestos containing materials identified within the subject area from which the samples were collected from.

A total of twenty-five (25) soil samples were submitted for quantitative asbestos analysis.

A copy of the analytical laboratory certificates of analysis and chain of custody documentation is presented in **Attachment 3**.

6. RESULTS

6.1. Asbestos Characterisation

6.1.1. Non-friable asbestos containing materials

No non-friable asbestos containing materials were identified within the site. No further assessment was undertaken.

6.1.2. Asbestos fines and friable asbestos (AF and FA)

A total of twenty-five (25) soil samples were submitted to the laboratory for asbestos analysis (0.001%) (refer to **Attachment 3 – Laboratory Documentation)**. Based on the proposed scope and the stratigraphy encountered across the site, only surface samples were obtained.

Sample ID	Naturally Occurring Asbestos Identified in Soil Sample
TP01_0.2-0.3	No
TP02_0.2-0.3	No
TP03_0.2-0.3	No
TP04_0.2-0.3	No
TP05_0.2-0.3	No
TP06_0.2-0.3	No
TP07_0.2-0.3	No
TP08_0.2-0.3	No
TP09_0.2-0.3	No
TP10_0.2-0.3	No
TP11_0.2-0.3	No
TP12_0.2-0.3	No
TP13_0.2-0.3	No
TP14_0.2-0.3	No
TP15_0.2-0.3	No
TP16_0.2-0.3	No
TP17_0.2-0.3	No
TP18_0.2-0.3	No
TP19_0.2-0.3	No
TP20_0.2-0.3	No
TP21_0.2-0.3	No
TP22_0.2-0.3	No
TP23_0.2-0.3	No
TP24_0.2-0.3	No
TP25-0.2-0.3	No

9. DISCUSSION

A discussion on comparison of laboratory analytical results and field observations, in the context of the assessment criteria adopted for this project, is provided below.

Based on known geological mapping of the area, the site is located within an area marked a low potential for NOA.

The scope of the investigation was relatively vague, and can only be used to develop a high-level approach to what NOA is likely present across the site and at what depths. Due to time and project constraints, only a very small number of test-pits were advanced across the site. As this investigation is indicative, the NSW EPA 2022 sampling density has not been met. Test-pit locations were focused on cut and fill plans, which drove the geotechnical assessment of the investigation targeting natural sub-surface soils and rock.

Based on observations made and analytical results obtained during the course of the investigation, NOA has not been identified within any samples submitted for analysis. NOA may be present at deeper depths in areas not specifically examined as part of this investigation.

10. CONCLUSIONS AND RECOMMENDATIONS

Based on SE's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed land-use, SE makes the following conclusions:

- Naturally Occurring Asbestos (NOA) has not been identified within the site;
- No NOA was detected in rocks, topsoils or residual CLAY soils within the site, however intrusive investigation was very limited. Per the NSW NOA database the site is situated within a Low Potential LGA and the Forbes Shire Council has identified NOA within the wider region at a Low-Medium Potential;
- Based on the assessment undertaken as part of this investigation, SE has concluded that the site is has a Low Potential of being impacted by NOA. Further works within the site should be undertaken under an unexpected finds protocol, with any suspected naturally occurring asbestos encountered to have further assessment undertaken.

Based on these conclusions, SE makes the following recommendations:

- An Asbestos Management Plan (AMP) is to be prepared by a suitably qualified occupational hygienist to manage potential NOA risks identified within the site and provide management strategies to mitigate the risks posed by NOA;
- If NOA is suspected to be encountered, a SafeWork NSW Licensed Asbestos Assessor (LAA) is to be engaged to undertake further assessment and assist in identifying any potential NOA, managing the risks posed to site personnel, and monitoring potential generation of airborne asbestos fibres;
- Any future works carried out within the site are to be carried out with the appropriate controls in place, per the yet to be published AMP and the SafeWork NSW Code of Practice: How to Safely Remove Asbestos (2022); and
- A Waste Classification Assessment should be carried out on any materials requiring disposal off-site as per the NSW EPA Waste Classification Guidelines (2014).

This report, including its conclusions and recommendations, must be read in conjunction with the limitations presented in **Section 11**.

11. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Sydney Environmental Group Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, SE reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to SE's engagement. The report must not be used for any purpose other than the purpose specified at the time SE was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual SE consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, SE reserves the right to review and amend this report.

12. REFERENCES

National Environment Protection Council (NEPC) 1999a, 'Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

National Environment Protection Council (NEPC) 1999b, 'Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'.

NSW DEC 2017, 'Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)'.

NSW EPA 2022, 'Contaminated Sites: Sampling Design Guidelines'.

NSW EPA 2020, 'Guidelines for Consultants Reporting on Contaminated Sites'.

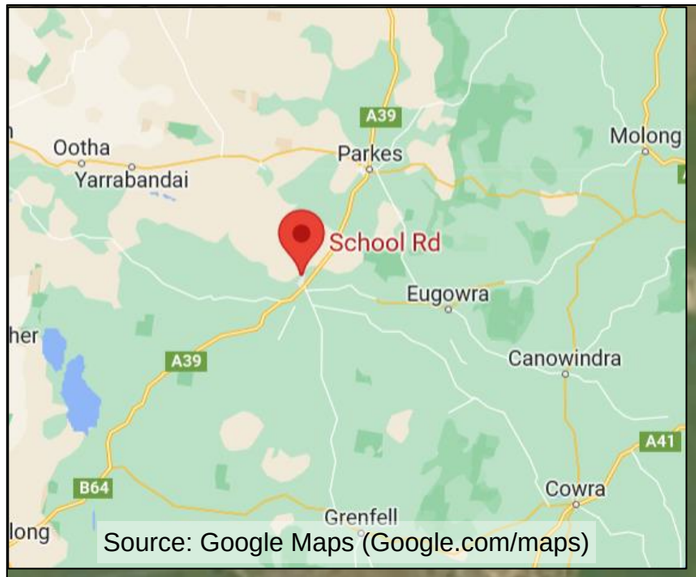
WA DOH 2009, 'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia' dated May 2009.

NSW EPA 2014, '*Waste Classification Guidelines – Part 1: Classifying Waste*'

SafeWork NSW 2022*, 'Code of Practice: How to Safely Remove Asbestos',* dated August 2019.

ATTACHMENT 1

FIGURES



Source: Google Maps (Google.com/maps)

Site Location
Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW

Source: Nearmap (apps.nearmap.com.au)

Sydney Environmental Group

Scale:	500 m	Site Location	
Client Name:	Captcha Property Group (c/- Allera)	Figure Number:	1
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-PSI-01-250723.v3f

N



Sydney Environmental Group	Scale: 250 m	Site Layout	
Client Name:	Captcha Property Group (c/- Allera)	N	Figure Number: 2
Project Name:	Stage 1 Preliminary Site Investigation		Figure Date: 24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW		Report Number: 2119-PSI-01-250723.v3f

Legend

- Site Boundary
- PAEC01 - On-Site Structures
- PAEC02 - Hardstand / Structure Footprints
- PAEC03 - Localised Chemical Storage
- PAEC04 - On-Site Dam
- PAEC05 - Agricultural Activities
- PAEC06 - Septic System

School Rd

School Rd

School Rd

Calarie Rd

Source: Nearmap (apps.nearmap.com.au)

Sydney Environmental Group

Scale:	250 m	Areas of Environmental Concern	
Client Name:	Captcha Property Group (c/- Allera)	Figure Number:	3
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-PSI-01-250723.v3f

N

ATTACHMENT 2

SITE PHOTOGRAPHS



Photograph 1 View of the eastern portion of the site from the central portion, as observed on 29 June 2023, facing east.



Photograph 2 Aerial view of the northern portion of the subject site, as observed on 29 June 2023, facing north.



Photograph 3 Example of topsoil (right) and underlying sandstone (left) materials encountered across the site, viewed within TP07, as observed 30 June 2023.



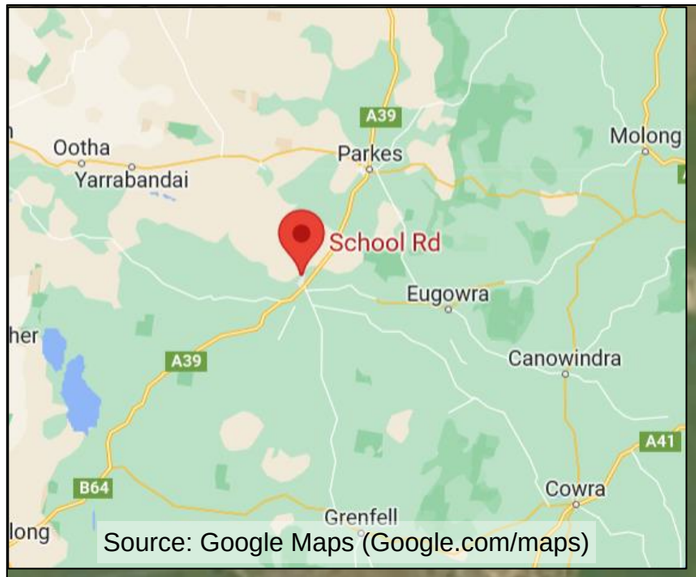
Photograph 4 Examples of naturally occurring rock materials encountered at depths of 0.5 – 1.5 m bgsl within soil materials, viewed within TP18, as observed 30 June 2023.



Photograph 3 Inferred Natural CLAY materials encountered across the site from depths of 0.5 m bgsl, viewed within TP20, as observed 30 June 2023.



Photograph 4 Example of Chrysotile asbestiform bearing serpentinite rock previously identified from the nearby region.



Source: Google Maps (Google.com/maps)

Site Location
Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW

Source: Nearmap (apps.nearmap.com.au)

Sydney Environmental Group

Scale:	500 m — Site Location		
Client Name:	ForbesView Pty Ltd (c/- Allera)	Figure Number:	1
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-PSI-01-250723.v3f

N



Scale:	250 m — Site Layout		
Client Name:	ForbesView Pty Ltd (c/- Allera)	N	Figure Number: 2
Project Name:	Stage 1 Preliminary Site Investigation		Figure Date: 24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW		Report Number: 2119-PSI-01-250723.v3f

Sydney Environmental Group

Legend

- Site Boundary
- PAEC01 - On-Site Structures
- PAEC02 - Hardstand / Structure Footprints
- PAEC03 - Localised Chemical Storage
- PAEC04 - On-Site Dam
- PAEC05 - Agricultural Activities
- PAEC06 - Septic System

School Rd

School Rd

School Rd

Edward St

The Bogan

Calarie Rd

Source: Nearmap (apps.nearmap.com.au)

Sydney Environmental Group

Scale:	250 m	Areas of Environmental Concern	
Client Name:	ForbesView Pty Ltd (c/- Allera)	Figure Number:	3
Project Name:	Stage 1 Preliminary Site Investigation	Figure Date:	24 July 2023
Project Location:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-PSI-01-250723.v3f

N

ATTACHMENT 3

LABORATORY DOCUMENTATION

		Group	Asbestos					
		Analyte	Asbestos Sample Mass/Dimensions	Asbestos Sample Description	AF	FA	FA + AF	ACM
		Units	-	-	% w/w	% w/w	% w/w	% w/w
		PQL	-	-	0.001	0.001	0.001	0.01
		Health Sceening Level (HSL)	-	-	0.001	0.001	0.001	0.01
	Site Adopted Criteria Residential A							
Sample ID	Reference / Sample Date			# Samples	24	24	24	24
				# Detects	0	0	0	0
				Minimum	ND	ND	ND	ND
				Average	NC	NC	NC	NC
				Standard Deviation	NC	NC	NC	NC
				Maximum	ND	ND	ND	ND
TP01-0.2-0.3	S23-JI0005797 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP02-0.2-0.3	S23-JI0005798 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP03-0.2-0.3	S23-JI0005799 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP04-0.2-0.3	S23-JI0005800 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP05-0.2-0.3	S23-JI0005801 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP06-0.2-0.3	S23-JI0005802 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP07-0.2-0.3	S23-JI0005803 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP08-0.2-0.3	S23-JI0005804 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP09-0.2-0.3	S23-JI0005805 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP10-0.2-0.3	S23-JI0005806 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP11-0.2-0.3	S23-JI0005807 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP12-0.2-0.3	S23-JI0005808 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP13-0.2-0.3	S23-JI0005809 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP14-0.2-0.3	S23-JI0005810 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP15-0.2-0.3	S23-JI0005811 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP16-0.2-0.3	S23-JI0005812 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP17-0.2-0.3	S23-JI0005813 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP18-0.2-0.3	S23-JI0005814 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP19-0.2-0.3	S23-JI0005815 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP20-0.2-0.3	S23-JI0005816 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP21-0.2-0.3	S23-JI0005817 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP22-0.2-0.3	S23-JI0005818 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP23-0.2-0.3	S23-JI0005819 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP24-0.2-0.3	S23-JI0005820 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01
TP25-0.2-0.3	S23-JI0005821 20/02/23				< 0.001	< 0.001	< 0.001	< 0.01

General Notes to Table: | - = Not Analysed | ACM = Asbestos Containing Material | AF = Asbestos Fines | FA = Fibrous Asbestos | NC = Not Calculated | ND = Non-Detect |

| NL = Not Limiting |PQL = Practical Quantification Limit

Notes to Statistical Calculations: The Average and Standard Deviation are calculated with non-detects replaced with a null (0) proxy value. Where all values are non-detect, a "NC" value is ouputted.

Value	Highlighted concentration exceeds the site adopted criteria (HIL)

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Sydney Environmental Group Pty Ltd
Unit 63/45 Huntley St
Alexandria
NSW 2015

Attention:	Steven Wallace
Report	1004857-AID
Project Name	FORBES
Project ID	2119
Received Date	Jul 04, 2023
Date Reported	Jul 07, 2023

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name FORBES
Project ID 2119
Date Sampled Jun 29, 2023
Report 1004857-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
TP01-0.2-0.3	23-Jl0005797	Jun 29, 2023	Approximate Sample 555g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP02-0.2-0.3	23-Jl0005798	Jun 29, 2023	Approximate Sample 603g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP03-0.2-0.3	23-Jl0005799	Jun 29, 2023	Approximate Sample 564g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP04-0.2-0.3	23-Jl0005800	Jun 29, 2023	Approximate Sample 660g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP05-0.2-0.3	23-Jl0005801	Jun 29, 2023	Approximate Sample 570g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP06-0.2-0.3	23-Jl0005802	Jun 29, 2023	Approximate Sample 717g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP07-0.2-0.3	23-Jl0005803	Jun 29, 2023	Approximate Sample 561g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP08-0.2-0.3	23-Jl0005804	Jun 29, 2023	Approximate Sample 594g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
TP09-0.2-0.3	23-Jl0005805	Jun 29, 2023	Approximate Sample 568g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP10-0.2-0.3	23-Jl0005806	Jun 29, 2023	Approximate Sample 539g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP11-0.2-0.3	23-Jl0005807	Jun 29, 2023	Approximate Sample 548g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP12-0.2-0.3	23-Jl0005808	Jun 29, 2023	Approximate Sample 632g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP13-0.2-0.3	23-Jl0005809	Jun 29, 2023	Approximate Sample 561g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP14-0.2-0.3	23-Jl0005810	Jun 29, 2023	Approximate Sample 612g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP15-0.2-0.3	23-Jl0005811	Jun 29, 2023	Approximate Sample 546g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP16-0.2-0.3	23-Jl0005812	Jun 29, 2023	Approximate Sample 594g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP17-0.2-0.3	23-Jl0005813	Jun 29, 2023	Approximate Sample 635g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP18-0.2-0.3	23-Jl0005814	Jun 29, 2023	Approximate Sample 547g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP19-0.2-0.3	23-Jl0005815	Jun 29, 2023	Approximate Sample 501g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP20-0.2-0.3	23-Jl0005816	Jun 29, 2023	Approximate Sample 649g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP21-0.2-0.3	23-Jl0005817	Jun 29, 2023	Approximate Sample 645g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
TP22-0.2-0.3	23-Jl0005818	Jun 29, 2023	Approximate Sample 686g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP23-0.2-0.3	23-Jl0005819	Jun 29, 2023	Approximate Sample 613g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP24-0.2-0.3	23-Jl0005820	Jun 29, 2023	Approximate Sample 796g Sample consisted of: Brown coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.
TP25-0.2-0.3	23-Jl0005821	Jun 29, 2023	Approximate Sample 708g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No trace asbestos detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Jul 05, 2023	Indefinite

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: Sydney Environmental Group Pty Ltd
Address: Unit 63/45 Huntley St
Alexandria
NSW 2015

Project Name: FORBES
Project ID: 2119

Order No.:
Report #: 1004857
Phone: 1300 884 164
Fax:

Received: Jul 4, 2023 5:15 PM
Due: Jul 7, 2023
Priority: 3 Day
Contact Name: Steven Wallace

Eurofins Analytical Services Manager : Asim Khan

Sample Detail						Asbestos - WA guidelines
Sydney Laboratory - NATA # 1261 Site # 18217						X
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	TP01-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005797	X
2	TP02-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005798	X
3	TP03-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005799	X
4	TP04-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005800	X
5	TP05-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005801	X
6	TP06-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005802	X
7	TP07-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005803	X
8	TP08-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005804	X
9	TP09-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005805	X
10	TP10-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005806	X
11	TP11-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005807	X
12	TP12-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005808	X
13	TP13-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005809	X

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Company Name: Sydney Environmental Group Pty Ltd
Address: Unit 63/45 Huntley St
Alexandria
NSW 2015

Project Name: FORBES
Project ID: 2119

Order No.:
Report #: 1004857
Phone: 1300 884 164
Fax:

Received: Jul 4, 2023 5:15 PM
Due: Jul 7, 2023
Priority: 3 Day
Contact Name: Steven Wallace

Eurofins Analytical Services Manager : Asim Khan

Sample Detail						Asbestos - WA guidelines
Sydney Laboratory - NATA # 1261 Site # 18217						X
14	TP14-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005810	X
15	TP15-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005811	X
16	TP16-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005812	X
17	TP17-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005813	X
18	TP18-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005814	X
19	TP19-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005815	X
20	TP20-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005816	X
21	TP21-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005817	X
22	TP22-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005818	X
23	TP23-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005819	X
24	TP24-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005820	X
25	TP25-0.2-0.3	Jun 29, 2023		Soil	S23-Jl0005821	X
Test Counts						25

Internal Quality Control Review and Glossary General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with the colour **blue** indicates data provided by customer that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to the most recent version of the 'Sample Preservation and Container Guide' for holding times (QS3001).
If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported. Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w:	Percentage weight-for-weight basis, e.g. of asbestos in asbestos-containing finds in soil samples (**% w/w**)
F/fld	Airborne fibre filter loading as Fibres (**N**) per Fields counted (**n**)
F/mL	Airborne fibre reported concentration as Fibres per millilitre of air drawn over the sampler membrane (**C**)
g, kg	Mass, e.g. of whole sample (**M**) or asbestos-containing find within the sample (**m**)
g/kg	Concentration in grams per kilogram
L, mL	Volume, e.g. of air as measured in AFM (**V = r x t**)
L/min	Airborne fibre sampling Flowrate as litres per minute of air drawn over the sampler membrane (**r**)
min	Time (**t**), e.g. of air sample collection period

Calculations

Airborne Fibre Concentration: $C = \left(\frac{A}{a}\right) \times \left(\frac{N}{n}\right) \times \left(\frac{1}{r}\right) \times \left(\frac{1}{t}\right) = K \times \left(\frac{N}{n}\right) \times \left(\frac{1}{V}\right)$

Asbestos Content (as asbestos): $\%\, w/w = \frac{(m \times P_A)}{M}$

Weighted Average (of asbestos): $\%_{WA} = \sum \frac{(m \times P_A)_x}{x}$

Terms

%asbestos	Estimated percentage of asbestos in a given matrix. May be derived from knowledge or experience of the material, informed by HSG264 *Appendix 2*, else assumed to be 15% in accordance with WA DOH *Appendix 2* (**P_A**).
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded (non-friable) condition. For the purposes of the NEPM and WA DOH, ACM corresponds to material larger than 7 mm x 7 mm.
AF	Asbestos Fines. Asbestos contamination within a soil sample, as defined by WA DOH. Includes loose fibre bundles and small pieces of friable and non-friable material such as asbestos cement fragments mixed with soil. Considered under the NEPM as equivalent to “non-bonded / friable”.
AFM	Airborne Fibre Monitoring, e.g. by the MFM.
Amosite	Amosite Asbestos Detected. Amosite may also refer to Fibrous Grunerite or Brown Asbestos. Identified in accordance with AS 4964-2004.
AS	Australian Standard.
Asbestos Content (as asbestos)	Total % w/w asbestos content in asbestos-containing finds in a soil sample (**% w/w**).
Chrysotile	Chrysotile Asbestos Detected. Chrysotile may also refer to Fibrous Serpentine or White Asbestos. Identified in accordance with AS 4964-2004.
COC	Chain of Custody.
Crocidolite	Crocidolite Asbestos Detected. Crocidolite may also refer to Fibrous Riebeckite or Blue Asbestos. Identified in accordance with AS 4964-2004.
Dry	Sample is dried by heating prior to analysis.
DS	Dispersion Staining. Technique required for Unequivocal Identification of asbestos fibres by PLM.
FA	Fibrous Asbestos. Asbestos containing material that is wholly or in part friable, including materials with higher asbestos content with a propensity to become friable with handling, and any material that was previously non-friable and in a severely degraded condition. For the purposes of the NEPM and WA DOH, FA generally corresponds to material larger than 7 mm x 7 mm, although FA may be more difficult to visibly distinguish and may be assessed as AF.
Fibre Count	Total of all fibres (whether asbestos or not) meeting the counting criteria set out in the NOHSC:3003
Fibre ID	Fibre Identification. Unequivocal identification of asbestos fibres according to AS 4964-2004. Includes Chrysotile, Amosite (Grunerite) or Crocidolite asbestos.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
HSG248	UK HSE HSG248, *Asbestos: The Analysts Guide*, 2nd Edition (2021).
HSG264	UK HSE HSG264, *Asbestos: The Survey Guide* (2012).
ISO (also ISO/IEC)	International Organization for Standardization / International Electrotechnical Commission.
K Factor	Microscope constant (**K**) as derived from the effective filter area of the given AFM membrane used for collecting the sample (**A**) and the projected eyepiece graticule area of the specific microscope used for the analysis (**a**).
LOR	Limit of Reporting.
MFM (also NOHSC:3003)	Membrane Filter Method. As described by the Australian Government National Occupational Health and Safety Commission, *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres*, 2nd Edition [NOHSC:3003(2005)].
NEPM (also ASC NEPM)	National Environment Protection (Assessment of Site Contamination) Measure, (2013, as amended).
Organic	Organic Fibres Detected. Organic may refer to Natural or Man-Made Polymeric Fibres. Identified in accordance with AS 4964-2004.
PCM	Phase Contrast Microscopy. As used for Fibre Counting according to the MFM.
PLM	Polarised Light Microscopy. As used for Fibre Identification and Trace Analysis according to AS 4964-2004.
Sampling	Unless otherwise stated Eurofins are not responsible for sampling equipment or the sampling process.
SMF	Synthetic Mineral Fibre Detected. SMF may also refer to Man Made Vitreous Fibres. Identified in accordance with AS 4964-2004.
SRA	Sample Receipt Advice.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres (particularly asbestos) in a given sample matrix.
UK HSE HSG	United Kingdom, Health and Safety Executive, Health and Safety Guidance, publication.
UMF	Unidentified Mineral Fibre Detected. Fibrous minerals that are detected but have not been unequivocally identified by PLM with DS according the AS 4964-2004. May include (but not limited to) Actinolite, Anthophyllite or Tremolite asbestos.
WA DOH	Reference document for the NEPM. Government of Western Australia, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (updated 2021), including Appendix Four: *Laboratory analysis*
Weighted Average	Combined average % w/w asbestos content of all asbestos-containing finds in the given aliquot or total soil sample (**$\%_{WA}$**).

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Asbestos Counter/Identifier:

Laxman Dias	Senior Analyst-Asbestos

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

Sydney Laboratory
Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Sydney Environmental Group	Project №	2119
Address	U63, 45 Huntley Street Alexandria NSW	Project Name	Forbes
Contact Name	Steven Wallace	Project Manager	Steven Wallace
Phone №	1300 884 164	EDD Format (ESdat, EQuIS, Custom)	
Special Directions		Sampler(s)	Mitchell Kirby
Purchase Order		Handed over by	
Quote ID №		Primary Email	enviro@sydneyenvironmental.com.au
		Secondary Email	Mitchell@sydneyenvironmental.com.au

Analysis (Please tick suite(s) required, and write in any additional analytes in the comments section below)

№	Client Sample ID	Sampled Date (dd/mm/yy)	Matrix (Solid (S) Water (W))	SEG Contam Suite 1 (TRH, BTEX, PAH, Metals, Asbestos ID)	SEG Contam Suite 2 (TRH, BTEX, PAH, Metals, OCP, PCB, Asbestos ID)	SEG Contam Suite 3 (TRH, BTEX, PAH, Metals, OCP, OPP, PCB, Asbestos	SEG ENM Suite 1 (TRH, BTEX, PAH, Metals, pH, EC, Asbestos ID)	Salinity Assessment Suite (L2 Aggresivity Suite, ESP %)	Asbestos ID AS4964 (0.01%)	Asbestos ID NEPM & WA (0.001%)	B7 Suite (TRH, BTEX, PAH, Metals)	B13 Suite (OCP, PCB)
1	TP01-0.2-0.3	29.8.23	S							X		
2	TP02-0.2-0.3									X		
3	TP03-0.2-0.3									X		
4	TP04-0.2-0.3									X		
5	TP05-0.2-0.3									X		
6	TP06-0.2-0.3									X		
7	TP07-0.2-0.3									X		
8	TP08-0.2-0.3									X		
9	TP09-0.2-0.3									X		
10	TP10-0.2-0.3									X		
11	TP11-0.2-0.3									X		
12	TP12-0.2-0.3									X		
13	TP13-0.2-0.3									X		
14	TP14-0.2-0.3									X		
15	TP15-0.2-0.3									X		
16	TP16-0.2-0.3									X		
17	TP17-0.2-0.3	30.8.23								X		
18	TP18-0.2-0.3									X		
19	TP19-0.2-0.3									X		
20	TP20-0.2-0.3									X		

Containers

1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964 WA Guidelines)

Turnaround Time (TAT) Requirements (Default will be 3 days if not ticked)

- ▫ Overnight
- ▫ Same Day
- ▫ 1 Day
- ▫ 2 Day
- ▫ 3 Day
- ▫ 5 Day
- ▫ Other (

Sample Comments / Dangerous Goods Hazard Warning

Method of Shipment: ▫ Courier (#) ▫ Hand Delivered ▫ Postal

Eurofins | mgt Laboratory Use Only	Received By		SYD | BNE | MEL | PER | ADL	Name	Mitchell Kirby	Signature		Date	3.7.23
	Received By		SYD | BNE | MEL | PER | ADL	Signature		Date		Time	
				Signature		Date		Time	

Time: — Temperature: —

Report №: 100 4857

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

Note: Metals = As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn), TRH = Total Recoverable Hydrocarbons, PAH = Polycyclic Aromatic Hydrocarbons, PCB = Polychlorinated Biphenyls, BTEX = Benzene, Toluene, Ethylbenzene, and Xylene

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

Sydney Laboratory
Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Sydney Environmental Group	Project №	2119	Project Manager	~~Steven Wallace~~
Address	U63, 45 Huntley Street Alexandria NSW	Project Name	Fabey	EDD Format (ESdat, EQuIS, Custom)	
Contact Name	Steven Wallace			Sampler(s)	Mitchell Kirby
Phone №	1300 884 164			Handed over by	
Special Directions				Primary Email	enviro@sydneyenvironmental.com.au
Purchase Order				Secondary Email	Mitchell@sydneyenvironmental.com.au
Quote ID №					

Analyses (Please tick which analyses are required, please specify "Total" or "Volatile" BOTTLE code must be used for analysis NOT listed)

Containers: 1L Plastic; 250ml Plastic; 125mL Plastic; 200mL Amber Glass; 40mL VOA vial; 500mL PFAS Bottle; Jar (Glass or HDPE); Other (Asbestos AS4964, WA Containers)

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)
- ▫ Overnight ▫ Same Day
- ▫ 1 Day ▫ 2 Day
- ☑ 3 Day ▫ 5 Day
- ▫ Other (

№	Client Sample ID	Sampled Date (dd/mm/yy)	Matrix (Solid (S) Water (W))	SEG Contam Suite 1 (TRH, BTEX, PAH, Metals, Asbestos ID)	SEG Contam Suite 2 (TRH, BTEX, PAH, Metals, OCP, PCB, Asbestos ID)	SEG Contam Suite 3 (TRH, BTEX, PAH, Metals, OCP, OPP, PCB, Asbestos	SEG ENM Suite 1 (TRH, BTEX, PAH, Metals, pH, EC, Asbestos ID)	Salinity Assessment Suite (L2 Aggresivity Suite, ESP %)	Asbestos ID AS4964 (0.01%)	Asbestos ID NEPM & WA (0.001%)	B7 Suite (TRH, BTEX, PAH, Metals)	B13 Suite (OCP, PCB)	Sample Comments / Dangerous Goods Hazard Warning
1	TP21-0.2-0.3	30/6/23	S							X			
2	TP22-0.2-0.3	↓	↓							X			
3	TP23-0.2-0.3									X			
4	TP24-0.2-0.3									X			
5	TP25 0.2-0.3									X			
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

	Courier (#) ▫ Hand Delivered ▫ Postal	Name	Mitchell Kirby	Signature		Date	3.7.23	Time
Eurofins | mgt Laboratory Use Only	Received By	SYD | BNE | MEL | PER | ADL |		Signature		Date	Time	Temperature
	Received By	SYD | BNE | MEL | PER | ADL |		Signature		Date	Time	Report №

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

Note: Metals = As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn), TRH = Total Recoverable Hydrocarbons, PAH = Polycyclic Aromatic Hydrocarbons, PCB = Polychlorinated Biphenyls, BTEX = Benzene, Toluene, Ethylbenzene, and Xylene

1004857.

Sydney Environmental Group

Soil Salinity Assessment

Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW

ForbesView Pty Ltd (c/- Allera)

Report No: 2119-SSA-01-250723.v2f

Report Date: 29 September 2023



Sydney Environmental Group Pty Ltd PO Box A1420, Sydney South NSW

Info@sydneyenvironmental.com.au

NOTICE: The information in this report is privileged and confidential, intended only for the use of the client above. This publication may not, therefore, be lent, copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form without the express written permission of Sydney Environmental Group.

DOCUMENT RECORD

Revision	Date	Author	Reviewer
v1f	28 July 2023	Mitchell Kirby	Steven Wallace
v2f	29 September 2023	Mitchell Kirby	Steven Wallace

Author Signature		**Reviewer Signature**	
Name	Mitchell Kirby	**Name**	Steven Wallace
Credentials	M.Env.Sci., B.Nat.Sci. (Envir. Management)	**Credentials**	CEnvP, M.Sc.Envir.Sci, B.Sc. Meteorology
Title	Environmental Scientist	**Title**	Senior Environmental Scientist

Document Title:	Soil Salinity Assessment, Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Site Address:	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Client Name:	ForbesView Pty Ltd (c/- Allera)
Site Size:	≈ 92 ha
Reference Number:	2119-SSA-01-250723.v1f
Project Type:	Soil Salinity Assessment
Project Type Abbreviation:	SSA
Document Draft:	FINAL
Document Revision No.	v2

PREPARED BY SYDNEY ENVIRONMENTAL GROUP PTY LTD ABN: 14 631 026 214

1. INTRODUCTION

Background

Sydney Environmental Group Pty Ltd (SE) was engaged by ForbesView Pty Ltd (c/- Allera) (the client) to undertake a soil salinity assessment for the in-situ soil materials within the site at Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW (refer to **Figure 1**).

1.1. SE has the following project appreciation:

- The site covers an area of approximately 92 ha;
- This report has been prepared to support a planned proposal for rezoning, and subsequent demolition of existing structures, subdivision and a mix of low-density residential, public recreation, commercial and associated roadways and infrastructure; and
- A soil salinity assessment of the site is required for inclusion in a development application for the proposed redevelopment.

Objectives

1.2. The objectives of this investigation were to:

- Assess the potential presence of salinity within the site in regard to potential salinity related risks to the proposed low-density residential development; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

1.3. **Scope of Work**

The scope of works undertaken to address the investigation objectives, included:

- Fieldwork including intrusive sampling;
- Laboratory analysis; and
- Data assessment and reporting.

2. SITE IDENTIFICATION

The site identification details and associated information are presented in **Table 2.1.**

Table 2.1. Site Identification Information

Attribute	Description
Street Address	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW
Lot and Deposited Plan (DP)	Lots 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158
Geographical Coordinates	34°12'56.6"S 150°34'39.92"E (Centre of site)
Site Area	≈ 92 ha
Local Government Area (LGA)	Forbes Shire Council
Parish	Forbes
County	Ashburnham
Zoning	R5 – Large Lot Residential (Eastern boundary of site); RE1 – Public Recreation (Central portion of site to southern boundary); and RU1 – Primary Production *Forbes Local Environmental Plan (2013)*

The locality of the site is set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

Regional geology, topography, soil landscape and hydrogeological information are presented in **Table 3.1.**

Table 3.1. Regional Setting Information

Attribute	Description
Climate	A review of the closest weather station to the site (Forbes Airport NSW, Station Number: 065103) indicated that the climate is relatively mild with average maximum temperatures ranging from 14.7 – 34.4 °C and minimum temperatures ranging from 2.7 – 18.2 °C. Rainfall is relatively varied across the year, ranging from 3.2 days of rain per month in April, to 6.1 average days of rainfall per month in June. Average monthly rainfall varied from 31.6 mm in April up to 54.7 mm in November.
Geology	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 28 June 2023), indicated that the majority of the site is likely to be underlain by The Ordovician to Silurian Cotton Formation, Calaire Sandstone and Mumbidgle Formation. Minor volcanics belonging to the Daroobalgie Volcanics. Sandstones are the dominant lithology with minor shales, mudstones, limestones and volcanics.
Acid Sulfate Soils (ASS)	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 28 June 2023), indicates that the site lies in an area mapped as ***'No Known Occurrence'*** with respect to acid sulfate soils. This infers that land management activities are not likely to be affected by acid sulfate soil materials. Further assessment of acid sulfate soils in the context of this investigation is considered by SE as not warranted.
Topography	Generally, the local landscape consists of Narrow, convex elongated crests and ridges, and gently inclined sideslopes. Slope gradients range from 3 to 8%. Elevation is 220-340 m. Ridges are generally orientated in a north/north-east, south/south-west direction. Rock outcrop is typical on crests and upper slopes. SE understands that the site is located at an elevation approximately 274 m to 254 m Australian Height Datum (AHD), sloping to the east and south from the north-western corner.
Hydrogeology	Surface water courses proximal to the site include dams located within the site boundaries, followed by an unnamed tributary to Lake Forbes, located approximately 580 m south-east of the site and several dams on the neighbouring properties. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the site is considered likely to be towards the southeast. A review of the NSW Office of Water groundwater database undertaken on 4 July 2023 indicated there were no registered groundwater features located within a 500m radius of the site.
Adjacent Sensitive Receptors	A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Map was undertaken to determine the closest sensitive ecological receptors. The closest ecological receptor is Forbes Wetlands, located approximately 2.4 km to the south-east of site. The closest sensitive human receptors are the residential properties surrounding the site's boundary and any future onsite construction workers/ builders.

4. SALINITY ASSESSMENT PROCESS

4.1. Salinity

Soil salinity is often assessed with respect to electrical conductivity of a 1:5 soil:water extract (EC 1:5). This value can be converted to ECe (electrical conductivity of a saturated extract) by multiplication with a factor dependent of soil texture ranging from 6 to 17 depending on soil type. Richards (1954) and Hazelton and Murphy (1992) classify soil salinity on the basis of ECe, and describe the implications of the salinity classes on agriculture.

4.2. Aggressivity

Aggressivity is a function of exposure classification, and is derived from AS 2159-2009 Piling Design and Installation. Aggressivity is characterised by the soil conditions effect on both concrete and steel, and is assessed with respect to Sulfates and Chlorides detected within the soil materials respectively.

4.3. Sodicity

Sodic soils may be affected by very severe surface crusting, very low infiltration and hydraulic conductivity, very hard and dense subsoils, high susceptibility to gully erosion and tunnel erosion. Sodicity also affects the shrink – swell properties of a soil. The general rating of sodicity is outlined in the DLWC (2002) publication *Site Investigations for Urban Salinity* (2002), and is assessed with respect to exchangeable sodium percentage (ESP) detected within the soil materials.

5. FIELDWORK

5.1. Soil Sampling

Soil sampling was undertaken by SE on the 30 June by Mitchell Kirby, an experienced environmental consultant representing SE.

A total of sixteen (16) soil samples were collected from sixteen (16) sampling locations during the investigation from the in-situ soil materials across the site down to a depth of 0.4 metres Below Ground Surface Level (BGSL), in line with the recommended sampling density outlined within the Department of Land and Water Conservation (now Department of Water and Energy), *Site Investigations for Urban Salinity* (2002).

Samples were collected at each sampling point, and placed in laboratory supplied acid-rinsed glass jars (with Teflon lined lids). The jars were labelled with the project number, sample identifier and date the samples were collected on.

Each sampling point established was marked on a site plan.

5.2. Site Geology

The soil materials within the site consisted of:

- Topsoil: Silty CLAY, medium red-brown, medium plasticity, dry, organic matter including grass rootlets; and
- Residual: CLAY, red/orange to brown, high plasticity, dry.

No foreign materials were encountered during the investigation.

Please note, that the investigation is limited to the in-situ soil materials defined within this report, and is indicative in nature. Soils adjacent or beneath this subject area were not inspected or sampled and are not part of this investigation.

5.3. Odours

Olfactory evidence of odours was not detected or observed within any of the soil materials.

5.4. Staining

Visual evidence of staining within the soil samples collected was not observed within any of the soil materials.

6. LABORATORY

The samples collected were transported to Eurofins, a NATA accredited laboratory, using chain of custody (COC) protocols. A selection of these samples was scheduled for analysis, with reference to the relevant salinity parameters.

A total of sixteen (16) samples were submitted for the following Salinity Assessment Suite:

- Electrical Conductivity (EC1:5);
- Electrical Resistivity;
- pH;
- Sulfates;
- Chlorides; and
- Exchangeable Sodium Percentage (ESP).

A copy of the analytical laboratory certificates of analysis and chain of custody documentation is presented in **Attachment 3**.

7. Results

Salinity Assessment

The sample analytical results were tabulated and compared to the adopted salinity assessment criteria and presented in the **Table 7.1.** below.

Table 7.1. Summary of Analytical Results from soil materials compared with salinity assessment criteria.

7.1.

Class	ECe (ds/m)	Implication
Non-Saline	**<2**	**Salinity effects mostly negligible**
Slightly Saline	2 – 4	Yields of sensitive crops affected
Moderately Saline	4 – 8	Yields of many crops affected
Very Saline	8 – 16	Only tolerant crops yield satisfactorily
Highly Saline	>16	Only a few very tolerant crops yield satisfactorily

Salinity Class for the soil materials sampled within the site were found to be **Non-Saline**.

Aggressivity Assessment (Concrete)

7.2.

The sample analytical results were tabulated and compared to the adopted aggressivity (concrete) assessment criteria and presented in the **Table 7.2** below.

Table 7.2. Summary of Analytical Results from soil materials compared with aggressivity assessment (concrete) criteria.

Exposure Conditions			Exposure Classification (Aggressivity)
Sulphates (SO_4) (mg/kg)	**pH**	**Chlorides (mg/kg) (in water)**	**Soil Conditions – B (Low permeability soils such as Clays and Silts)**
<4000	**>5.5**	**<6000**	**Non-aggressive**
4000-8000	**4.5-5.5**	6000-12000	Mild
8000-16000	4-4.5	12000-30000	Moderate
>16000	<4	>30000	Severe

7.3.

Based on the criteria outlined within AS2159-2009, the sulphate levels detected within the samples are considered **non-aggressive** to towards concrete.

Aggressivity Assessment (Steel)

The sample analytical results were tabulated and compared to the adopted aggressivity (steel) assessment criteria and presented in the **Table 7.3** below.

Table 7.3. Summary of Analytical Results from soil materials compared with aggressivity assessment (steel) criteria.

Exposure Conditions			Exposure Classification (Aggressivity)
Chlorides (mg/kg) (in soil)	**pH**	**Resistivity (Ohms)**	**Soil Conditions – B (Low permeability soils such as Clays and Silts)**
<4000	**>5.5**	**<6000**	**Non-aggressive**
4000-8000	4.5-5.5	6000-12000	Mild
8000-16000	4-4.5	12000-30000	Moderate
>16000	<4	>30000	Severe

Based on the criteria outlined within AS2159-2009, the chloride levels detected within the samples are considered **non-aggressive** to towards steel.

Sodicity Assessment

7.4. The sample analytical results were tabulated and compared to the adopted sodicity assessment criteria and presented in the **Table 7.4.** below.

Table 7.4. Summary of Analytical Results from soil materials compared with sodicity assessment criteria

ESP%	Implication
<5	**Non-sodic**
5 – 15	**Sodic**
>15	**Highly sodic**

Based on the criteria outlined within DLWC (2002), the soils are considered to be **Sodic** to **Highly Sodic**.

8. CONCLUSIONS AND RECOMMENDATIONS

Based on SE's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment, SE makes the following conclusions:

- The soils within the site are considered to be **non-saline**;
- The soils within the site are considered to be **non-aggressive** to both steel and concrete;
- The soils within the site are considered to be **sodic** to **highly sodic**;

Based on these conclusions, SE makes the following recommendations:

In general, the management strategies should be directed at:

- Minimising the impact of development on the site salinity;
- Minimising the impact of salinity on the proposed development;
- Maintaining as much as practicable the natural water balance;
- Maintaining good drainage;
- Avoiding disturbance or exposure of sensitive soils;
- Retaining or increasing appropriate native vegetation in strategic areas; and
- Implementing building controls and engineering responses where appropriate.

These management strategies generally include:

- Develop the best use of existing topography to minimise cut and fill operations;
- Maintenance and improvement of native vegetation along drainage courses;
- Water management of landscaped areas;
- Utilise native and deep rooted plants in order to minimise soil erosion;
- Minimise exposure of slightly to moderately saline soils in temporary excavation faces;
- Minimise exposure of slightly to moderately saline soils in stockpiles during site works;
- Minimise potential for ponding or water logging areas on the site;
- Provision of lining in temporary ponds with non-saline clays to minimise groundwater recharge through the soils;
- Dispose of excavated slightly to moderately saline soils to locations where salts cannot be leached to the environment;
- Natural drainage patterns to be maintained where possible;
- Drainage infrastructure in vulnerable areas to be installed as soon as practical to avoid excessive water infiltration, ponding of water on site and salt leaching;
- Imported material should be tested for salinity to avoid importing saline soils;
- Roads should have well designed sub soil drainage;
- In fill areas place the soils with highest salinity at the deepest levels;
- Application of gypsum to areas of exposed slightly to moderately saline soils if applicable;
- Concrete of suitable strength and reinforcement cover is to be used for drainage structures and wherever contact with water and increased soil moisture is expected;
- Pipes used for stormwater drainage should be sealed to minimise the risk of leakage;
- Soils that are excavated from either roads or service trenches throughout areas or the site found to be slightly to moderately saline should be re-instated at the same horizontal level or lower where possible; and
- Conduct a comprehensive post-earthworks salinity assessment to determine the final salinity status of each individual lot.

This report, including its conclusions and recommendations, must be read in conjunction with the limitations presented in **Section 9**.

9. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Sydney Environmental Group Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, SE reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to SE's engagement. The report must not be used for any purpose other than the purpose specified at the time SE was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual SE consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, SE reserves the right to review and amend this report.

10. REFERENCES

NSW EPA 2020, 'Contaminated Sites: Sampling Design Guidelines'.

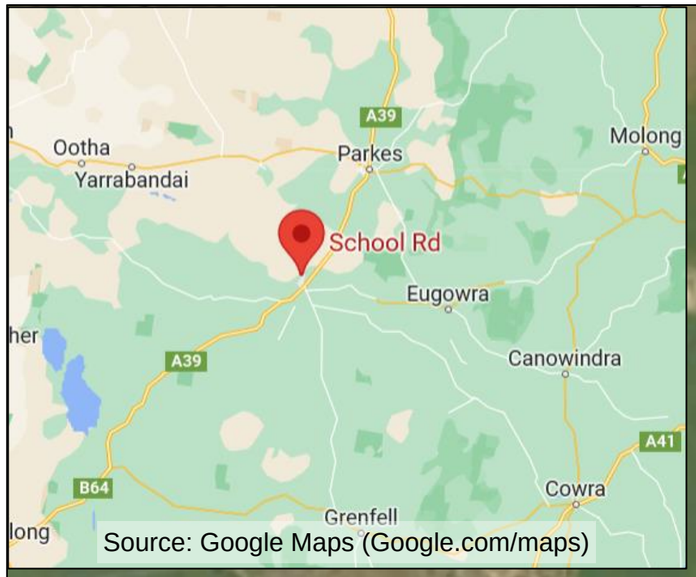
Department of Land and Water Conservation (now Department of Water and Energy) publication *Site Investigations for Urban Salinity*, 2002

Richards, L. A. (ed.) 1954. Diagnosis and Improvement of Saline and Alkaline Soils. USDA Handbook No. 60, Washington D.C.

Hazelton, P. A. and Murphy B. W. 1992. A Guide to the Interpretation of Soil Test Results. Department of Conservation and Land Management.

ATTACHMENT 1

FIGURES



Source: Google Maps (Google.com/maps)

Site Location
Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW

Source: Nearmap (apps.nearmap.com.au)

Sydney Environmental Group

Scale:	500 m — Site Location		
Client Name:	ForbesView Pty Ltd (c/- Allera)	Figure Number:	1
Project Name:	Soil Salinity Assessment	Figure Date:	24 July 2023
Project Location:	Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW	Report Number:	2119-SSA-01-250723.v2f

N



Scale:	250 m	Site Layout and Sampling Locations	
Client Name:	ForbesView Pty Ltd (c/- Allera)	N	Figure Number: 2
Project Name:	Soil Salinity Assessment		Figure Date: 24 July 2023
Project Location:	Lot 375, 376, 386-389, 830, 831, 1272 & 1273 DP 750158, School Road, Forbes NSW		Report Number: 2119-SAA-01-250723.v2f

Sydney Environmental Group

ATTACHMENT 2

SITE PHOTOGRAPHS



Photograph 1. Representative topsoil and residual soils observed in TP06, as observed on 28 June 2023.

ATTACHMENT 3

LABORATORY ANALYTICAL REPORTS AND CHAIN OF CUSTODY

Sample ID	Reference / Sample Date		Depth	EC	Field Texture	ECe Conversion Factor	ECe	pH	Chloride	Sulfate	Resistivity	ESP	Salinity Rating	Sodicity Rating	Aggressivity Rating
		Units	m bgs	µS/cm	-	-	dS/m	pH unit	mg/kg	mg/kg	Ohm.m	%	-	-	-
		PQL	0.1	10	-	-	10	0.1	10	10	0.5	0.1	-	-	-
SSA-01	S23-JI0005887 30/06/23			10	Heavy Clay	6	0.06	9.5	300	60	38	11	NS	S	Non-Aggressive
SSA-02	S23-JI0005888 30/06/23			10	Heavy Clay	6	0.06	8.2	< 10	< 10	890	1	NS	NS	Non-Aggressive
SSA-03	S23-JI0005889 30/06/23			10	Heavy Clay	6	0.06	8.7	810	410	14	13	NS	S	Non-Aggressive
SSA-04	S23-JI0005890 30/06/23			10	Heavy Clay	6	0.06	9.6	69	13	76	8.2	NS	S	Non-Aggressive
SSA-05	S23-JI0005891 30/06/23			10	Heavy Clay	6	0.06	8.4	< 10	< 10	730	1.8	NS	NS	Non-Aggressive
SSA-06	S23-JI0005892 30/06/23			10	Heavy Clay	6	0.06	8.3	< 10	< 10	700	2.2	NS	NS	Non-Aggressive
SSA-07	S23-JI0005893 30/06/23			10	Heavy Clay	6	0.06	9.7	< 10	< 10	110	8.7	NS	S	Non-Aggressive
SSA-08	S23-JI0005894 30/06/23			10	Heavy Clay	6	0.06	9.7	22	19	77	12	NS	S	Non-Aggressive
SSA-09	S23-JI0005895 30/06/23			10	Heavy Clay	6	0.06	8.3	380	20	39	26	NS	VS	Non-Aggressive
SSA-10	S23-JI0005896 30/06/23			10	Heavy Clay	6	0.06	8.4	< 10	< 10	810	2.7	NS	NS	Non-Aggressive
SSA-11	S23-JI0005897 30/06/23			10	Heavy Clay	6	0.06	8.8	210	19	53	9.7	NS	S	Non-Aggressive
SSA-12	S23-JI0005898 30/06/23			10	Heavy Clay	6	0.06	7.8	< 10	< 10	2300	0.8	NS	NS	Non-Aggressive
SSA-13	S23-JI0005899 30/06/23			10	Heavy Clay	6	0.06	9.2	< 10	< 10	220	1.1	NS	NS	Non-Aggressive
SSA-14	S23-JI0005900 30/06/23			10	Heavy Clay	6	0.06	8.3	< 10	< 10	590	1.7	NS	NS	Non-Aggressive
SSA-15	S23-JI0005901 30/06/23			10	Heavy Clay	6	0.06	9.2	< 10	< 10	220	3.1	NS	NS	Non-Aggressive
SSA-16	S23-JI0005902 30/06/23			10	Heavy Clay	6	0.06	8.4	< 10	< 10	460	0.6	NS	NS	Non-Aggressive

General Notes to Table: | HS = Highly Sodic | NS = Non-Saline / Non-Sodic | SS = Slightly Saline | S = Sodic | MS = Moderately Saline | VS = Very Saline |

Texture based on visual assessment of soils. Texture conversion factor sources from Department of Land and water Conservation, 2002 ' Site Investigations for Urban Salinity' as referenced by WSROC 2004

Salinity Summary		
Non-Saline (NS)	16	100%
Slightly Saline (SS)	0	0%
Moderately Saline (MS)	0	0%
Very Saline (VS)	0	0%

Sodicity Summary		
Non-Sodic (NS)	9	56%
Sodic (S)	6	38%
Very Sodic (VS)	1	6%

Aggressivity Summary		
Non-Aggressive	16	100%
Mild	0	0%
Moderate	0	0%
Severe	0	0%

Sydney Environmental Group Pty Ltd
Unit 63/45 Huntley St
Alexandria
NSW 2015

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Steven Wallace**

Report **1004860-S**
Project name FORBES SSA
Project ID 2119
Received Date Jul 04, 2023

Client Sample ID			**SSA-01**	**SSA-02**	**SSA-03**	**SSA-04**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-JI0005887**	**S23-JI0005888**	**S23-JI0005889**	**S23-JI0005890**
Date Sampled			**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	300	< 10	810	69
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	270	11	710	130
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.5	8.2	8.7	9.6
Resistivity*	0.5	ohm.m	38	890	14	76
Sulphate (as SO4)	10	mg/kg	60	< 10	410	13
Exchangeable Sodium Percentage (ESP)	0.1	%	11	1.0	13	8.2
Sample Properties						
% Moisture	1	%	14	11	19	13

Client Sample ID			**SSA-05**	**SSA-06**	**SSA-07**	**SSA-08**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-JI0005891**	**S23-JI0005892**	**S23-JI0005893**	**S23-JI0005894**
Date Sampled			**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	< 10	< 10	22
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	14	14	94	130
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.4	8.3	9.7	9.7
Resistivity*	0.5	ohm.m	730	700	110	77
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	19
Exchangeable Sodium Percentage (ESP)	0.1	%	1.8	2.2	8.7	12
Sample Properties						
% Moisture	1	%	16	15	18	17

Client Sample ID			SSA-09	SSA-10	SSA-11	SSA-12
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S23-JI0005895	S23-JI0005896	S23-JI0005897	S23-JI0005898
Date Sampled			Jun 30, 2023	Jun 30, 2023	Jun 30, 2023	Jun 30, 2023
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	380	< 10	210	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	250	12	190	< 10
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.3	8.4	8.8	7.8
Resistivity*	0.5	ohm.m	39	810	53	2300
Sulphate (as SO4)	10	mg/kg	20	< 10	19	< 10
Exchangeable Sodium Percentage (ESP)	0.1	%	26	2.7	9.7	0.8
Sample Properties						
% Moisture	1	%	15	14	11	6.3

Client Sample ID			SSA-13	SSA-14	SSA-15	SSA-16
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S23-JI0005899	S23-JI0005900	S23-JI0005901	S23-JI0005902
Date Sampled			Jun 30, 2023	Jun 30, 2023	Jun 30, 2023	Jun 30, 2023
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	< 10	< 10	< 10	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	46	17	46	22
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.2	8.3	9.2	8.4
Resistivity*	0.5	ohm.m	220	590	220	460
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	< 10
Exchangeable Sodium Percentage (ESP)	0.1	%	1.1	1.7	3.1	0.6
Sample Properties						
% Moisture	1	%	13	13	13	14

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Jul 06, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Jul 06, 2023	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Jul 06, 2023	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Jul 06, 2023	7 Days
- Method: LTM-INO-4030 Conductivity			
Exchangeable Sodium Percentage (ESP)	Melbourne	Jul 08, 2023	28 Days
- Method: LTM-MET-3060 - Cation Exchange Capacity (CEC) & Exchangeable Sodium Percentage (ESP)			
% Moisture	Sydney	Jul 05, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: Sydney Environmental Group Pty Ltd
Address: Unit 63/45 Huntley St
Alexandria
NSW 2015

Project Name: FORBES SSA
Project ID: 2119

Order No.:
Report #: 1004860
Phone: 1300 884 164
Fax:

Received: Jul 4, 2023 5:15 PM
Due: Jul 7, 2023
Priority: 3 Day
Contact Name: Isabelle Figatowski

Eurofins Analytical Services Manager : Asim Khan

Sample Detail						Aggressivity Soil Set	Moisture Set	Exchangeable Sodium Percentage (ESP)
Melbourne Laboratory - NATA # 1261 Site # 1254								X
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	SSA-01	Jun 30, 2023		Soil	S23-Jl0005887	X	X	X
2	SSA-02	Jun 30, 2023		Soil	S23-Jl0005888	X	X	X
3	SSA-03	Jun 30, 2023		Soil	S23-Jl0005889	X	X	X
4	SSA-04	Jun 30, 2023		Soil	S23-Jl0005890	X	X	X
5	SSA-05	Jun 30, 2023		Soil	S23-Jl0005891	X	X	X
6	SSA-06	Jun 30, 2023		Soil	S23-Jl0005892	X	X	X
7	SSA-07	Jun 30, 2023		Soil	S23-Jl0005893	X	X	X
8	SSA-08	Jun 30, 2023		Soil	S23-Jl0005894	X	X	X
9	SSA-09	Jun 30, 2023		Soil	S23-Jl0005895	X	X	X
10	SSA-10	Jun 30, 2023		Soil	S23-Jl0005896	X	X	X
11	SSA-11	Jun 30, 2023		Soil	S23-Jl0005897	X	X	X
12	SSA-12	Jun 30, 2023		Soil	S23-Jl0005898	X	X	X

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: Sydney Environmental Group Pty Ltd
Address: Unit 63/45 Huntley St
Alexandria
NSW 2015

Project Name: FORBES SSA
Project ID: 2119

Order No.:
Report #: 1004860
Phone: 1300 884 164
Fax:

Received: Jul 4, 2023 5:15 PM
Due: Jul 7, 2023
Priority: 3 Day
Contact Name: Isabelle Figatowski

Eurofins Analytical Services Manager : Asim Khan

Sample Detail						Aggressivity Soil Set	Moisture Set	Exchangeable Sodium Percentage (ESP)
Melbourne Laboratory - NATA # 1261 Site # 1254								X
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X
13	SSA-13	Jun 30, 2023		Soil	S23-Jl0005899	X	X	X
14	SSA-14	Jun 30, 2023		Soil	S23-Jl0005900	X	X	X
15	SSA-15	Jun 30, 2023		Soil	S23-Jl0005901	X	X	X
16	SSA-16	Jun 30, 2023		Soil	S23-Jl0005902	X	X	X
Test Counts						16	16	16

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Exchangeable Sodium Percentage (ESP)	%	< 0.1			0.1	Pass	
LCS - % Recovery							
Conductivity (1:5 aqueous extract at 25 °C as rec.)	%	105			70-130	Pass	
Resistivity*	%	105			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S23-Jl0005889	CP	%	101			70-130	Pass	
Sulphate (as SO4)	S23-Jl0005889	CP	%	102			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S23-Jl0005887	CP	mg/kg	300	300	<1	30%	Pass	
Sulphate (as SO4)	S23-Jl0005887	CP	mg/kg	60	60	<1	30%	Pass	
Exchangeable Sodium Percentage (ESP)	S23-Jl0005887	CP	%	11	11	1.5	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-Jl0005894	CP	uS/cm	130	150	15	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S23-Jl0005894	CP	pH Units	9.7	9.7	<1	30%	Pass	
Resistivity*	S23-Jl0005894	CP	ohm.m	77	66	15	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S23-Jl0005895	CP	%	15	15	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Exchangeable Sodium Percentage (ESP)	S23-Jl0005899	CP	%	1.1	1.0	7.3	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-Jl0005902	CP	uS/cm	22	25	15	30%	Pass	
Resistivity*	S23-Jl0005902	CP	ohm.m	460	400	15	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Asim Khan	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Metal
Ryan Phillips	Senior Analyst-Inorganic



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

Sydney Laboratory
Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Sydney Environmental Group	Project No	2119	Project Manager	~~Steven Wallace~~
Address	U63, 45 Huntley Street Alexandria NSW	Project Name	Forbes SSA	EDD Format (ESdat, EQuIS, Custom)	
Contact Name	Steven Wallace				
Phone No	1300 884 164				
Special Directions					
Purchase Order					
Quote ID No					

Sampler(s)	Mitchell Kirby	
Handed over by		
Primary Email	enviro@sydneyenvironmental.com.au	
Secondary Email	Mitchell@sydneyenvironmental.com.au	

Turnaround Time (TAT) Requirements (prepaid surcharges will be applied for 2 days or less turnaround)

- ▫ Overnight
- ▫ Same Day
- ▫ 1 Day
- ▫ 2 Day
- ▫ 3 Day
- ▫ 5 Day
- ▫ Other (

Analytes (Please tick boxes as required. Please specify if "Total" or "Filtered" & 3 TCLP, SPLP, Waste Classification, Leachate Suite, Soil Suite, Water Suite)

Containers

No	Client Sample ID	Sampled Date (dd/mm/yy)	Matrix (Solid (S) Water (W))	SEG Contam Suite 1 (TRH, BTEX, PAH, Metals, Asbestos ID)	SEG Contam Suite 2 (TRH, BTEX, PAH, Metals, OCP, PCB, Asbestos ID)	SEG Contam Suite 3 (TRH, BTEX, PAH, Metals, OCP, DPP, PCB, Asbestos	SEG ENM Suite 1 (TRH, BTEX, PAH, Metals, pH, EC, Asbestos ID)	Salinity Assessment Suite (L2 Aggressivity Suite, ESP %)	Asbestos ID AS4964 (0.01%)	Asbestos ID NEPM & WA (0.001%)	B7 Suite (TRH, BTEX, PAH, Metals)	B13 Suite (OCP, PCB)	1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PF-AS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964 WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	SSA-01	[redacted] 30.6.23	S					X													
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10																					
11	~~SSA-02~~																				
12																					
13																					
14																					
15																					
16	SSA-16																				
17																					
18																					
19																					
20																					

Method of Shipment	▫ Courier (#)	▫ Hand Delivered	▫ Postal	Name	Mitchell Kirby	Signature		Date	30.6.23	Time		
Eurofins | mgt Laboratory Use Only	Received By	Overseas	▫ SYD | BNE | MEL | PER | ADL |	Signature		Date	9/7	Time	5:13	Temperature	9.9	
	Received By		▫ SYD | BNE | MEL | PER | ADL |	Signature		Date		Time	:	Report No		

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

Note: Metals = As, Cd, Cr, Co, Hg, Ni, Pb, and Zn), TRH = Total Recoverable Hydrocarbons, PAH = Polycyclic Aromatic Hydrocarbons, PCB = Polychlorinated Biphenyls, BTEX = Benzene, Toluene, Ethylbenzene, and Xylene

1004860

Appendix 4 - Geotechnical Report

Core Geotech

Sydney
31 Lilburn Street, Tallawong NSW 2762
T: 0479 154 977
E: rsingh@coregeotech.com.au
ABN: 83 650 146 633

Report

Geotechnical Investigation report
Proposed Planning Proposal
School Road, Forbes NSW

Prepared for:

Sydney Environmental Group Pty Ltd
Unit 63/45 Huntley Street
Alexandria NSW 2015

Prepared by:

Core Geotech Pty Ltd

19 August 2023

Ref: CG23-0608-B Rev 0

Document Status

Date	Rev No.	Comments
19.08.2023	0	Geotechnical Investigation Report

Document copyright of Core Geotech Pty Ltd.

The contents of this document are and remain the intellectual property of Core Geotech Pty Ltd (CG). This document should only be used for the purpose for which it was commissioned and should not be used for other projects or by a third party without written consent from CG.

Document delivery

CG provides this document in either printed format, electronic format or both. The electronic format is provided for the client's convenience and CG requests that the client ensures the integrity of this electronic information is maintained.

Where an electronic only version is provided to the client, a signed hard copy of this document is held on file by CG and a copy will be provided if requested.

Table of Contents

1 Introduction 4
2 Scope of Works 4
3 Proposed Development 4
4 Site Description 5
5 Fieldwork 5
6 Laboratory Testing 5
7 Ground Model 5
7.1 Soil Landscape 5
7.2 Geology 6
7.3 Subsurface Conditions 6
7.4 Groundwater 6
8 Laboratory Test Results 7
9 Geotechnical Discussion and Recommendations 9
9.1 General 9
9.2 Slope Stability 9
9.3 Aggressivity 9
9.4 Preliminary AS2870-2011 Site Classification 9
9.5 Removal of Dams 9
9.6 Groundwater Control During Excavation 10
9.7 Site Preparation and Earthworks 10
9.7.1 Excavation Characteristics 10
9.7.2 Subgrade Preparation 11
9.7.3 Engineered Fill 11
9.7.4 Edge Compaction 11
9.7.5 Service Tranches 11
9.7.6 Earthworks Inspection and Testing 12
9.8 Temporary Batter Slopes 12
9.9 Retention Design Parameters 13
9.10 Footings 13
9.11 Pile Foundation 14
9.12 Pavement Design Parameters 15
10 Further Inspection 16
11 Reference 16
12 Closure 17

Appendices

Appendix A: Information About this Report
Appendix B: Test Pit Location Plan – Drawing No. CG23-0648-1
Appendix C: Test Pit Logs
Appendix D: Laboratory Test Results
Appendix E: Site Photography
Appendix F: Foundation Maintenance Homeowner's Guide

1 Introduction

As requested, Core Geotech Pty Ltd (CG) has carried out a geotechnical investigation of a site located at Lot 375, 376, 386-389, 830, 831, 1272 and 1273 in DP750158 School Road Forbes NSW which is being considered for a future residential subdivision development.

The land capability assessment comprised site inspections, non-intrusive and intrusive site investigations followed by laboratory testing of selected samples, engineering analysis and reporting.

Details of the work undertaken, and the results obtained are presented in this report, together with comments relating to engineering design and construction practice. Comments are also provided on the need for further geotechnical investigations that are required when the project progresses to the development application stage.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter QU23-0235 Rev 1 dated 18 June 2023.

2 Scope of Works

As detailed in our proposal letter, the instructed scope of work to be conducted by CG was defined as follows:

- Desktop study of available information relevant to the proposed development;
- Arrange and execute a geotechnical Site Investigation (SI);
- Review of all the data relevant to existing subsurface information and the proposed project;
- Details and descriptions of the existing subsoil strata with laboratory test results;
- Preliminary Site Classification as per AS2870 2011 Residential Slabs and Footings;
- Development of the geotechnical ground model and provide appropriate soil design parameters;
- Provide suitable foundation options as appropriate (e.g. shallow footings / bored piers etc.) and applicable design parameters;
- Provide permanent and temporary retention options for further consideration;
- Comment on the proposed construction methodology;
- Stability criteria for open excavations and advice regarding excavation staging including bench heights and the like. Advice on earthworks, rate of excavation, and on site trafficability after disturbance of the site at excavated levels;
- Geotechnical advice regarding site ground water conditions;
- Advice on ground construction difficulties likely to be encountered;
- Geotechnical design parameters provided for the foundation design;
- Risk of slope instability;
- Recommendations in terms of site preparation;

3 Proposed Development

Based on the supplied information, it is understood that under the Forbes Local Environmental Plan 2013, the land is currently zoned RU1 – Primary Production, R5 - Large Lot Residential, and RE1 - Public Recreation. A Planning Proposal is required to rezone the Site to facilitate future residential development. The Site has been identified by Forbes Shire Council for future residential development and is included within Council's Draft Local Housing Strategy (LHS)

2021 – 2024. The Draft LHS indicates that the Site could facilitate the development of upwards of 600 dwellings (including R5 Large Lot Residential portion). The Site is identified as Stage 4 and Stage 4a of Precinct 5 within the Draft LHS and identified for release in 2036.

4 Site Description

The proposed site is an irregular shaped rectangle which cover an area of approximately 92ha. The site is bounded to the north by School Road, to the south by rural residential dwelling and Morton Street, to the east by Farnell Street and to the west by Edward Street. No detailed contour survey plan was available for CG to review at the time of preparing this report. However, by visual observation site has a gently to moderately sloping land towards the east, west and south boundary.

At the time of the investigation, the site generally comprised a rural residential dwelling near the north west side and well maintained grassed agricultural land with individual paddocks separated by a series of farm fences. The area near the rural dwelling contained medium to large size trees and remainder of the site was generally vacant and covered with native grass and bushland. Some farm dams were observed at isolated locations during the investigation.

The surface soils generally comprise silty clay topsoil. Site photography is shown in Appendix E.

5 Fieldwork

Fieldwork was carried out on 29 and 30 June 2023 which included excavation of twenty-five (25) test pits (TP01 to TP25) to a termination/refusal depth ranging from 0.9m to 2.0m using a track mounted excavator fitted with 450mm wide bucket attachment. Dynamic Cone Penetration and Pocket Penetrometer (PP) test was carried out to assess the relative density/consistency of in-situ soils. Disturbed samples were collected, labelled and sent to a NATA Accredited laboratories with Chain of Custody (COC) documentation.

The field investigation was carried out in the presence of one of Geotechnical Engineers from CG who selected test pit locations, carried out sampling and prepared test pit logs. Two site plans showing the test pit locations (Ref. CG23-0608-3 and CG23-0608-4) and test pit logs are attached in Appendix B and C respectively.

6 Laboratory Testing

Laboratory testing was carried out generally in accordance with Australian Standards. All testing was scheduled by CG and carried out by Eurofins Environmental Testing and Benchmark Geotechnical, NATA Accredited Testing Laboratories. The extent of testing carried out to provide the geotechnical parameters required for this study, are presented below:

- Four (4) samples for Particle Size Distribution (PSD) and California Bearing Ratio (CBR) test;
- Six (6) samples to test for Atterberg Limit and Linear Shrinkage test, Aggressivity Suite and Cation exchange Capacity (CEC) test;
- Twenty-five (25) samples for Field Moisture Content test;

7 Ground Model

7.1 Soil Landscape

The NSW Environment & Heritage eSPADE web application identifies the soil landscape for majority of the site is as Bald Hill (bh). A small portion of the site on the north east side comprise Parkes (pa) landscape. The Bald Hill soil landscape is characterised by:

Landscape – Narrow elongate crests, ridges and gently inclined side slopes at Forbes and south and west of Forbes on predominately sandstones.

Soils – Shallow (<30 cm), rapidly drained Lithosols are widespread. Shallow (<50 cm), well-drained Red Earths and occasional shallow (<50 cm), well-drained Red Podzolic Soils occur on side slopes.

Limitations –Water erosion hazard; rock outcrop; shallow, strongly acid, highly permeable soils with low fertility, low available water holding capacity and localised high organic matter.

7.2 Geology

Based on the review of Forbes 1:250,000 Geological Map Geological Series Sheet S155-7 Second Edition 2000 from Geological Survey of NSW, the site area on the west is underlain by Palaeozoic Silurian Devonian Calarie Sandstone which generally comprises cross bedded pebbly to planer bedded medium grained sandstone. The area to the east is underlain by Cainozoic Quaternary (Qr) which generally comprises colluvial sheetwash and scree slopes, minor aeolian climbing dunes.

7.3 Subsurface Conditions

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area and can be summarised according to the following subsurface sequence:

Table 1: Summary of subsurface profile encountered in TP01 to TP25

Layer	Description	Depth to the base of layer (m)
Topsoil Unit 1	Silty CLAY, fine to medium grained, brown, trace grass rootlets, moisture condition >plastic limit	
		0.2 – 0.3
Residual Unit 2a	CLAY, medium plasticity to high , red, trace fine to medium grained sand and gravel, moisture condition >plastic limit, firm to very stiff	
		0.5 - >2.0
Unit 2b	Gravelly CLAY/Sandy CLAY/Sandy Gravelly CLAY, medium plasticity, red orange, fine to medium grained gravel and sand, moisture condition <plastic limit, very stiff (only TP01, TP05, TP21, TP23 and TP24)	
		0.5 - >1.3
Rock Unit 3	SANDSTONE, extremely to distinctly weathered, fine to medium grained, grey, orange, medium strength, Class V (only TP05 to TP08, TP13, TP14, TP17 to TP24)	
		>0.7 - >2.0

It should be noted that the depths and layer thickness provided in Table 1 are based on the subsurface conditions as observed at the investigation locations and may not be a representative of the entire site.

7.4 Groundwater

Groundwater was not encountered at the time of investigation. However, it is pointed out that standing groundwater and seepages may fluctuate with variations in rainfall, temperature and other factors. No longer term groundwater monitoring has been carried out.

8 Laboratory Test Results

Field Moisture Content (FMC) of soil samples tested ranged from 9.9% to 22.4% and liquid limit was recorded 37% to 89% which indicating high plasticity soils and of similar reactivity. A summary of laboratory test results which include field moisture content and Atterberg Limit with Linear Shrinkage tests is presented in Table 2 below.

Table 2: Summary of FMC and Atterberg Limit with Linear Shrinkage Test Results

TP No.	Depth (m)	Material Description/Origin	FMC (%)	LL (%)	PI (%)	LS (%)
TP01	0.4 – 0.8	Clay/Residual	15.5			
TP02	0.6 – 0.8	Clay/Residual	13.7			
TP03	0.8 – 1.0	Clay/Residual	19.4	89	69	23.5
TP04	1.0 – 1.2	Clay/Residual	22.4			
TP05	1.2 – 1.5	Sandy Clay/Residual	17.4			
TP06	0.3 – 0.6	Clay/Residual	20.1	53	33	16.0
TP07	0.4 – 0.8	Clay/Residual	15.6			
TP08	0.6 – 0.8	Clay/Residual	15.0			
TP09	0.4 – 0.8	Clay/Residual	20.5			
TP10	0.8 – 1.0	Clay/Residual	20.1			
TP11	1.5 – 2.0	Clay/Residual	19.4			
TP12	1.0 – 1.5	Clay/Residual	19.0			
TP13	1.0 – 1.5	Clay/Residual	15.7			
TP14	0.4 – 0.8	Clay/Residual	19.8			
TP15	0.6 – 0.8	Clay/Residual	15.5			
TP16	1.5 – 0.8	Clay/Residual	21.7			
TP17	0.8 – 1.0	Clay/Residual	15.8	53	38	14.5
TP18	0.4 – 0.8	Clay/Residual	16.2			
TP19	0.6 – 0.8	Clay/Residual	15.4	37	21	10.5
TP20	0.4 – 0.6	Clay/Residual	18.8	51	32	13.5
TP21	1.0 – 1.2	Sandy Gravelly Clay/Residual	11.1			
TP22	0.4 – 0.8	Clay/Residual	14.1	42	25	11.0
TP23	0.6 – 1.0	Sandstone/Rock	9.7			
TP24	0.3 – 0.6	Sandy Gravelly Clay/Residual	9.9			
TP25	0.6 – 1.0	Clay/Residual	14.7			

Note: FMC – Field Moisture Content, LL – Liquid Limit, PI – Plasticity Index and LS – Linear Shrinkage

Four (4) bulk samples were collected from to aid in assessment of strength of subgrade material. The FMC and CBR test results are shown in Table 3.

Table 3: A summary of FMC and CBR test results

TP No.	Depth (m)	Material Description/Origin	FMC (%)	OMC (%)	Swell (%)	MDD (t/m³)	CBR (%)
TP01	0.4 – 0.8	Clay/Residual	15.5	21.5	0.5	1.61	5.0
TP07	0.4 – 0.8	Clay/Residual	15.6	18.0	1.5	1.69	3.5
TP09	0.4 – 0.8	Clay/Residual	20.5	18.5	3.0	1.70	2.0
TP14	0.4 – 0.8	Clay/Residual	19.8	20.0	3.5	1.66	3.0
TP18	0.4 – 0.8	Clay/Residual	16.2	18.0	2.0	1.74	7.0

Note: FMC – Field Moisture Content, OMC – Optimum Moisture Content, MDD – Maximum Dry Density, CBR – California Bearing Ratio

A summary of Particle Size Distribution (PSD) test results is presented in Table 4 below.

Table 4: A summary of PSD test results

Sieve size, mm	TP11		TP13		TP23		TP25	
	Passed %	Retained %	Passed %	Retained %	Passed %	Retained %	Passed %	Retained %
26.5			100	0				
19	100	0	84	16	100	0	100	0
13.2	99	1	76	8	94	6	100	0
9.5	97	2	69	7	91	3	100	0
6.7	96	1	59	9	88	3	100	0
4.75	95	1	52	7	85	3	100	0
2.36	94	1	43	9	82	3	66	0
1.18	93	1	38	5	73	2	66	1
0.6	92	1	36	2	77	3	67	1
0.425	91	1	35	1	73	4	95	2
0.3	90	1	34	1	67	7	91	4
0.15	85	5	32	2	57	10	82	9
0.075	77	9	28	4	52	5	74	8

Six (6) soil samples were selected from test pit TP01, TP06, TP11, TP14, TP20 and TP24 to test for aggressivity suite to assess the exposure classification of in situ soils to buried concrete and steel members. The results of the laboratory testing summarised in Table 5 below.

Table 5: Summary of Field Moisture Content and Aggressivity test

TP No.	Depth (m)	Material Description/Origin	FMC (%)	pH	Conductivity µS/cm	Resistivity Ohm.m	Chloride, Cl- (ppm)	Sulphate, SO4- (ppm)
TP01	0.4 – 0.8	Clay/Residual	14	8.7	410	25	470	140
TP06	0.3 – 0.6	Clay/Residual	15	7.9	27	380	<10	20
TP11	1.5 – 2.0	Clay/Residual	17	9.3	210	47	37	94
TP14	0.4 – 0.8	Clay/Residual	18	9.4	180	56	36	73
TP20	0.4 – 0.6	Clay/Residual	17	8.0	17	580	<10	13
TP24	0.3 – 0.6	Sandy Gravelly Clay/Residual	9.6	7.3	<10	1900	<10	<10
Note: FMC – Field Moisture Content								

Six (6) soil samples were selected from TP03, TP08 TP13, TP17, TP19 and TP23 to test for conductivity and Cation Exchange Capacity (CEC) of in situ soils. The results of the laboratory testing summarised in Table 6 below.

Table 6: A summary of conductivity and Cation Exchange Capacity (CEC) test results

TP No.	Depth (m)	Material Description/Origin	Conductivity µS/cm	Cation Exchange Capacity
TP03	0.8 – 1.0	Clay/Residual	560	39
TP08	0.6 – 0.8	Clay/Residual	200	20
TP13	1.0 – 1.5	Clay/Residual	320	32
TP17	0.8 – 1.0	Clay/Residual	170	35
TP19	0.6 – 0.8	Clay/Residual	76	13
TP23	0.6 – 1.0	Sandstone/Rock	200	14

The laboratory test results are attached in Appendix D.

9 Geotechnical Discussion and Recommendations

9.1 General

The subsurface profile encountered in the test pits generally comprised firm to very stiff clay/sandy gravelly clay residual soils overlying sandstone rock.

9.2 Slope Stability

No evidence of slope instability (i.e. landslip, etc.) was observed within the site, which is consistent with the gently sloping landforms across most of the site. Therefore, it is considered that hillside instability does not impose significant constraints on the proposed site development. A stability hazard map has not been prepared, as no significant stability hazards were identified within the site.

9.3 Aggressivity

Based on the aggressivity test results, it is concluded that the soil conditions are non-aggressive for both steel and concrete piles as per AS2159:2009 Piling Design and Installation. It should be noted that for cast in-situ piles in soils under the water table (if encountered), concrete with a minimum compressive strength of 32MPa should be used.

9.4 Preliminary AS2870-2011 Site Classification

In accordance with AS2870-2011, “Residential Slabs and Footings - Construction” a class P site classification is appropriate for this site due to abnormal moisture conditions created by the presence of existing rural residential dwelling and small to large size trees.

The designing engineer should recognise that the majority of natural soil encountered on this site result in a Class M (moderately reactive) in areas of natural medium plasticity clays and shallow rock or Class H1 and H2 (highly reactive) in areas of deep high plasticity natural clays. It is anticipated that the characteristic surface movement under normal moisture condition may range from 40mm to 75mm.

It should be noted that in majority of samples the liquid limit ranging from 37% to 53% and linear shrinkage varying from 10.5% to 16.0%. However, in one sample the liquid limit and linear shrinkage was recorded higher as compared to the other samples. The liquid limit of this sample was recorded 89% and linear shrinkage was 23.5%. It is recommended that during the bulk cut/fill earthworks such high plasticity soils should be excavated and placed in deeper fill areas otherwise site classification in such soils could be worsen than Class H2 (highly reactive).

Placement of further reactive fill may increase the severity of classifications. Therefore, advice should be sought if fill earthworks exceeding about 0.4m depth is to be carried out on site to verify that the classification provided in this report remains valid.

The above recommendations are provided on the assumption that the performance expectations described in AS 2870 – 2011 are acceptable and future site maintenance accord CSIRO BTF -18 a copy of which is attached in Appendix F.

9.5 Removal of Dams

Three small to medium size dams were observed on site at the time of investigation. It is understood that this dam will be required to be decommissioned and desilted prior to earthworks operations commencing. The following methodology should be followed in the preparation process:

- Dewater all dams;
- Desilt and spread saturated and overly silty material in a designated stripped area separate to the dam (separating oversize and organic material) and allow sufficient time to dry;

- Once dry, assess the excavated material for suitability (geotechnical and environmental) for reuse in structural filling (to be undertaken by the geotechnical engineer);
- Remove all silt and sediment (and any excessively soft and compressible zones) from the dam base and surrounding dam batters, ensuring that excavation batters do not exceed the recommended values provided in *Section 9.8 Temporary Batter Slopes* of this report;
- Remove dam walls and associate uncontrolled filling and stockpile separately. This material will also need to be assessed by a geotechnical engineer for geotechnical and environmental suitability for reuse as structural filling;
- Follow site preparation procedures discussed in Section 9.7 Site Preparation and earthworks of this report. Ensure that a test roll is conducted in the presence of a geotechnical engineer in order to identify excessively weak subgrade or compressible zones; and
- Once approved, filling can be commenced with layer thickness, maximum particle size, compaction and moisture content to be in accordance with the requirements of Section 9.7 Site Preparation and earthworks of this report.

9.6 Groundwater Control During Excavation

Based on the investigation completed to date, it is anticipated that the groundwater may not be encountered during the excavation up to the termination/refusal depth of the test pits. However, if some seepage encountered during the excavation, then it may be controlled by conventional sump and pump dewatering system during construction.

It should be noted that groundwater levels are affected by climatic conditions, seasonal changes and soil permeability and will therefore vary with time.

9.7 Site Preparation and Earthworks

9.7.1 Excavation Characteristics

The depth of excavation to achieve the proposed design levels will vary across the site due to variations in existing surface levels.

Based on the subsurface profile encountered up to the termination/refusal depth of the test pits, the excavation below the existing surface grade is expected to be through firm to very stiff residual clay/sandy gravelly clay and then extremely to distinctly weathered sandstone rock. Excavation of such soils should be readily achieved using conventional earthmoving equipment, possibly with the assistance of light rock hammering or ripping in the upper weathered rock sequence (if rock encountered).

The excavation of medium to high strength rock (if encountered) would require moderate to heavy ripping with large bulldozers and the use of large hydraulic rock hammers for the bulk of the excavation. However, the use of such equipment should be limited due to the potential for excessive vibration transmitting across the site boundaries. Vertical rock excavation may require diamond-tipped rotary rock saws or milling heads along site boundaries to reduce vibrations and minimise over-break.

Excavation for footings and trenches in medium strength rock (if encountered) will also require the use of large hydraulic rock hammers together with rotary rock saws or milling heads.

It is recommended that a trial excavation with smaller equipment be carried out to assess vibration generated prior to bulk excavation. Vibration monitoring should be carried out by engaging an experienced consultant during the trial and in bulk excavation.

9.7.2 Subgrade Preparation

Following stripping and excavation to design levels, the subgrade should be proof rolled with at least eight passes of a static (non-vibratory) smooth drum roller of at least 12 tonnes deadweight. The final pass of proof rolling should be carried out under the direction of an experienced geotechnical engineer for the detection of unstable or soft areas.

Subgrade heaving during proof-rolling may occur in areas where the clays have become 'wet' and should be expected in areas of poorly compacted fill. Heaving areas should be locally removed to a stable base and replaced with engineered fill, as outlined below in *Section 9.7.3 Engineered Fill* of this report.

If soil softening occurs after rainfall periods, then the clay subgrade should be over-excavated to below the depth of moisture softening and replaced with engineered fill. If the clay subgrade exhibits shrinkage cracking, then the surface should be watered and rolled until the shrinkage cracks are no longer evident.

Engineered fill must be used where site levels need to be raised.

9.7.3 Engineered Fill

From a geotechnical perspective, the excavated residual soils and sandstone rock encountered up to the termination/refusal depth of test pits should be suitable for re-use as engineered fill, given it is 'clean', free of organic matter, contain a maximum particle size of 75mm and is approved by an environmental consultant to use on a residential development site.

Engineered fill comprising the excavated above-mentioned material should be compacted in maximum 200mm thick loose layers using a minimum 12 tonne deadweight padfoot roller to the following density and moisture ratios:

- Below the proposed buildings: strictly between 98% and 102% of SMDD and at a moisture content within 2% of SOMC;
- Below landscaped areas: to a density ratio of at least 95% of SMDD and at a moisture content within 2% of SOMC;

Where subgrade preparation and engineered fill placement will be required within about 15m of any nearby buildings and retaining walls then it would need to be carried out at the commencement of works using vibration monitors affixed onto the building(s) to assess the exclusion zone width where static rolling would need to be completed.

9.7.4 Edge Compaction

In order to achieve adequate edge compaction where fill platforms are proposed, we recommend that the outer edge of each fill layer extend a horizontal distance of at least 1m beyond the design geometry. The roller must extend over the edge of each placed layer in order to seal the batter surface. On completion of filling, the excess under-compacted edge fill should be trimmed back to the design geometry.

9.7.5 Service Tranches

Backfilling of service trenches must be carried out using engineered fill in order to reduce post construction settlements. Due to the reduced energy output of the rollers that can be placed in trenches, backfilling should be carried out in maximum 150mm thick loose layers and compacted using a trench roller, a pad foot roller attachment fitted to an excavator, and/or a vertical rammer compactor (also known as a 'Wacker Packer'). Due to the reduced loose layer thickness, the maximum particle size of the backfill material should also reduce to 100mm. The compaction specifications provided above are applicable. This is particularly important below any stormwater pipes where lack of compaction could lead to localised settlement and linear depressions over the trenches.

9.7.6 Earthworks Inspection and Testing

Density tests should be regularly carried out on the engineered fill to confirm the above specifications are achieved, as outlined below:

- The frequency of density testing for general engineered fill should be at least one test per layer per 1000m² or one test per 200m³ distributed reasonably evenly throughout the full depth and area, or 3 tests per visit, whichever requires the most tests (assumes maximum 300mm thick loose layers);
- The frequency of density testing for trench backfill should be at least one test per two layers per 40 linear metres (assumes maximum 150mm thick loose layers), with each test fully penetrating both layers.

Engineered fill to support any building loads must be placed under Level 1 inspection and testing. Level 2 testing of fill compaction is considered appropriate for pavement construction, including for the trench backfill.

9.8 Temporary Batter Slopes

The requirements for the excavation support will be governed by the geotechnical conditions and occupational health and safety requirements. The current NSW Work Cover code of practice for construction works/excavations requires that excavations in soil deeper than 1.5m must be stabilised by retaining structures. Also, if the excavations are to extend below the zone of influence of any nearby footings, then the proposed excavations are to be retained prior to excavation.

Based upon our past experiences, the following maximum batter slopes in Table 7 are recommended for the design of temporary and permanent cuts of up to 2.5m depends upon the surface level.

Table 7: Recommended Maximum Batter slopes for Exposed Material

Material	Temporary Batter Slope (H:V)	Permanent Batter Slope (H:V)
Unit 2a and 2b - Residual clay soils	1.5:1	3:1
Unit 3 - Sandstone rock	1.25:1	1.5:1
Notes: Any temporary cuts in soils should be covered to maintain the natural moisture		

The above safe batter is based on the assumption that all surcharge and footing loads are kept well clear of the excavation perimeter. As a guide, surcharge loadings should be no closer than 2.5H from the top of any batter or the face of any excavation (including footing excavation), where H is the vertical height in meters of the batter or depth of the excavation.

Steeper batter angles may be adopted following approval from a suitability experienced geotechnical engineer, and adoption of an inspection regime by a qualified geotechnical engineer. All vertical excavations to be avoided during periods of predicted heavy or prolonged rainfall. Inspections are to be completed by this office following any of the below events during construction:

- Following rainfall events in excess of 30mm over a 24-hour period.
- At any sign of instability including but not limited to:
  - Water seepage through the excavation face;
  - Loose/very soft material observed at the face of the excavation;
  - Tension cracks observed at the surface;

Excavations adjacent to existing structures, property boundaries or services (where batters cannot be achieved during horizontal distance constraints) are to be retained prior to excavation via use of an in-situ retaining wall system (e.g. non-contiguous pile wall).

9.9 Retention Design Parameters

It is suggested that design of permanent retaining structures be based on an average bulk unit weight for the retained material of 19kN/m³ and on a triangular distribution. In order to maximise rigidity of these walls, 'at rest' (K_o) earth pressure conditions may be considered. Earth pressure coefficients and geotechnical parameter for retaining wall design are presented in Table 8 below. Surcharge loads from the adjacent properties should be included in the wall design by multiplying vertical loads by the appropriate coefficient given in Table 8 below:

Table 8: Earth Pressure Coefficients (non-sloping crest surface)

Material	Unit Weight (kN/m³)	Ø' (in degrees)	E' (MPa)	Earth Pressure Coefficient		
				K_0	K_a	K_p
Residual Clay	18	26	20	0.5	0.39	2.56
Sandstone Class V	20	30	50	0.50	0.33	3.00

Note:

1. Ø' - angle of internal soil friction; E' – long term Young's modulus, N/A – No geotechnical parameters have been assigned to manmade fill layers due to the absence of records;
2. K_0 - coefficient of earth pressure at rest, K_a - coefficient of active earth pressure, K_p - coefficient of passive earth pressure.
3. The estimated values of K_0 are based on initial conditions before the construction of the perimeter retention system.
4. The retaining wall designer must adopt the above set of K_a and K_p parameters relevant to the actual construction method and structure type adopted.
5. The above parameters are based on the condition of a horizontal ground surface behind the retaining structure. Applicable surcharge loads behind the wall must also be considered in the design.
6. Inferred from AS 4678.

Retaining structures should be designed in accordance with AS 4678-2002 "Earth Retaining Structures" or an alternate approved factor of safety approach. Should any fill be placed against the permanent retaining wall after construction, it is expected that the compaction induced pressures will be much greater than the above active earth pressures. The compaction equipment used to compact backfill behind the wall must be carefully selected and preferably light-weight compaction equipment should be used. The load on the retaining wall due to compaction equipment may be estimated from Figure J5 in AS4678-2002 "Earth Retaining Structures".

It is noted that some ground movement will occur behind temporary or permanent retaining walls. By definition, movement of the wall must occur to fully mobilise the active and passive earth pressure coefficients provided in Table 8 above. The extent of this movement is dependent on the height of retaining, type of wall selected and construction methodology. This must be considered during the design and construction of the retaining walls to ensure adjacent facilities are not adversely affected.

Application of hydrostatic pressure should not be ignored unless a permanent drainage system of the ground behind the walls is installed. We advise all wall drainage to comprise a proper subsoil drainage designed by an experienced groundwater engineer.

9.10 Footings

For high level footings founded in engineered fill placed under Level 1 control to the specification in *Section 9.7 Site Preparation and Earthworks* above, which are not underlain by any uncontrolled fill, or natural clayey soils of at least very stiff strength, an allowable bearing

pressure of 100kPa may be adopted for footings embedded at least 0.5m below the surrounding ground level, provided the movements associated with shrink swell reactivity of the underlying soils can be accommodated.

The proposed buildings must be designed to accommodate shrink swell movements as discussed above. We note that the effects of differential movements associated with the reactive soils would be reduced where pavements extend around the entire perimeter of the buildings. Planters, gardens or grassed areas immediately adjacent to the building should be avoided for buildings founded on high level footings as they allow for the ingress of moisture and exacerbate reactive movements.

We recommend that all high-level footings be excavated, cleaned, inspected and poured with minimum delay to avoid either wetting or drying of the foundation. If delays in pouring concrete are anticipated, we recommend that the base of the footings be protected with a blinding layer of concrete of at least 75mm thickness. Water should be prevented from ponding in the base of footing excavations as this will tend to soften the foundation material, resulting in further excavation and cleaning being required.

9.11 Pile Foundation

Pile foundations should be used to support any part of the proposed structure to transfer proposed loads to the more competent subsurface ground units at depth accommodating concentrated compression or tension loads below to mitigate any predicted differential foundation settlement issues.

A range of pile foundation options for this site are available, the suitability of which is dictated by site location, ground conditions, nature of the surrounding environment, local availability, programme, plant access and cost. Typical pile foundation options include:

- Continuous Flight Auger (CFA) concrete;
- Bored Piles;

Based on the ground conditions, location of the site with respect to the surrounding built up environment and local market availability, it is expected that bored piles may be a preferred option for this project. Recommended bearing pressures and modulus values for the range of possible foundation materials encountered in test pits at the site are presented in Table 9. These parameters apply to the design of socketed bored piers.

Table 9: Summary of Pile Design Parameters

Recommended Parameters for Foundation Design				
Foundation Stratum	**Rock Classification**	**Allowable bearing pressure (kPa)**	**Allowable compressive socket side shear (kPa)[1]**	**Design Young's modulus (MPa)**
Sandstone	Class V	600	40	50

Notes:

1. End Bearing pressure to cause settlement of <1% of minimum footing dimension.
2. [1]Clean sockets of roughness category R2 or better (Walker and Pells, 1998); values must be reduced if smear is not removed.
3. Shaft adhesion applicable for the design of bored piers, uncased over rock socket length, where adequate sidewall cleanliness and roughness achieved.

The foundation design parameters given in the Table 9 assume that footings are socketed at least 0.6m into rock but it must be verified by the design engineer. It is recommended that the foundation excavations (piles) are clean and free of loose debris, with pile sockets free of smear and adequately rough immediately prior to concrete placement.

Bored piles should be cleaned and inspected and approved by a geotechnical consultant for the adequacy of the bearing and socket depths prior to concreting. If groundwater encountered during the drilling of bored piles, then temporary steel casing may require preventing hole collapse in clay.

Foundation proportioned on the basis of the above parameters would be expected to experience total settlements of less than 1% of the footing width (or pile diameter) under the applied Working (i.e Serviceability) Load, with differential settlements between adjacent columns expected to be less than half of this value.

9.12 Pavement Design Parameters

Five (5) CBR samples were collected for the assessment of strength of the subgrade. CBR value of residual clay samples collected from the test pits (TP01, TP07, TP09, TP14 and TP18) ranged from 2.0% to 7.0%. The CBR test result reports are attached in Appendix D.

Subgrade material at the tested locations comprises high plasticity residual clay. Subgrade material was assessed to be about 2% wet to 6% dry of Standard Optimum Moisture Content (SOMC) at the time of testing.

The natural subgrade material of three samples from TP09, TP14 and TP18 recorded a swell ranging from 2.0% to 3.5%. There is a possibility that during the boxing of roads the existing subgrade material at some isolated location may either need to be removed and replaced or stabilised to improve the subgrade properties to reduce shrinkage/swelling. CG recommends the subgrade should be inspected by a geotechnical consultant after preliminary boxing to identify stabilisation requirements.

For the proposed, provided the subgrade has been prepared in accordance with recommendations described in *Section 9.7.2 Subgrade Preparation* above, a CBR value of 3% can be adopted for design, or, a short term Young's Modulus of 30MPa.

We recommend that all base course materials for flexible pavements and sub-base materials for rigid pavements comprise DGB20 in accordance with RTA QA Specification 3051 unbound base. The DGB20 material should be compacted in maximum 200mm thick loose layers using a large smooth drum roller to at least 98% of Modified Maximum Dry Density (MMDD). Adequate moisture conditioning to within 2% of Modified Optimum Moisture Content (MOMC) should be provided during placement. For rigid pavements a recycled DGB20 product would be considered appropriate.

We further recommend that all sub-base materials for flexible pavements, rigid pavements, and floor slabs comprise DGS40, DGS20 or DGB20 in accordance with RTA QA Specification 3051. Recycled materials may be used provided they conform to the specification requirements of 3051. If the recycled materials contain brick or ceramic fragments, it is highly unlikely that they will conform to the specification requirements. If a recycled subbase is adopted, then it must be overlain by a minimum thickness of 150mm of quarried (non-recycled) base to limit the potential for reflective cracking of the asphaltic concrete which can occur when recycled materials recement. The subbase material should be compacted in maximum 200mm thick loose layers using a large smooth drum roller to at least 98% of MMDD. Again, adequate moisture conditioning to within 2% of MOMC should be provided during placement .

The final pavement material and compaction specification must be determined by the pavement designer once the traffic loading and location of the proposed roads are confirmed.

Density tests should be carried out on the granular pavement materials to confirm the above specifications are achieved. The frequency of density testing should be at least one test per layer per 500m2; three tests per lot and three tests per visit, whichever requires the most tests. Level 2 testing of fill compaction in accordance with AS3798-2007 would be considered

acceptable for the pavement layers. The geotechnical testing authority (GTA) should be directly engaged by Client.

Subsoil drains should be provided below the perimeter of the proposed pavements, including any internal planters etc. with invert levels at least 200mm below subgrade level. The drainage trenches should be excavated with a uniform longitudinal fall to appropriate discharge points so as to reduce the risk of water ponding. The subgrade should be graded to promote water flow towards the subsoil drains. Discharge from the subsoil drains should be piped to the stormwater system.

10 Further Inspection

It is recommended that the following review/inspections be undertaken during the construction stage:

- All the footings should be cleared of debris, softened materials and designed by a qualified professional Structural Engineer and should be inspected and approved by a Structural or Geotechnical Consultant prior to pouring of concrete.
- Temporary and permanent support design should be approved by an experienced consultant.
- Structural drawings for footings should be reviewed and approved by an experienced person.
- All footings must be inspected and approved by an experienced Geotechnical Engineer prior to pouring concrete.
- All earthworks including proof rolling inspections, density testing of all engineered fill should be carried out under the geotechnical supervision.
- In the event soil conditions encountered differ significantly from those described within this report.
- If project design is altered significantly from drawings reviewed and outlined or project described within this report.
- Any excavations exceeding 1.5m depth should be inspected by an experienced person to assess its stability.
- To confirm founding materials and allowable bearing pressures.

11 Reference

1. AS1726 - 2017, “Geotechnical Site Investigation”.
2. AS2870 - 2011, “Residential slabs and footings”.
3. AS2159-2009, “Piling – Design and installation”.
4. AS3798 – 2007, “Guidelines on earthworks for commercial and residential developments”.
5. AS4678 – 2002, “Earth-retaining structures”.
6. NSW Environment & Heritage eSPADE web application.
7. Forbes 1:250,000 Geological Map Geological Series Sheet S155-7 Second Edition 2000 from Geological Survey of NSW
8. HB 160 – 2006 Soils testing Reconfirmed 2016 Standards Australia.

12 Closure

This report has been prepared for Sydney Environmental Group Pty Ltd in accordance with CG's proposal dated 18 June 2023 (Ref. QU23-0235 Rev 1) under CG's Terms of Engagement.

The report is provided for the exclusive use of Sydney Environmental Group Pty Ltd for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. The conclusions drawn in the report are based on interpolation between test pits. Conditions can vary between test locations that cannot be explicitly defined or inferred by investigation.

The report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by CG, as the report has been written as advice and opinion rather than instructions for construction.

The report must be read in conjunction with the attached Information Sheets and any other explanatory notes and should be kept in its entirety without separation of individual pages or sections. CG cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing the report CG has necessarily relied upon information provided by the client and/or their agents.

This report has been prepared to advise on causes of distress and to suggest methods of remediation and should not be used for any litigation matters as the scope of work did not include such litigation objectives.

This report must be read in conjunction with the attached Information Sheets and any other explanatory notes.

We trust these comments are sufficient to meet your present requirements. Please do not hesitate to contact the undersigned should you have any queries.

For and on behalf of
Core Geotech Pty Ltd

Report prepared by:



Vishnu Inturi
Geotechnical Engineer
B.Tech (Civil) ME (Civil)

Reviewed and Authorised by:



Raj Singh
Principal Geotechnical Engineer
MIEAust CPEng NER
(Membership No. 3428360)

Appendix A
Information About this Report

Information About This Report

Limitations

Scope of Services: The report has been prepared in accordance with the scope of services set out in CG's Proposal under CG's Terms of Engagement, or as otherwise agreed with the client. The scope of services may have been limited and/or amended by a range of factors including time, budget, access and site constraints.

Specific Purpose: The report is provided for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report.

Currency of Information: The information in this report is considered accurate at the date of issue with regard to the current conditions of the site.

Reliance on Information: In preparing the report CG has necessarily relied upon information provided by the Client and/or their Agents. Such data may include surveys, analyses, designs, maps and plans. CG has not verified the accuracy or completeness of the data except as stated in this report.

Copyright and Reproductions: The contents of this documents are and remain the intellectual property of CG. This document should only be used for the purpose for which it was commissioned and should not be used for other projects or by a third party. This report shall not be reproduced either totally or in part without the permission of CG. Where information from this report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimise the likelihood of misinterpretation.

Construction Specifications: Unless otherwise stated, the report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by CG.

Report Should Not be Separated: The report must be read in conjunction with the attached information Sheets and any other explanatory notes and should be kept in its entirely without separation of individual pages or sections.

Review by Others: CG cannot be held responsible for interpretation or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

GENERAL NOTES

Geotechnical Reporting: Geotechnical reporting relies on the interpretation of factual information based on judgment and opinion and is far less exact than other engineering or design disciplines. Geotechnical reports are for a specific purpose, development and site as described in the report and may not contain sufficient information for other purposes, developments or sites (including adjacent sites) other than that described in the report.

Subsurface Conditions: Subsurface conditions can change with time and can vary between test locations. For example, the actual interface between the materials may be far more gradual or abrupt than indicated and contaminant presence may be affected by spatial and temporal patterns. Therefore, actual conditions in areas not sampled may differ from those predicted since no subsurface investigation, no matter how comprehensive, can reveal all subsurface details and anomalies. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions and thus the continuing adequacy of a geotechnical report. CG should be kept informed of any such events and should be retained to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Groundwater: Groundwater levels indicated on borehole and test pit logs are recorded at specific times. Depending on ground permeability, measured levels may or may not reflect actual levels if measured over a longer time period. Also, groundwater levels and seepage inflows may fluctuate with seasonal and environmental variations and construction activities.

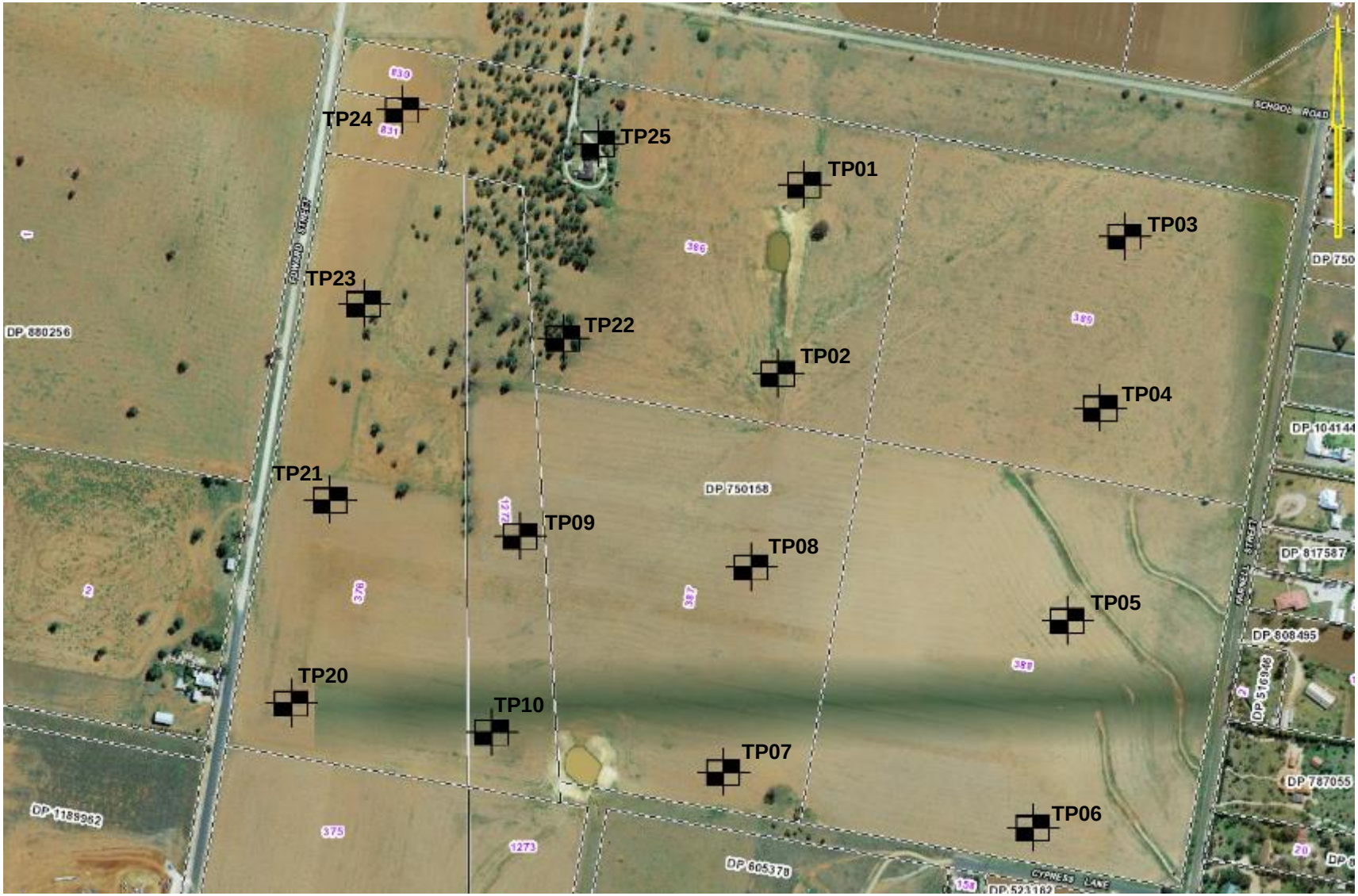
Interpretation of Data: Data obtained from nominated discrete locations, subsequent laboratory testing and empirical or external sources are interpreted by trained professionals in order to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions in accordance with any relevant industry standards, guidelines or procedures.

Soil and Rock Descriptions: Soil and rock descriptions are based on AS 1726 – 2017, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the accompanying soil and rock terms sheet for further information.

Further Advice: CG would be pleased to further discuss how any of the above issues could affect a specific project. We would also be pleased to provide further advice or assistance including:

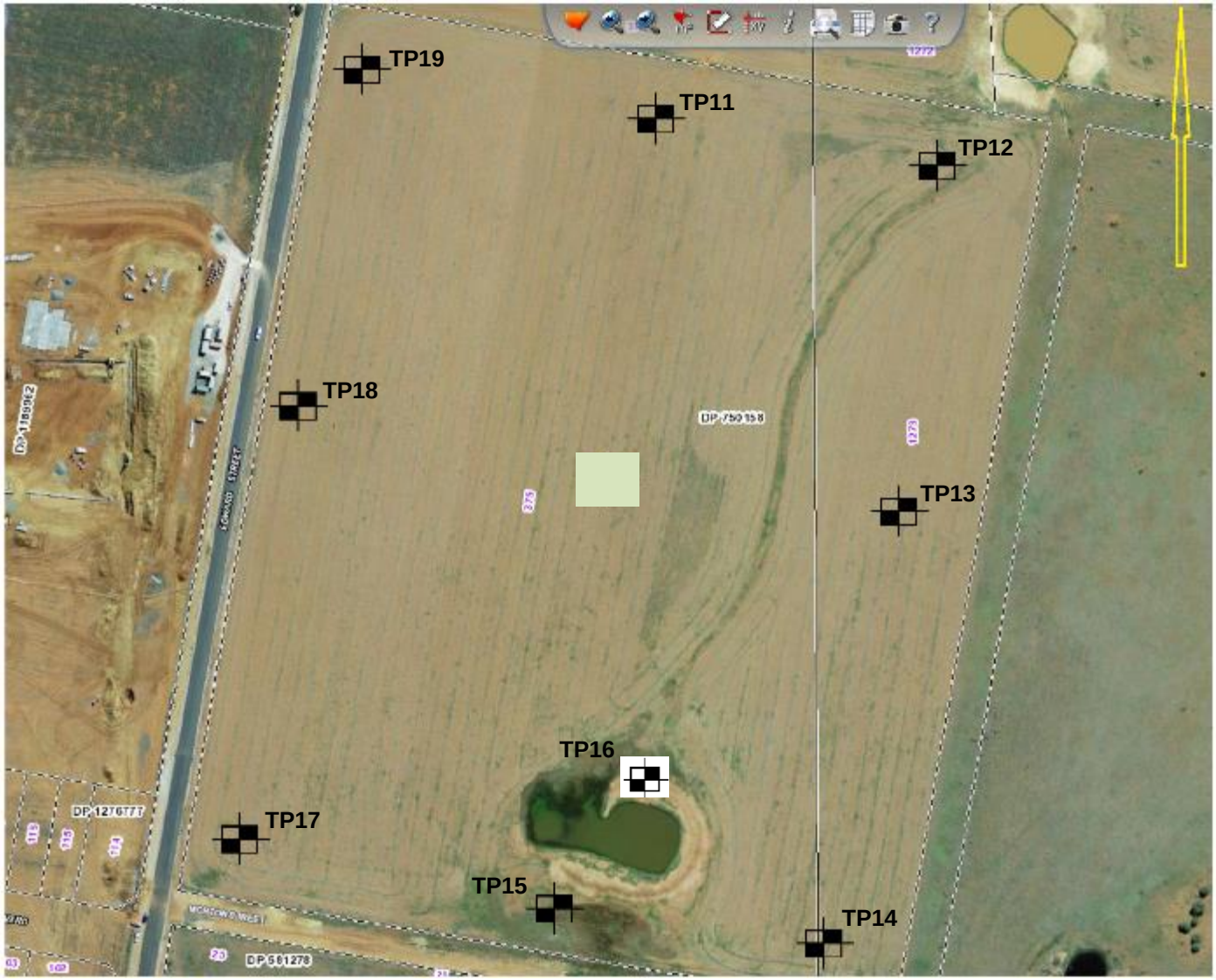
- Assessment of suitability of designs and construction techniques;
- Contract documentation and specification;
- Construction control testing (earthworks, pavement materials, concrete);
- Construction advice (foundation assessments, excavation support).

Appendix B
Test Pit Location Plan
Drawing No. CG23-0608-1



	LEGEND:	Core Geotech	Scale: A4 - NOT TO SCALE	Client: SYDNEY ENVIRONMENTAL GROUP PTY LTD	
	APPROXIMATE TEST PIT LOCATION		Date: 10/08/2023	Project: PROPOSED RESIDENTIAL DEVELOPMENT	
			Drawing: RS	Location: SCHOOL ROAD, FORBES NSW	
			Drawing No: CG23/0608-3	Sheet: 1 of 1	**SITE PLAN**

31 Lilburn Street,
Tallawong NSW 2762
Tel: 0479 154 977
Email: rsingh@coregeotech.com.au



	LEGEND:	Core Geotech	Scale: A4 - NOT TO SCALE	Client: SYDNEY ENVIRONMENTAL GROUP PTY LTD	
	APPROXIMATE TEST PIT LOCATION		Date: 10/08/2023	Project: PROPOSED RESIDENTIAL DEVELOPMENT	
		31 Lilburn Street, Tallawong NSW 2762 Tel: 0479 154 977 Email: rsingh@coregeotech.com.au	Drawing: RS	Location: SCHOOL ROAD, FORBES NSW	
			Drawing No: CG23/0608-4	Sheet: 1 of 1	**SITE PLAN**

Appendix C
Test Pit Logs

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP01

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI	Silty CLAY, low to medium plasticity, brown, trace grass rootlets, moisture condition >plastic limit	DCP = 2	TOPSOIL
							2	
							4	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition >plastic limit, very stiff	7	RESIDUAL
			0.5				7	
							9	
							14	
							17	
			1.0				17	
					CI/CH	Gravelly CLAY, medium to high plasticity, red orange, fine to medium grained gravel and sand, moisture condition <plastic limit, very stiff		
			1.5			Borehole TP01 terminated at 1.5m		
			2.0					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP02

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI	Silty CLAY, low to medium plasticity, brown, trace grass rootlets, moisture condition >plastic limit	DCP = 3	TOPSOIL
							3	
							4	
					CH	CLAY, high plasticity, red grey, trace fine to medium grained sand and gravel, moisture condition >plastic limit, very stiff	6	RESIDUAL
			0.5				6	
							12	
							12	
							12	
			1.0				17	
					CH	CLAY, high plasticity, red orange yellow,with fine to medium grained sand and gravel, moisture condition >plastic limit, very stiff		
			1.5					
						Borehole TP02 terminated at 1.8m		
			2.0					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP03

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CH	Silty CLAY, low to medium plasticity, brown, trace grass rootlets, moisture condition >plastic limit		TOPSOIL
			0.5		CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition >plastic limit, very stiff		RESIDUAL
			1.0					
			1.5					
			2.0		CH	CLAY, high plasticity, red orange, with fine to m grained sand and gravel, moisture condition >plastic limit, very stiff		
			2.5			Borehole TP03 terminated at 2m		

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP04

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CH	Silty CLAY, low to medium plasticity, brown, trace grass rootlets, moisture condition >plastic limit	DCP = 2	TOPSOIL
							2	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition >plastic limit, stiff to very stiff	3	RESIDUAL
							4	
			0.5				5	
							7	
							7	
							8	
							7	
			1.0				7	
							5	
							5	
							5	
							4	
			1.5				5	
							5	
							5	
							5	
					CI/CH	CLAY, medium to high plasticity, red orange, with fine to medium grained sand and gravel, moisture condition >plastic limit, very stiff	4	
			2.0				3	
							3	
							4	
						Borehole TP04 terminated at 2.2m	7	
							12	
			2.5				12	
							12	

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP05

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** --- **DATUM** ---

EXCAVATION CONTRACTOR --- **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CH	Silty CLAY, low to medium plasticity, brown, trace grass rootlets, moisture condition >plastic limit	DCP = 2	TOPSOIL
							2	
					CH	CLAY, high plasticity, orange red, trace fine to medium grained sand, moisture condition >plastic limit, firm to very stiff	3	RESIDUAL
							2	
			0.5				4	
							4	
							5	
							4	
							4	
			1.0		CI	Sandy CLAY, medium plasticity, orange grey, with fine to medium grained sand and gravel, moisture condition >plastic limit, stiff to very stiff	5	
							4	
							9	
			1.5			SANDSTONE, extremely to distinctly weathered, fine to medium grained, grey orange, medium strength	+12 Double bounce	ROCK
			2.0			Borehole TP05 terminated at 1.5m		

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP06

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							3	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition > plastic limit, firm to very stifff	2	RESIDUAL
							4	
			0.5				6	
							9	
							17	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength	DB	ROCK
			1.0			Borehole TP06 terminated at 0.9m		
			1.5					
			2.0					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP07

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							4	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition > plastic limit, stiff to very stifff	4	RESIDUAL
							3	
			0.5				4	
							5	
							9	
							9	
							9	
					CI/CH	CLAY, medium to high plasticity, red, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stifff	12	
			1.0				12	
							16	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength	+17	ROCK
			1.5			Borehole TP07 terminated at 1.4m		
			2.0					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP08

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 4	TOPSOIL
							3	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition > plastic limit, stiff to very stifff	3	RESIDUAL
							4	
			0.5				5	
							9	
					CI/CH	CLAY, medium to high plasticity, red, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stifff	9	
							12	
							17	
			1.0			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength	DB	ROCK
			1.5			Borehole TP08 terminated at 1.3m		
			2.0					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP09

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** --- **DATUM** ---

EXCAVATION CONTRACTOR --- **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							2	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand and gravel, moisture condition > plastic limit, firm to very stifff	1	RESIDUAL
							1	
			0.5				2	
							2	
							2	
							2	
							4	
			1.0				3	
							4	
							5	
							4	
							5	
			1.5				4	
					CI	CLAY, medium plasticity, red, with fine to medium grained sand and gravel, moisture condition < plastic limit, stiff to very stifff	4	
							6	
							5	
							6	
			2.0				9	
						Borehole TP09 terminated at 2m	9	
							12	
							10	
							10	
			2.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP10

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							3	
					CH	CLAY, high plasticity, red, trace fine to medium gravel, moisture condition > plastic limit, firm to stiff	2	RESIDUAL
							2	
			0.5				3	
							4	
							5	
							4	
							3	
			1.0				4	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stifff	5	
							6	
							7	
							9	
			1.5				9	
							10	
							9	
							9	
			2.0			Borehole TP10 terminated at 2m		
			2.5					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP11

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** --- **DATUM** ---

EXCAVATION CONTRACTOR --- **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							1	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	2	RESIDUAL
							2	
			0.5				4	
							3	
							4	
							3	
							3	
			1.0				3	
							4	
							5	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stifff	6	
							7	
			1.5				9	
							9	
							12	
							10	
							9	
			2.0				9	
						Borehole TP11 terminated at 2m	12	
							10	
			2.5					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP12

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 29/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED		0.0		CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							3	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	2	RESIDUAL
							2	
			0.5				3	
							2	
							4	
							5	
							4	
			1.0				3	
							4	
							5	
							4	
							6	
			1.5				7	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, very stiff to hard	9	
							8	
							9	
			2.0				9	
						Borehole TP12 terminated at 2m		
			2.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP13

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							2	
							3	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	4	RESIDUAL
			0.5				3	
							5	
							6	
							5	
							5	
			1.0				5	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, very stiff to hard	9	
							9	
							12	
							12	
			1.5			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength		ROCK
			2.0			Borehole TP13 terminated at 1.7m		

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP14

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED		0.0		CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							3	
							2	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	2	RESIDUAL
			0.5				2	
							4	
							5	
							4	
							4	
			1.0				4	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, very stiff to hard	6	
							5	
							8	
			1.5				8	
							8	
							8	
							9	
			2.0			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength	+12 Double bounce	ROCK
			2.5			Borehole TP14 terminated at 2m		

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP15

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							4	
							2	
					CH	CLAY, high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stiff	4	RESIDUAL
			0.5				4	
							3	
							4	
							3	
							4	
			1.0				5	
							7	
							8	
							7	
							7	
			1.5				7	
							8	
							9	
			2.0			Borehole TP15 terminated at 2m		
			2.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP16

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							2	
							1	
					CH	CLAY, high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit, stiff to very stiff	2	RESIDUAL
			0.5				4	
							4	
							5	
							4	
							5	
			1.0				4	
							4	
							7	
							8	
							8	
			1.5				8	
							8	
			2.0					
						Borehole TP16 terminated at 2m		
			2.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP17

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit		TOPSOIL
			0.5		CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, stiff to very stiff		RESIDUAL
			1.0		CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit		
			1.5					
			2.0			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength		ROCK
			2.5			Borehole TP17 terminated at 2m		

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP18

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 1	TOPSOIL
							0	
							1	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	3	RESIDUAL
							2	
			0.5				5	
							4	
							5	
							4	
							5	
			1.0				9	
							12	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, green brown orange, medium to high strength	DB	ROCK
			1.5			Borehole TP18 terminated at 1.4m		

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP19

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							1	
					CH	CLAY, medium to high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	0	RESIDUAL
							2	
			0.5				4	
							6	
							7	
							12	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength	DB	ROCK
			1.0			Borehole TP19 terminated at 1m		
			1.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP20

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							2	
					CH	CLAY, high plasticity, red, trace fine to medium grained sand, moisture condition > plastic limit, firm to stiff	1	RESIDUAL
							4	
			0.5				3	
							3	
							5	
							7	
							9	
			1.0				9	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit	12	
							12	
			1.5			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength		ROCK
			2.0			Borehole TP20 terminated at 1.7m		

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP21

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition > plastic limit	DCP = 2	TOPSOIL
							1	
							2	
					CH	CLAY, high plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition = plastic limit	4	RESIDUAL
			0.5				5	
							4	
							5	
							4	
							4	
			1.0		CI	Sandy Gravelly CLAY, medium plasticity, yellow grey red, fine to medium grave and sand, moisture condition <plastic limit	5	
							5	
							12	
							18	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength	DB	ROCK
			1.5			Borehole TP21 terminated at 1.4m		
			2.0					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP22

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition = plastic limit	DCP = 2	TOPSOIL
							2	
					CI	CLAY, medium plasticity, red, fine to medium grained sand, trace fine to medium gravel, moisture condition < plastic limit	10	RESIDUAL
							12	
							14	
			0.5				18	
							19	
							22	
			1.0			SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength		ROCK
			1.5			Borehole TP22 terminated at 1.1m		

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP23

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI/CH	Silty CLAY, medium to high plasticity, red brown, trace grass rootlets, moisture condition = plastic limit	DCP = 2	TOPSOIL
							6	
					CI	Sandy CLAY, medium plasticity, red , fine to medium grained sand, moisture condition < plastic limit	5	RESIDUAL
							5	
							9	
			0.5				12	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength	18	ROCK
			1.0			Borehole TP23 terminated at 1.1m		
			1.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP24

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** _____ **DATUM** _____

EXCAVATION CONTRACTOR _____ **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI	Silty CLAY, medium plasticity, red brown, trace grass rootlets, moisture condition = plastic limit	DCP = 2	TOPSOIL
							6	
					CL-CI	Sandy Gravelly CLAY, medium plasticity, orange grey, medium to coarse gravel, fine to medium grained sand, moisture condition< plastic limit	8	RESIDUAL
							12	
			0.5				DB	
						SANDSTONE, extremely to distinctly weathered, medium to coarse grained, yellow brown orange, medium to high strength		ROCK
			1.0			Borehole TP24 terminated at 0.7m		
			1.5					

Core Geotech Pty Ltd
31 Lilburn Street
Tallawong NSW 2762
Telephone: +61 0479 154 977

TEST PIT NUMBER TP25

CLIENT Sydney Environmental Group Pty Ltd **PROJECT NAME** Proposed Planning Proposal

PROJECT NUMBER CG23-0608 **PROJECT LOCATION** School Road, Forbes NSW

DATE STARTED 29/6/23 **COMPLETED** 30/6/23 **R.L. SURFACE** --- **DATUM** ---

EXCAVATION CONTRACTOR --- **SLOPE** --- **BEARING** ---

EQUIPMENT Track Mounted Excavator **TEST PIT LOCATION** Refer to Drawing No. CG23-0608-1

TEST PIT SIZE 400mm **LOGGED BY** VI **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
E	NONE ENCOUNTERED				CI	Silty CLAY, medium plasticity, red brown, trace grass rootlets, moisture condition = plastic limit	DCP = 2	TOPSOIL
							4	
					CI/CH	CLAY, medium to high plasticity, red orange grey, with fine to medium grained sand, moisture condition < plastic limit	2	RESIDUAL
							4	
			0.5				3	
							5	
							6	
							7	
							8	
			1.0				9	
					CI	CLAY, medium plasticity, red orange grey, with fine to medium grained sand and gravel, moisture condition < plastic limit	12	
			1.5				12	
						Borehole TP25 terminated at 1.7m		
			2.0					

BOREHOLE / TEST PIT CG23-0608 TEST PIT LOGS.GPJ GINT STD AUSTRALIA.GDT 19/8/23

Abbreviations, Notes & Symbols

Core Geotech

SUBSURFACE INVESTIGATION

METHOD

Borehole Logs

AS#	Auger screwing (#-bit)
AD#	Auger drilling (#-bit)
B	Blank bit
V	V-bit
T	TC-bit
HA	Hand auger
R	Roller/tricone
W	Washbore
AH	Air hammer
AT	Air track
LB	Light bore push tube
MC	Macro core push tube
DT	Dual core push tube

Excavation Logs

BH	Backhoe/excavator bucket
NE	Natural exposure
HE	Hand excavation
X	Existing excavation

Cored Borehole Logs

NMLC	NMLC core drilling
NQ/HQ	Wireline core drilling

SUPPORT

Borehole Logs

C	Casing
M	Mud

Excavation Logs

S	Shoring
B	Benched

SAMPLING

B	Bulk sample
D	Disturbed sample
U#	Thin-walled tube sample (#mm diameter)
ES	Environmental sample
EW	Environmental water sample

FIELD TESTING

PP	Pocket penetrometer (kPa)
DCP	Dynamic cone penetrometer
PSP	Perth sand penetrometer
SPT	Standard penetration test
PBT	Plate bearing test
s_u	Vane shear strength peak/residual (kPa) and vane size (mm)
N*	SPT (blows per 300mm)
Nc	SPT with solid cone
R	Refusal

**denotes sample taken*

BOUNDARIES

————	Known
— — — -	Probable
.....	Possible

SOIL

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
Wp	Plastic Limit
Wl	Liquid Limit
MC	Moisture Content

CONSISTENCY

VS	Very Soft
S	Soft
F	Firm
St	Stiff
VSt	Very Stiff
H	Hard
Fb	Friable

DENSITY INDEX

VL	Very Loose
L	Loose
MD	Medium Dense
D	Dense
VD	Very Dense

USCS SYMBOLS

GW	Well graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines
SM	Silty sand, sand-silt mixtures
SC	Clayey sand, sand-clay mixtures
ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity
PT	Peat muck and other highly organic soils

ROCK

WEATHERING

RS	Residual Soil
XW	Extremely Weathered
HW	Highly Weathered
MW	Moderately Weathered
DW*	Distinctly Weathered
SW	Slightly Weathered
FR	Fresh

**covers both HW & MW*

STRENGTH

EL	Extremely Low
VL	Very Low
L	Low
M	Medium
H	High
VH	Very High
EH	Extremely High

ROCK QUALITY DESIGNATION (%)

$$= \frac{\text{sum of intact core pieces} > 100\text{mm}}{\text{total length of section being evaluated}} \times 100$$

CORE RECOVERY (%)

$$= \frac{\text{core recovered}}{\text{core lIft}} \times 100$$

NATURAL FRACTURES

Type

JT	Joint
BP	Bedding plane
SM	Seam
FZ	Fractured zone
SZ	Shear zone
VN	Vein

Infill or Coating

Cn	Clean
St	Stained
Vn	Veneer
Co	Coating
Cl	Clay
Ca	Calcite
Fe	Iron oxide
Mi	Micaceous
Qz	Quartz

Shape

pl	Planar
cu	Curved
un	Undulose
st	Stepped
ir	Irregular

Roughness

pol	Polished
slk	Slickensided
smo	Smooth
rou	Rough

Soil and Rock Terms

Core Geotech

SOIL

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through the hand.
Moist	Feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist, but with free water forming on hands when handled.

For cohesive soils, moisture content may also be described in relation to plastic limit (W_P) or liquid limit (W_L). [>> much greater than, > greater than, < less than, << much less than].

CONSISTENCY

Term	c_u (kPa)	Term	c_u (kPa)
Very Soft	< 12	Very Stiff	100 - 200
Soft	12 - 25	Hard	> 200
Firm	25 - 50	Friable	-
Stiff	50 - 100		

DENSITY INDEX

Term	I_D (%)	Term	I_D (%)
Very Loose	< 15	Dense	65 – 85
Loose	15 – 35	Very Dense	> 85
Medium Dense	35 – 65		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		63 - 200
Gravel	coarse	20 - 63
	medium	6 - 20
	fine	2.36 - 6
Sand	coarse	0.6 - 2.36
	medium	0.2 - 0.6
	fine	0.075 - 0.2
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass coarse grained	fine grained
Trace	≤ 5%	≤ 15%
Some	5 - 2%	15 - 30%

SOIL ZONING

Layers	Continuous exposures
Lenses	Discontinuous layers of lenticular shape
Pockets	Irregular inclusions of different material

SOIL CEMENTING

Weakly	Easily broken up by hand
Moderately	Effort is required to break up the soil by hand

SOIL STRUCTURE

Massive	Coherent, with any partings both vertically and horizontally spaced at greater than 100mm
Weak	Peds indistinct and barely observable on pit face. When disturbed approx. 30% consist of peds smaller than 100mm
Strong	Peds are quite distinct in undisturbed soil. When disturbed >60% consists of peds smaller than 100mm

ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of….)
Conglomerate	… gravel sized (> 2mm) fragments
Sandstone	… sand sized (0.06 to 2mm) grains
Siltstone	… silt sized (<0.06mm) particles, rock is not laminated
Claystone	… clay, rock is not laminated
Shale	… silt or clay sized particles, rock is laminated

STRENGTH

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	< 0.03	High	1 – 3
Very Low	0.03 – 0.1	Very High	3 – 10
Low	0.1 – 0.3	Extremely High	> 10
Medium	0.3 – 1		

WEATHERING

Term	Description
Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident
Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water. Fabric of original rock is still visible
Highly Weathered	Rock strength usually highly changed by weathering; rock may be highly discoloured
Moderately Weathered	Rock strength usually moderately changed by weathering; rock may be moderately discoloured
Distinctly Weathered	See 'Highly Weathered' or 'Moderately Weathered'
Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh	Rock shows no signs of decomposition or staining

NATURAL FRACTURES

Type	Description
Joint	A discontinuity or crack across which the rock has little or no tensile strength. May be open or closed
Bedding plane	Arrangement in layers of mineral grains of similar sizes or composition
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed)
Shear zone	Zone with roughly parallel planar boundaries, of rock material intersected by closely spaced (generally < 50mm) joints and /or microscopic fracture (cleavage) planes
Vein	Intrusion of any shape dissimilar to the adjoining rock mass. Usually igneous

Shape	Description
Planar	Consistent orientation
Curved	Gradual change in orientation
Undulose	Wavy surface
Stepped	One or more well defined steps
Irregular	Many sharp changes in orientation

Infill or Coating	Description
Clean	No visible coating or discolouring
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating ≤ 1mm thick. Ticker soil material described as seam

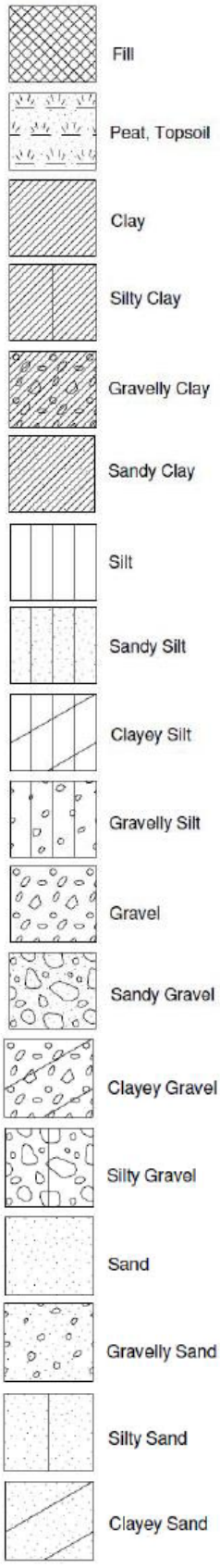
Roughness	Description
Polished	Shiny smooth surface
Slickensided	Grooved or striated surface, usually polished
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally < 1mm). Feels like fine to coarse sandpaper

Note: soil and rock descriptions are generally in accordance with AS1726-1993 Geotechnical Site Investigations

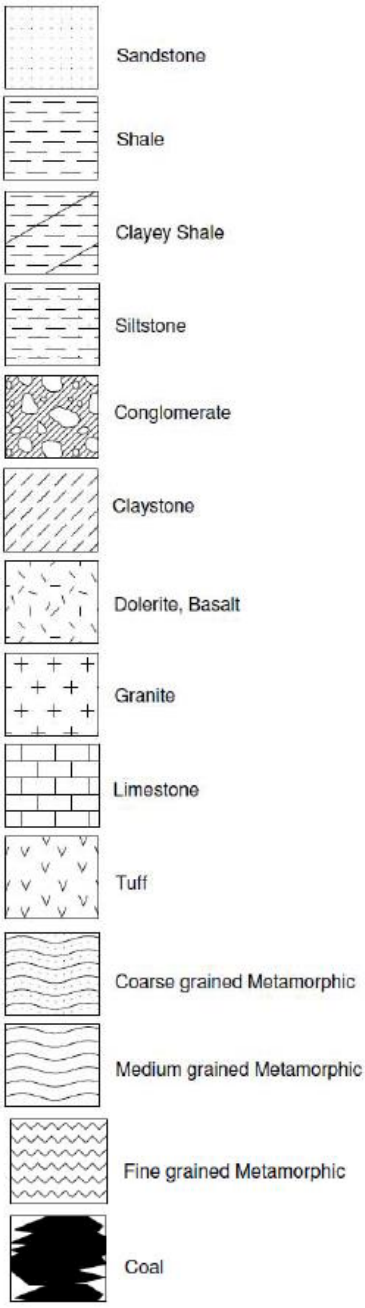
Graphic Symbols Index

Core Geotech

Soil



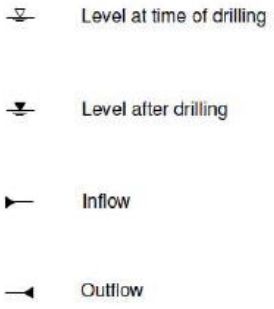
Rock



Other



Water Measurements



Appendix D
Laboratory Test Results

Material Test Report

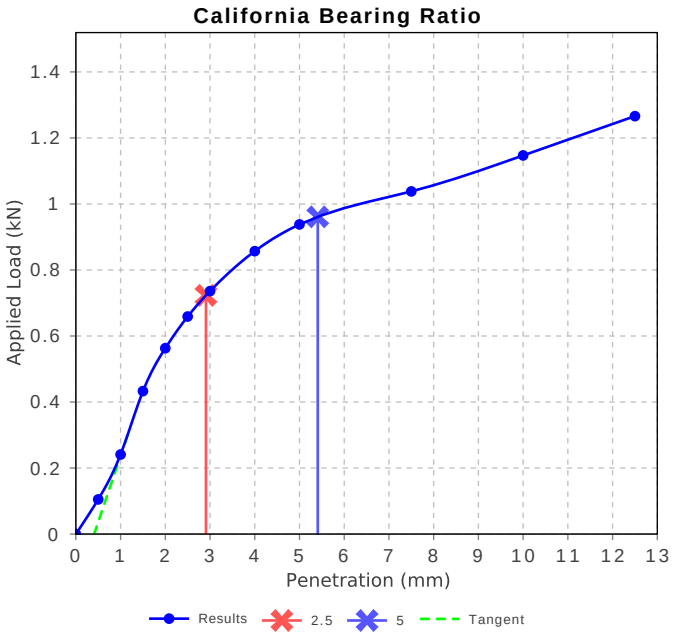
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126A
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 31/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP01, Depth: 0.4 - 0.8 m**
Material: Ruddy Brown Silty Clay trace Sand
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Additive Type	None		
Additive Percent (%)	0		
Maximum Dry Density (t/m^3)	1.61		
Optimum Moisture Content (%)	21.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.5		
Dry Density after Soaking (t/m^3)	1.60		
Field Moisture Content (%)	15.6		
Moisture Content at Placement (%)	21.7		
Moisture Content Top 30mm (%)	28.4		
Moisture Content Rest of Sample (%)	23.4		
Mass Surcharge (kg)	6.75kg		
Soaking Period (days)	4		
Curing Hours	91.5		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	69		
Plastic Limit (%)	20		
Plasticity Index (%)	**49**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**19.0**		
Cracking Crumbling Curling	Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126C
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 28/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP03, Depth: 0.8 - 1.0 m**
Material: Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	89		
Plastic Limit (%)	20		
Plasticity Index (%)	**69**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**23.5**		
Cracking Crumbling Curling	Cracking & Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126F
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP06, Depth: 0.3 - 0.6 m**
Material: Dark Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	53		
Plastic Limit (%)	20		
Plasticity Index (%)	**33**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.0**		
Cracking Crumbling Curling	Cracking		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

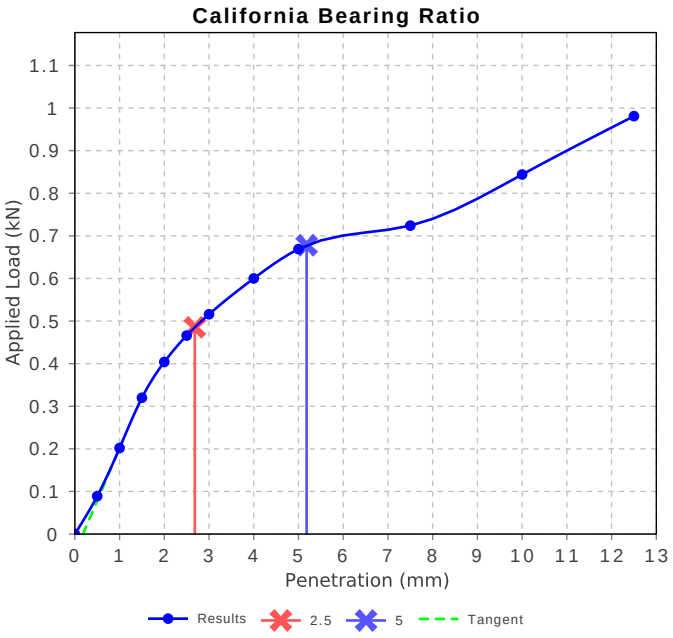
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126G
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP07, Depth: 0.4 - 0.8 m**
Material: Brown Silty Clay
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**3.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Additive Type	None		
Additive Percent (%)	0		
Maximum Dry Density (t/m^3)	1.69		
Optimum Moisture Content (%)	18.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	102.0		
Dry Density after Soaking (t/m^3)	1.66		
Field Moisture Content (%)	15.5		
Moisture Content at Placement (%)	18.5		
Moisture Content Top 30mm (%)	24.4		
Moisture Content Rest of Sample (%)	19.0		
Mass Surcharge (kg)	6.75kg		
Soaking Period (days)	4		
Curing Hours	96.1		
Swell (%)	1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

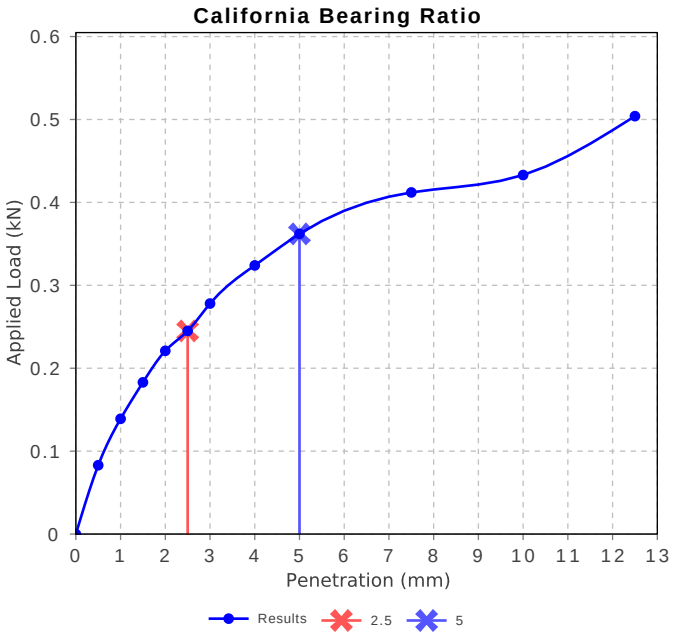
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126I
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP09, Depth: 0.4 - 0.8 m**
Material: Ruddy Brown Silty Clay
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Additive Type	None		
Additive Percent (%)	0		
Maximum Dry Density (t/m^3)	1.70		
Optimum Moisture Content (%)	18.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.5		
Dry Density after Soaking (t/m^3)	1.65		
Field Moisture Content (%)	20.4		
Moisture Content at Placement (%)	18.4		
Moisture Content Top 30mm (%)	29.3		
Moisture Content Rest of Sample (%)	20.2		
Mass Surcharge (kg)	6.75kg		
Soaking Period (days)	4		
Curing Hours	92.3		
Swell (%)	3.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

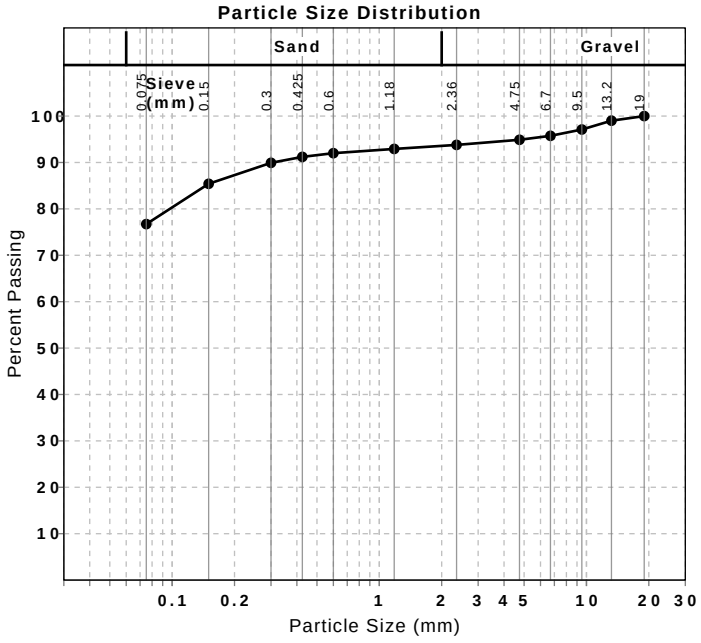
Report Number:	**P230463-1**
Issue Number:	1
Date Issued:	07/08/2023
Client:	Core Geotech
	31 Lilburn Street, Tallawong NSW 2762
Contact:	Raj Singh, 0479 154 977
Project Number:	P230463
Project Name:	Forbes Planning Proposal - Geotechnical
Project Location:	School Road, Forbes
Client Reference:	CG23-0608
Work Request:	2126
Sample Number:	23-2126K
Date Sampled:	30/06/2023
Dates Tested:	03/07/2023 - 28/07/2023
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Site Selection:	Selected by Client
Sample Location:	**TP11, Depth: 1.5 - 2.0 m**
Material:	Ruddy Brown Silty Clay
Material Source:	In-Situ

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**99**			1		
9.5 mm	**97**			2		
6.7 mm	**96**			1		
4.75 mm	**95**			1		
2.36 mm	**94**			1		
1.18 mm	**93**			1		
0.6 mm	**92**			1		
0.425 mm	**91**			1		
0.3 mm	**90**			1		
0.15 mm	**85**			5		
0.075 mm	**77**			9		

Moisture Content (AS1289.2.1.1)		Min	Max
Moisture Content (%)	19.4		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	48		
Plastic Limit (%)	16		
Plasticity Index (%)	**32**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**13.0**		
Cracking Crumbling Curling	Curling		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

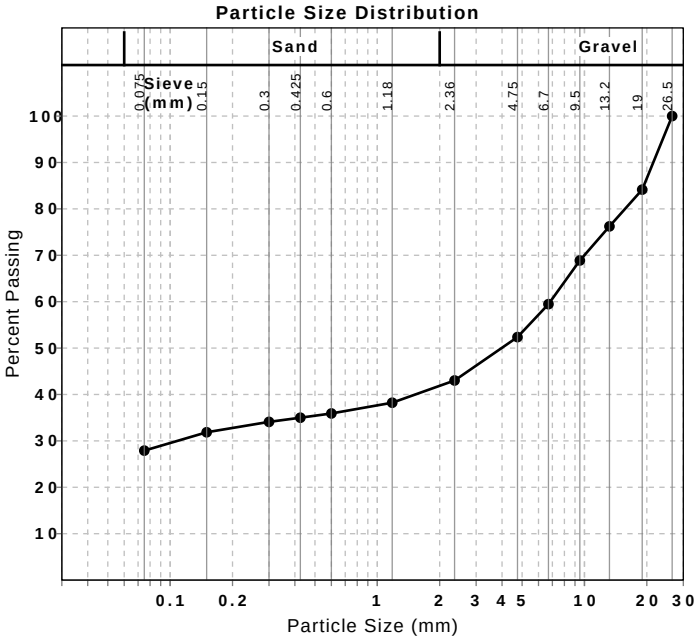
Report Number:	**P230463-1**
Issue Number:	1
Date Issued:	07/08/2023
Client:	Core Geotech
	31 Lilburn Street, Tallawong NSW 2762
Contact:	Raj Singh, 0479 154 977
Project Number:	P230463
Project Name:	Forbes Planning Proposal - Geotechnical
Project Location:	School Road, Forbes
Client Reference:	CG23-0608
Work Request:	2126
Sample Number:	23-2126M
Date Sampled:	30/06/2023
Dates Tested:	03/07/2023 - 28/07/2023
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Site Selection:	Selected by Client
Sample Location:	**TP13, Depth: 1.0 - 1.5 m**
Material:	Ruddy Brown Silty Clay with Shale
Material Source:	In-Situ

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**84**			16		
13.2 mm	**76**			8		
9.5 mm	**69**			7		
6.7 mm	**59**			9		
4.75 mm	**52**			7		
2.36 mm	**43**			9		
1.18 mm	**38**			5		
0.6 mm	**36**			2		
0.425 mm	**35**			1		
0.3 mm	**34**			1		
0.15 mm	**32**			2		
0.075 mm	**28**			4		

Moisture Content (AS1289.2.1.1)		Min	Max
Moisture Content (%)	15.7		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	65		
Plastic Limit (%)	18		
Plasticity Index (%)	**47**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.0**		
Cracking Crumbling Curling	Curling		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

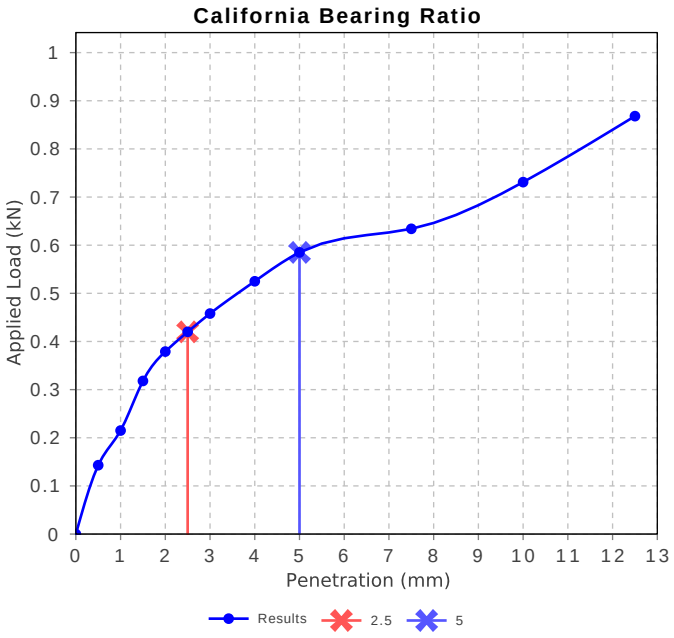
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126N
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP14, Depth: 0.4 - 0.8 m**
Material: Ruddy Brown Silty Clay
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**3.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Additive Type	None		
Additive Percent (%)	0		
Maximum Dry Density (t/m^3)	1.66		
Optimum Moisture Content (%)	20.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.60		
Field Moisture Content (%)	20.8		
Moisture Content at Placement (%)	20.0		
Moisture Content Top 30mm (%)	29.6		
Moisture Content Rest of Sample (%)	21.2		
Mass Surcharge (kg)	6.75kg		
Soaking Period (days)	4		
Curing Hours	93.8		
Swell (%)	3.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126Q
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 31/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP17 , Depth: 0.8 - 1.0 m**
Material: Ruddy Brown Silty Clay with Shale
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	53		
Plastic Limit (%)	15		
Plasticity Index (%)	**38**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**14.5**		
Cracking Crumbling Curling	Cracking & Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

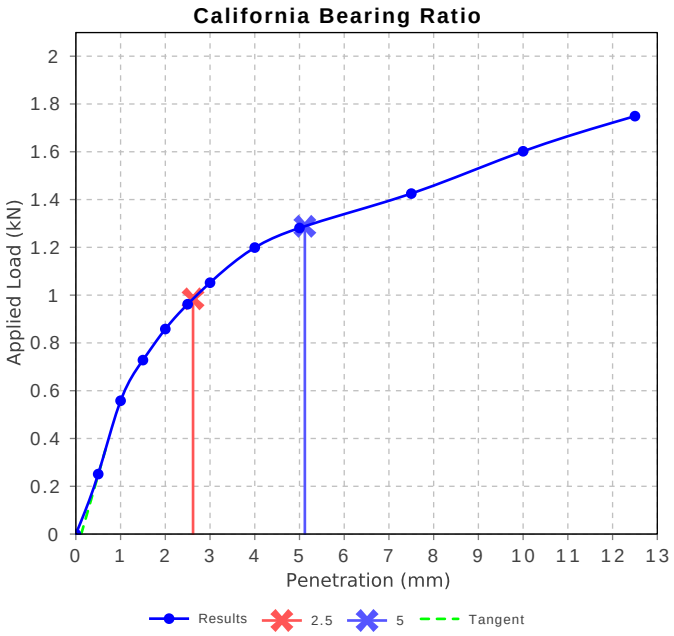
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126R
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP18, Depth: 0.4 - 0.8 m**
Material: Ruddy Brown Silty Clay
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**7**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Additive Type	None		
Additive Percent (%)	0		
Maximum Dry Density (t/m^3)	1.74		
Optimum Moisture Content (%)	18.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.70		
Field Moisture Content (%)	18.1		
Moisture Content at Placement (%)	18.1		
Moisture Content Top 30mm (%)	20.4		
Moisture Content Rest of Sample (%)	18.3		
Mass Surcharge (kg)	6.75kg		
Soaking Period (days)	4		
Curing Hours	27.0		
Swell (%)	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126S
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 04/08/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP19, Depth: 0.6 - 0.8 m**
Material: Ruddy Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	37		
Plastic Limit (%)	16		
Plasticity Index (%)	**21**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**10.5**		
Cracking Crumbling Curling	Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126T
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 04/08/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP20, Depth: 0.4 - 0.6 m**
Material: Ruddy Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	51		
Plastic Limit (%)	19		
Plasticity Index (%)	**32**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**13.5**		
Cracking Crumbling Curling	Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126V
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 04/08/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP22, Depth: 0.4 - 0.8 m**
Material: Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	42		
Plastic Limit (%)	17		
Plasticity Index (%)	**25**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**11.0**		
Cracking Crumbling Curling	Curling		

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

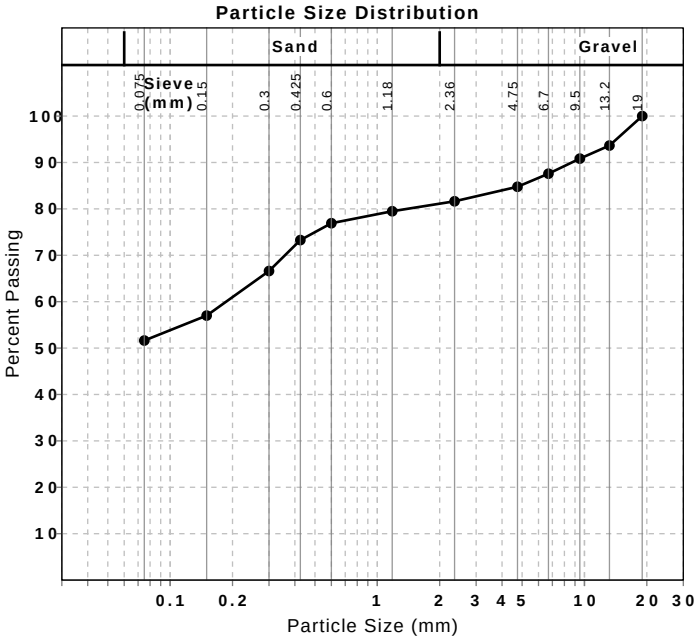
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Sample Number: 23-2126W
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 24/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP23, Depth: 0.6 - 1.0 m**
Material: Ruddy Brown Silty Clay with Shale
Material Source: In-Situ

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**94**			6		
9.5 mm	**91**			3		
6.7 mm	**88**			3		
4.75 mm	**85**			3		
2.36 mm	**82**			3		
1.18 mm	**79**			2		
0.6 mm	**77**			3		
0.425 mm	**73**			4		
0.3 mm	**67**			7		
0.15 mm	**57**			10		
0.075 mm	**52**			5		

Moisture Content (AS1289.2.1.1)		Min	Max
Moisture Content (%)	9.7		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

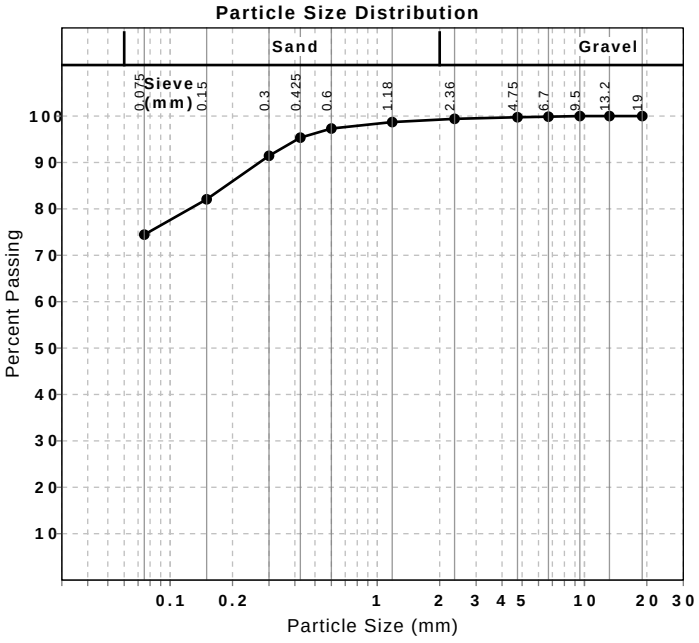
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number:	**P230463-1**
Issue Number:	1
Date Issued:	07/08/2023
Client:	Core Geotech
	31 Lilburn Street, Tallawong NSW 2762
Contact:	Raj Singh, 0479 154 977
Project Number:	P230463
Project Name:	Forbes Planning Proposal - Geotechnical
Project Location:	School Road, Forbes
Client Reference:	CG23-0608
Work Request:	2126
Sample Number:	23-2126Y
Date Sampled:	30/06/2023
Dates Tested:	03/07/2023 - 21/07/2023
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Site Selection:	Selected by Client
Sample Location:	**TP25, Depth: 0.6 - 1.0 m**
Material:	Ruddy Brown Silty Clay
Material Source:	In-Situ

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**100**			0		
4.75 mm	**100**			0		
2.36 mm	**99**			0		
1.18 mm	**99**			1		
0.6 mm	**97**			1		
0.425 mm	**95**			2		
0.3 mm	**91**			4		
0.15 mm	**82**			9		
0.075 mm	**74**			8		

Moisture Content (AS1289.2.1.1)		Min	Max
Moisture Content (%)	9.9		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P230463-1**
Issue Number: 1
Date Issued: 07/08/2023
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P230463
Project Name: Forbes Planning Proposal - Geotechnical
Project Location: School Road, Forbes
Client Reference: CG23-0608
Work Request: 2126
Date Sampled: 30/06/2023
Dates Tested: 03/07/2023 - 17/07/2023
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Location: School Road, Forbes
Material: CLAY
Material Source: In-Situ

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content (%)	Min	Max	Material
23-2126A	TP01, Depth: 0.4 - 0.8 m	15.5 %	**	**	Ruddy Brown Silty Clay trace Sand
23-2126B	TP02, Depth: 0.6 - 0.8 m	13.7 %	**	**	Brown Silty Clay
23-2126C	TP03, Depth: 0.8 - 1.0 m	19.4 %	**	**	Brown Silty Clay
23-2126D	TP04, Depth: 1.0 - 1.2 m	22.4 %	**	**	Brown Silty Clay
23-2126E	TP05, Depth: 1.2 - 1.5 m	17.4 %	**	**	Light Brown Silty Clay
23-2126F	TP06, Depth: 0.3 - 0.6 m	20.1 %	**	**	Dark Brown Silty Clay
23-2126G	TP07, Depth: 0.4 - 0.8 m	15.6 %	**	**	Brown Silty Clay
23-2126H	TP08, Depth: 0.6 - 0.8 m	15.0 %	**	**	Light Brown Silty Clay with Shale
23-2126I	TP09, Depth: 0.4 - 0.8 m	20.5 %	**	**	Ruddy Brown Silty Clay
23-2126J	TP10, Depth: 0.8 - 1.0 m	20.1 %	**	**	Ruddy Brown Silty Clay with Shale
23-2126K	TP11, Depth: 1.5 - 2.0 m	19.4 %	**	**	Ruddy Brown Silty Clay
23-2126L	TP12, Depth: 1.0 - 1.5 m	19.0 %	**	**	Ruddy Brown Silty Clay
23-2126M	TP13, Depth: 1.0 - 1.5 m	15.7 %	**	**	Ruddy Brown Silty Clay with Shale
23-2126N	TP14, Depth: 0.4 - 0.8 m	19.8 %	**	**	Ruddy Brown Silty Clay
23-2126O	TP15, Depth: 0.6 - 0.8 m	15.5 %	**	**	Ruddy Brown Silty Clay
23-2126P	TP16, Depth: 1.5 - 2.0 m	21.7 %	**	**	Ruddy Brown Silty Clay
23-2126Q	TP17 , Depth: 0.8 - 1.0 m	15.8 %	**	**	Ruddy Brown Silty Clay with Shale
23-2126R	TP18, Depth: 0.4 - 0.8 m	16.2 %	**	**	Ruddy Brown Silty Clay
23-2126S	TP19, Depth: 0.6 - 0.8 m	15.4 %	**	**	Ruddy Brown Silty Clay

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Sample Number	Sample Location	Moisture Content (%)	Min	Max	Material
23-2126T	TP20, Depth: 0.4 - 0.6 m	18.8 %	**	**	Ruddy Brown Silty Clay
23-2126U	TP21, Depth: 1.0 - 1.2 m	11.1 %	**	**	Brown Silty Clay
23-2126V	TP22, Depth: 0.4 - 0.8 m	14.1 %	**	**	Brown Silty Clay
23-2126W	TP23, Depth: 0.6 - 1.0 m	9.7 %	**	**	Ruddy Brown Silty Clay with Shale
23-2126X	TP24, Depth: 0.3 - 0.6 m	9.9 %	**	**	Brown Silty Clay
23-2126Y	TP25, Depth: 0.6 - 1.0 m	14.7 %	**	**	Ruddy Brown Silty Clay

This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Benchmark Geotechnical Pty Ltd
146 Clifton Avenue
Kemps Creek
NSW 2178

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Hamish Barsing**

Report **1011801-S**
Project name PROPOSED PLANNING PROPOSAL
Project ID P230463
Received Date Jul 28, 2023

Client Sample ID			**TP01**	**TP03**	**TP06**	**TP08**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-JI0063639**	**S23-JI0063640**	**S23-JI0063641**	**S23-JI0063642**
Date Sampled			**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	470	-	< 10	-
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	410	560	27	200
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	8.7	-	7.9	-
Resistivity*	0.5	ohm.m	25	-	380	-
Sulphate (as SO4)	10	mg/kg	140	-	20	-
Sample Properties						
% Moisture	1	%	14	16	15	14
Cation Exchange Capacity						
Cation Exchange Capacity*	0.5	meq/100g	-	39	-	20

Client Sample ID			**TP11**	**TP13**	**TP14**	**TP17**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-JI0063643**	**S23-JI0063644**	**S23-JI0063645**	**S23-JI0063646**
Date Sampled			**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	37	-	36	-
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	210	320	180	170
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	9.3	-	9.4	-
Resistivity*	0.5	ohm.m	47	-	56	-
Sulphate (as SO4)	10	mg/kg	94	-	73	-
Sample Properties						
% Moisture	1	%	17	14	18	13
Cation Exchange Capacity						
Cation Exchange Capacity*	0.5	meq/100g	-	32	-	35

Client Sample ID			TP19	TP20	TP23	TP24
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S23-JI0063647**	**S23-JI0063648**	**S23-JI0063649**	**S23-JI0063650**
Date Sampled			**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**	**Jun 30, 2023**
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	-	< 10	-	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	76	17	200	< 10
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	-	8.0	-	7.3
Resistivity*	0.5	ohm.m	-	580	-	1900
Sulphate (as SO4)	10	mg/kg	-	13	-	< 10
Sample Properties						
% Moisture	1	%	12	17	9.0	9.6
Cation Exchange Capacity						
Cation Exchange Capacity*	0.5	meq/100g	13	-	14	-

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Sydney	Aug 03, 2023	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Aug 03, 2023	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Aug 03, 2023	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Sydney	Aug 03, 2023	7 Days
- Method: LTM-INO-4030 Conductivity			
Cation Exchange Capacity	Melbourne	Aug 02, 2023	28 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
% Moisture	Sydney	Jul 28, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: Benchmark Geotechnical Pty Ltd
Address: 146 Clifton Avenue
Kemps Creek
NSW 2178

Project Name: PROPOSED PLANNING PROPOSAL
Project ID: P230463

Order No.:
Report #: 1011801
Phone: 1300 919 000
Fax:

Received: Jul 28, 2023 10:02 AM
Due: Aug 4, 2023
Priority: 5 Day
Contact Name: Hamish Barsing

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail						Aggressivity Soil Set	Moisture Set	Moisture Set	Cation Exchange Capacity
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X	X
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	TP01	Jun 30, 2023		Soil	S23-Jl0063639	X		X	
2	TP03	Jun 30, 2023		Soil	S23-Jl0063640		X		X
3	TP06	Jun 30, 2023		Soil	S23-Jl0063641	X		X	
4	TP08	Jun 30, 2023		Soil	S23-Jl0063642		X		X
5	TP11	Jun 30, 2023		Soil	S23-Jl0063643	X		X	
6	TP13	Jun 30, 2023		Soil	S23-Jl0063644		X		X
7	TP14	Jun 30, 2023		Soil	S23-Jl0063645	X		X	
8	TP17	Jun 30, 2023		Soil	S23-Jl0063646		X		X
9	TP19	Jun 30, 2023		Soil	S23-Jl0063647		X		X
10	TP20	Jun 30, 2023		Soil	S23-Jl0063648	X		X	
11	TP23	Jun 30, 2023		Soil	S23-Jl0063649		X		X
12	TP24	Jun 30, 2023		Soil	S23-Jl0063650	X		X	

eurofins

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

Melbourne
6 Monterey Road
Dandenong South
VIC 3175
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Geelong
19/8 Lewalan Street
Grovedale
VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 25403

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

Canberra
Unit 1,2 Dacre Street
Mitchell
ACT 2911
Tel: +61 2 6113 8091
NATA# 1261 Site# 25466

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
1/2 Frost Drive
Mayfield West NSW 2304
Tel: +61 2 4968 8448
NATA# 1261
Site# 25079 & 25289

Eurofins ARL Pty Ltd
ABN: 91 05 0159 898

Perth
46-48 Banksia Road
Welshpool
WA 6106
Tel: +61 8 6253 4444
NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
NZBN: 9429046024954

Auckland
35 O'Rorke Road
Penrose,
Auckland 1061
Tel: +64 9 526 4551
IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: +64 3 343 5201
IANZ# 1290

Company Name: Benchmark Geotechnical Pty Ltd
Address: 146 Clifton Avenue
Kemps Creek
NSW 2178

Project Name: PROPOSED PLANNING PROPOSAL
Project ID: P230463

Order No.:
Report #: 1011801
Phone: 1300 919 000
Fax:

Received: Jul 28, 2023 10:02 AM
Due: Aug 4, 2023
Priority: 5 Day
Contact Name: Hamish Barsing

Eurofins Analytical Services Manager : Bonnie Pu

Sample Detail	Aggressivity Soil Set	Moisture Set	Moisture Set	Cation Exchange Capacity
Melbourne Laboratory - NATA # 1261 Site # 1254	X	X	X	X
Sydney Laboratory - NATA # 1261 Site # 18217	X	X	X	X
Test Counts	6	12	12	6

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**µg/L:** micrograms per litre
ppm: parts per million	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR: RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Method Blank							
Cation Exchange Capacity							
Cation Exchange Capacity*	meq/100g	< 0.5			0.5	Pass	
LCS - % Recovery							
Chloride	%	108			70-130	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	%	100			70-130	Pass	
Resistivity*	%	95			70-130	Pass	
Sulphate (as SO4)	%	105			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S23-Jl0063596	NCP	%	106			70-130	Pass	
Sulphate (as SO4)	S23-Jl0063596	NCP	%	104			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S23-Jl0063596	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Sulphate (as SO4)	S23-Jl0063596	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-Jl0063640	CP	uS/cm	560	630	12	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S23-Jl0063640	CP	pH Units	9.6	9.7	pass	30%	Pass	
Resistivity*	S23-Jl0063640	CP	ohm.m	18	16	12	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Cation Exchange Capacity*	S23-Jl0062318	NCP	meq/100g	1.3	1.3	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	S23-Jl0063647	CP	%	12	12	1.2	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	S23-Jl0063650	CP	uS/cm	< 10	< 10	<1	30%	Pass	
Resistivity*	S23-Jl0063650	CP	ohm.m	1900	1500	18	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Bonnie Pu	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic
Caitlin Breeze	Senior Analyst-Inorganic
Emily Rosenberg	Senior Analyst-Metal



Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Appendix E
Site Photography



Photo 1: A view showing the site conditions



Photo 2: Another view showing the site conditions



Photo 3: A photo showing the material excavated from one of the test pits



Photo 4: A view showing the subsurface profile in the test pit



Photo 5: Site view looking towards north direction



Photo 6: Site view looking towards west direction from the eastern boundary

Appendix F
Foundation Maintenance Homeowner's Guide

Foundation Maintenance and Footing Performance:
A Homeowner's Guide

CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

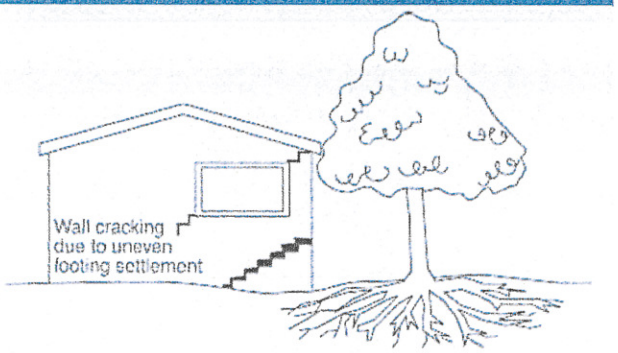
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

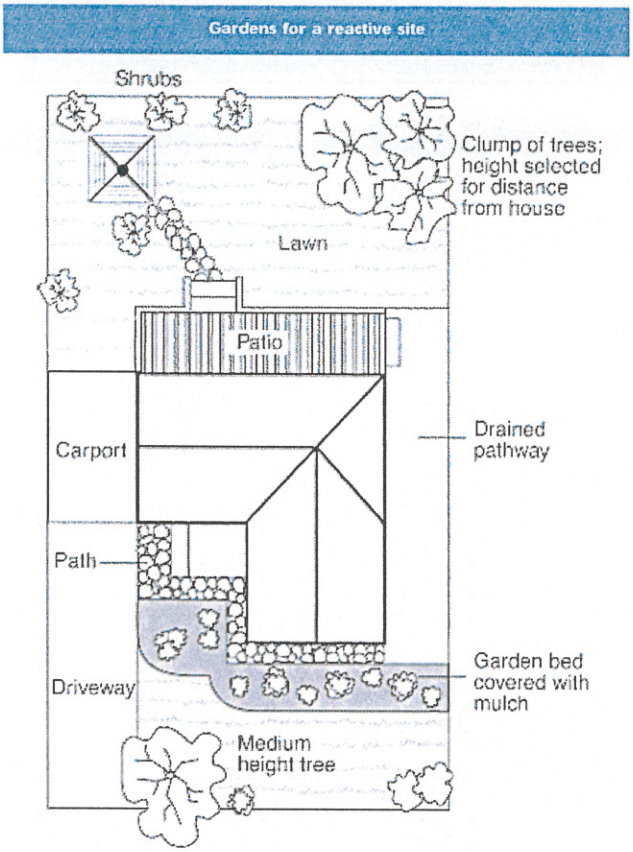
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

Distributed by

CSIRO PUBLISHING PO Box 1139, Collingwood 3066, Australia

Freecall 1800 645 051 Tel (03) 9662 7666 Fax (03) 9662 7555 www.publish.csiro.au

Email: publishing.sales@csiro.au

© CSIRO 2003. Unauthorised copying of this Building Technology file is prohibited

Appendix 5 - Preliminary Biodiversity Development Assessment Report

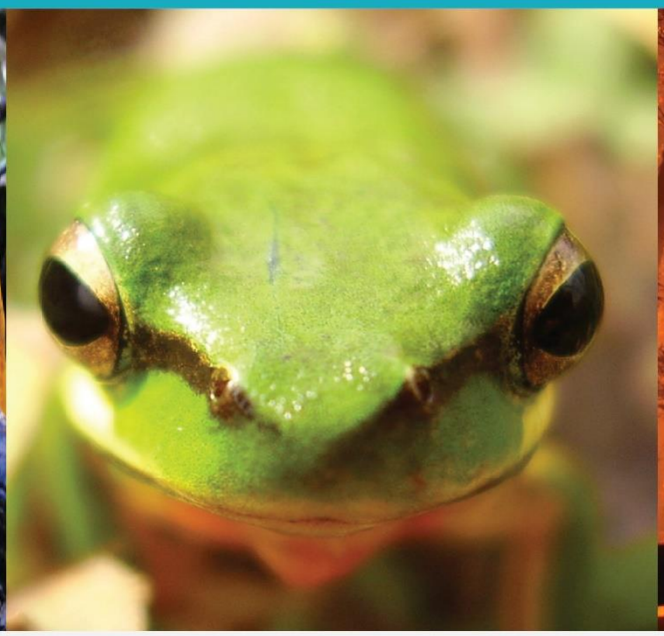


TRAVERS BUSHFIRE & ECOLOGY

A TBE ENVIRONMENTAL COMPANY

p







BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Proposed rezoning for residential development

Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 DP 750158

School Road

Forbes

28 September 2023

(REF: 21ALLE07)

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Proposed Rezoning for Residential Development
Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 DP 750158,
School Road, Forbes

BAM Accredited Author:	Diane Warman B. Sc. (Hons.) - Botanist – Accredited Assessor No. BAAS22026
Contributors:	Diane Warman B. Sc. (Hons.) – Botanist– Accredited Assessor No. BAAS22026 Corrine Edwards B. Env. Sc. Mgmt. (Hons.) – Fauna Ecologist Claire Larkin B. Env. Sc. Mgmt – Fauna Ecologist
BAMC Case Owner:	Diane Warman B. Sc. (Hons.) - Botanist – Accredited Assessor No. BAAS22026
Flora survey:	Diane Warman B. Sc. (Hons.) - Botanist – Accredited Assessor No. BAAS22026
Fauna survey:	Corrine Edwards B. Env. Sc. Mgmt. (Hons.) – Fauna Ecologist
Plans prepared:	Sandy Cardow B. Sc.
Approved by:	Michael Sheather-Reid (Accredited Assessor No. BAAS17085)
Version:	DRAFT
Date:	28/09/23
File:	21ALLE07

Request an online quote 24/7

This document is copyright © *Travers bushfire & ecology* 2023

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features is to be confirmed by a registered surveyor.

EXECUTIVE SUMMARY

Travers bushfire & ecology (TBE) was engaged to prepare a Biodiversity Development Assessment Report (BDAR) for a proposed residential subdivision at School Road in Forbes. The entire area bounded by Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273, DP 750158 was subject to detailed survey effort and will hereafter be referred to as the 'study area'.

The area of direct impact from the development will hereafter be referred to as the 'development footprint.'

TBE notes that targeted seasonal survey is not yet fully completed for the site and for the purposes of this BDAR we have assumed presence of relevant species candidate species.

Planning proposal

This document will support a Planning Proposal submission to Forbes Shire Council for the rezoning of a 92.39 ha parcel of land currently zoned RU1 – Primary Production, R5 – Large Lot Residential, and RE1 – Public Recreation.

EPBC Act, Fisheries Management Act Assessment outcomes

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, no threatened fauna species, no threatened flora species, and one TECs listed under this Act was recorded within the study area.

The proposal was not considered to have a significant impact on or be constrained by Matters of National Environmental Significance (MNES). As such a referral to Department of Climate Change, Energy, the Environment and Water (DCCEEW), is not required.

In respect of matters relative to the *Fisheries Management Act 1994 (FM Act)*, no suitable habitat for threatened marine or aquatic species was observed within the development footprint and there are no matters requiring further consideration under this Act.

Recorded biodiversity

An Ecological Survey was undertaken in accordance with the *Biodiversity Assessment Methodology* 2020 (BAM) as well as relevant legislation including the *Environmental Planning and Assessment Act 1979* (*EP&A Act*), the *Biodiversity Conservation Act 2016* (*BC Act*), the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) and the *Fisheries Management Act 1994* (*FM Act*). Compliant and non-compliant survey and limitations for candidate species are explained in Section 2.5, Section 4.1 (Flora) and Section 4.2 (Fauna).

In respect of matters required to be considered under the *EP&A Act* and relating to the species / provisions of the *BC Act*, one (1) threatened fauna species, Grey-crowned Babbler (*Pomatostomus temporalis*), no threatened flora species, and one (1) threatened ecological community (TEC), Inland Grey Box Woodland in the Riverina, NSW South-Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, was recorded within the development footprint.

In respect of matters required to be considered under the *EPBC Act*, no threatened fauna species, no threatened flora species and one (1) threatened ecological community, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia, listed under this Act was recorded within the development footprint.

In respect of matters relative to the *FM Act*, no suitable habitat for threatened marine or aquatic species was observed within the development footprint.

Avoidance and minimisation actions

The following strategies and actions have been undertaken to either avoid or minimise impacts on biodiversity values:

Direct and indirect impact avoidance & minimisation

Based on the observed ecological constraints and habitat present an environmental protection area has been identified. This environmental protection area avoids development within the remnant native vegetation. This specifically avoids six remnant *Eucalyptus microcarpa* trees which include hollow-bearing trees and habitat for the Grey-crowned Babbler (*Pomatostomus temporalis temporalis*). There will be an exception where a potential water reservoir is to be located at a high point for gravity distribution. This water reservoir is subject to separate DA application by Council.

The primary avoidance actions may be described as the following:

- The subdivision has been designed to utilise the lower biodiversity value areas of the site based on the extent of existing cleared landscape.
- PCT 76 is a threatened ecological community. A large avoidance action has been undertaken to retain the areas of higher vegetation integrity, i.e., areas containing remnant trees and shrubs (although there is still an impact on the derived native grassland with low vegetation integrity scores).
- Avoiding six (6) of the habitat (*Eucalyptus microcarpa)* trees.
- Avoidance of prescribed impacts.
- Utilisation of cleared paddocks that have been pasture improved and no longer considered derived native grassland area.
- Avoidance of the Grey-crowned Babbler habitat area.

It should be reiterated that the vegetation integrity score was low to the remnant vegetation area, and below the threshold for offsetting in the derived native grassland area. Also, remnants of native vegetation that are fully structured are very fragmented locally and isolated, therefore subject to natural attrition due to agricultural land management, and edge effects.

The proposal seeks to consolidate the small remnant to help with its longevity by providing some long-term conservation measures, but also allowing some degree of passive recreational pursuits.

The proposed development layout has considered the main ecological features of importance within the site and provided an avoidance measure over most of the features, generally meeting the requirements of Stage 2 of BAM 2020.

Impact assessment

Avoidance actions are outlined in Section 5.2. The resultant direct, indirect, and cumulative ecological impacts of the proposal have been carefully considered in Section 5. Further recommended mitigation measures to minimise/offset these impacts, to address threatening

processes and to create a more positive ecological outcome for threatened biodiversity have been outlined within Section 5.3.

Table A – Vegetation and impact measures

	Total (ha)	Impacted (ha)
Total area of site	92.39	
PCT76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern slopes and Riverina bioregions – derived native grassland (PCT76 – DNG)	4.17	4.17
PCT76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern slopes and Riverina bioregions. (PCT76)	7.74	3.8
Total verified native vegetation on site and total impacted native vegetation	**11.9**	**7.97**
PCT76 - Proposed Environmental Protection area	4.07	

The planning proposal has been calculated to impact 7.97 ha (Table A) of native vegetation mapped as the Plant Community Type (PCT) 76.

- PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions – 11.9 ha - equivalent to the *BC Act* EEC Inland Grey Box Woodland in the Riverina, NSW Southwestern Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions.

However, an environmental area has been incorporated into the design to directly avoid key areas of habitat / environmental significance. This environmental protection area is 4.07 ha which reduces the overall impacted area to 3.9ha.

The Assessment of Serious and Irreversible Impacts (SAII) are set out under Section 6.7.2 of the *BC Reg 2017* to guide the determining authority on this decision. These principles have been reviewed and assessed in Appendix 1 and Appendix 2. No SAII entities were recorded during survey and no SAII entities have the potential to occur. Therefore, the proposal will not cause any serious and irreversible impacts on threatened biodiversity.

There will be no significant impact on matters listed under the *FM Act*.

The proposal was not considered to have a significant impact on matters of national environmental significance. As such a referral to Department of Agriculture, Fisheries and Forestry (DAFF) should not be required.

Biodiversity Offsets Scheme (BOS) – Threshold Assessment

The proposed development exceeds the nominated threshold triggers of the Area clearing Threshold as assessed in Section 5.1.2. Therefore, biodiversity offsets are required under the Biodiversity Offsets Scheme (BOS).

LIST OF ABBREVIATIONS

APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method (2020)
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act (2016)*
BC Reg	*Biodiversity Conservation Regulation (2017)*
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	Bushfire Protection Assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
CM Act	*Coastal Management Act 2016*
DAFF	Department of Agriculture, Fisheries and Forestry
DAWE	Department of Agriculture, Water, and the Environment (superceded by DAFF 2022)
DCCEEW	Department of Climate Change, Energy, the Environment and Water.
DCP	Development Control Plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy (superseded by DAWE)
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry and Environment (superseded by DPE Dec 2021)
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act (1979)*
EPBC Act	*Environment Protection and Biodiversity Conservation Act (1999)*
FM Act	Fisheries Management Act
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Local Environmental Plan
LGA	Local Government Area
LLS Act	*Local Land Services Act (2013)*
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act (1974)*
NRAR	Natural Resources Access Regulator (NSW)
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (superseded by DPIE from August 2019)
PCT	Plant Community Type
PFC	Projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	Rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SULE	Safe useful life expectancy
TEC	Threatened ecological community
TPZ	Tree preservation zone
TSC Act	*Threatened Species Conservation Act (1995)* – superseded by the *Biodiversity Conservation Act (2016)*
VMP	Vegetation management plan

TABLE OF CONTENTS

1. INTRODUCTION 1

1.1 Purpose 2

1.1.1 Certification of BAM compliance 2

1.1.2 Terminology 2

1.2 Site description 3

1.2.1 Site overview 3

1.2.2 Landscape features 4

1.2.3 Zoning 5

1.3 Proposed development 5

1.3.1 Identification of development site footprint 6

1.4 Statutory assessment requirements 8

1.4.1 Environmental Planning and Assessment Act 1979 (EP&A Act) 8

1.4.2 Biodiversity Conservation Act 2016 (BC Act) 9

1.4.3 Fisheries Management Act 1994 (FM Act) 10

1.4.4 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) 10

1.4.5 State Environmental Planning Policy (Resilience and Hazards) 2021 – Division 1 Coastal wetlands and littoral rainforests area 11

1.4.6 Licences 11

2. SURVEY METHODOLOGY 14

2.1 Presurvey information collation and resources 14

2.2 Flora survey methodology 16

2.3 Fauna survey methodology 16

2.4 Field survey effort 19

2.5 Survey limitations 21

2.6 Accuracy of identification 22

3. SURVEY RESULTS 24

3.1 Flora results 24

3.1.1 Native vegetation extent 24

3.1.2 Native flora 24

3.1.3 Plant community types (PCTs) 25

3.1.4 Vegetation integrity assessment 32

3.2 Fauna results 34

3.3 Habitat results 35

3.3.1 Fauna habitat observations 35

3.3.2 Habitat tree data 36

4. BIODIVERSITY ASSESSMENT 38

4.1 Flora 38

4.1.1 State legislative flora matters 38

4.1.2 Matters of National Environmental Significance - flora 41

4.2 Fauna 44

4.2.1 Key fauna habitat 44

4.2.2 State legislative fauna matters 45
4.2.3 Matters of national environmental significance - fauna 52
4.3 Watercourses, GDEs & Wetlands 53
4.3.1 Endangered wetland communities 53
4.3.2 Groundwater dependent ecosystems (GDEs) 53
4.3.3 Watercourses 54
4.3.4 State Environmental Planning Policy (Resilience and Hazards) 2021 – Division 1 Coastal wetlands and littoral rainforests area 55
5. IMPACT ASSESSMENT 56
5.1 BOS thresholds 56
5.1.1 Biodiversity Values Land 56
5.1.2 Area clearing threshold 57
5.1.3 Test of Significance 57
5.2 Avoidance and minimisation actions 58
5.4.3 Serious & Irreversible Impacts (SAIIs) 69
5.5 Vegetation connectivity and habitat corridors 69
6. CONCLUSION 72
6.1 Legislative compliance 72
6.2 Biodiversity credit requirements 72
6.2.1 Impacts requiring offset 72
6.2.2 Impacts not requiring offset 73
6.2.3 Areas not requiring assessment 73
7. BAM CREDIT RESULTS 74
7.1 Ecosystem credits and species credits 74
7.2 Ecosystem credit classes 80
7.3 Species credit classes 80
8. BIBLIOGRAPHY 82

Figures

Figure 1-1 – Study area shaded yellow and outlined in red 1
Figure 1-2 – Zoning 5
Figure 1-3 – Precinct No. 4 and No. Edwards Street (North and East) Release Area 7
Figure 1-4 – Concept Design Masterplan (23 September 2023) 8
Figure 1-5 – Site Map 12
Figure 1-6 – Location map 13
Figure 2-1 – The State Vegetation Type Map(Study area identified by red outline) 15
Figure 2-2 – Flora and fauna survey effort and results. 23
Figure 4-1 – Alluvial groundwater system discharging into a river 54
Figure 4-2 – Mapped hydroline spatial data (approximate study area in red) 55
Figure 5-1 – Biodiversity Land Map (purple) relative to the study area (yellow) 56
Figure 5-2 – Local connectivity (study area in red) 70
Figure 5-3 – Species credit species polygons 71

Tables

Table 1-1 – Site features 3
Table 1-2 – Landscape features 4
Table 1-3 – Vegetation and Impact measures 6
Table 2-1 – Fauna survey effort 19
Table 2-2 – Flora survey effort 19
Table 2-3 – Plot and transect survey effort – development footprint 20
Table 2-4 – Survey adequacy for species credit species (flora) 21
Table 2-5 – Survey adequacy for species credit species (fauna) 22
Table 3-1 – Native flora observations within the study area 24
Table 3-2 – PCT shortlist and justification 25
Table 3-3 – Plant Community Types within study area 26
Table 3-4 – Number of plots required per area of zone. 33
Table 3-5 – Current vegetation integrity score 33
Table 3-6 – Future vegetation integrity score 34
Table 3-7 – Fauna recorded within the study area 34
Table 3-8 – Observed fauna habitat 35
Table 3-9 – Habitat tree data 37
Table 4-2 – Species credit species (flora) 39
Table 4-3 – Condition Thresholds of the EPBC Act for Grey Box Grassy Woodlands TEC . 42
Table 4-5 – Ecosystem credit species (fauna) 46
Table 4-6 – Species credit species (fauna) 48
Table 4-7 – Nationally listed threatened fauna species with suitable habitat present 52
Table 5-1 – BOS entry threshold report 57
Table 5-2 – Measures to mitigate and manage impacts 61
Table 5-3 – Prescribed impacts 65
Table 5-4 – Direct impact assessment 67
Table 5-5 – Indirect impact assessment 68
Table 7-1 – Requirement for ecosystem credits 75
Table 7-2 – Requirement for species credits 75
Table 7-3 – Ecosystem credit summary 80
Table 7-4 – Credit classes for PC76 - Like for like options 80
Table 7-5 – Species credit summary 80

Appendices

Appendix 1. SAII impact assessment - species 84
Appendix 2. SAII impact assessment - communities 85
Appendix 3. Plot data sheets 86
Appendix 4. EPBC impact criteria 89
Appendix 5. Microbat call analysis 93
Appendix 6. Staff qualifications and experience 96
Appendix 7. BAM-C outputs 100

1. INTRODUCTION

Travers bushfire & ecology (TBE) was engaged to undertake a biodiversity development / assessment within Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 DP 750158, at School Road, Forbes within the Forbes Shire Council local government area (LGA). The extent of this entire lot is shown in Figure 1-1. It is the intention of this proposal to follow Forbes Local Housing Strategy (2023) by providing opportunities for residential area with active recreation and environmental protection. This lot is subject to proposed rezoning and will hereafter be referred to as the 'study area.'

The area containing the proposed development, APZs and all associated impact on habitat features is hereafter referred to as the 'development footprint' (refer to Figure 1-3).

The proposal shall be assessed under the *Biodiversity Conservation Act 2016* (*BC Act*).



Figure 1-1 – Study area shaded yellow and outlined in red

1.1 Purpose

The purpose of this Biodiversity Development Assessment Report (BDAR) is to assess the potential impact on biodiversity, including threatened species, populations, and ecological communities by the rezoning of land from RU1 – Primary Production, RE1 – Public recreation, and R5 – Large Lot residential, to support a residential area with active public recreation.

Consequently, the following tasks have been completed:

- Botanical survey to describe the vegetation communities and their condition.
- Fauna habitat survey to detect and assess fauna and their potential habitats.
- Preparation of a BDAR in accordance with the requirements of the:
    a) *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act),*
    b) *Biodiversity Conservation Act 2016 (BC Act),*
    c) *Biodiversity Conservation Regulation 2017 (BC Reg.),*
    d) *Fisheries Management Act 1994 (FM Act)*, and
- Preparation of a BDAR in accordance with the Biodiversity Assessment Methodology (BAM) 2020.

Please note that the targeted surveys for threatened species will be completed in optimal season (September to October) and BDAR will be updated accordingly.

1.1.1 Certification of BAM compliance

Section 6.15 of the *BC Act* regarding the currency of a BDAR requires:

(1) A biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared based on the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted.
(2) A relevant application is an application for planning approval, for vegetation clearing approval, for biodiversity certification or in respect of a biodiversity stewardship agreement.

Diane Warman (BAAS 22026) is an accredited person under the *BC Act.* I, Diane Warman, certify here that the report has been prepared based on the requirements of (and information provided under) the BAM as 27 September 2023, and that date is within 14 days of the date the report is so submitted.

1.1.2 Terminology

Throughout this report the terms development footprint and study area are used. It is important to have a thorough understanding of these terms as they apply to the assessment.

Development footprint means the area directly affected by the proposal. It has the same meaning as “subject land” defined below.

Study area is the portion of land that encompasses all surveys undertaken and is usually all land contained within the designated property boundary. The study area extends as far as is necessary to assess all important biodiversity values known and likely to occur within the subject land and includes the development footprint and any additional areas which are likely to be affected by the proposal, either directly or indirectly.

Subject land is land to which the BAM is applied in Stage 1 to assess the biodiversity values. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement. In this case, it refers to the area designated as the development footprint and has the same meaning for the purposes of this report. The terms “subject land” and “development footprint” are interchangeable in this regard.

Direct impacts are those that directly affect the habitat and individuals. They include, but are not limited to, death through clearing, predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all the likely direct impacts of the proposed activity or development.

Indirect impacts occur when project-related activities affect species, populations, or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all the likely indirect impacts of the proposed activity or development.

1.2 Site description

1.2.1 Site overview

Table 1-1 provides an overview the planning, cadastral and topographical details of the study area and an overview of the site and surrounds is shown on Figure 1-5 and Figure 1-6.

Table 1-1 – Site features

Location	Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272 and 1273 in DP 750158, School Road, Forbes
Location description	The site is located approximately 4.1 km northwest of Forbes railway station. The site is surrounded on the eastern side by existing urban development and by rural farmland to the south, north and west.
Area	92.39 ha
Local government area	Forbes Shire
Zoning	RU1 – Primary Production, RE1 – Public recreation, and R5 – Large Lot residential
Grid reference MGA-56	55 H 593264E; 6308899N
Elevation	Approximately 250 – 275 m AHD
Topography	The site is generally flat with a central low point at the southern end. There is a slight elevation at the north-western portion of the site.
Catchment and drainage	There is no catchment on the site, however there is an unnamed first order stream located south of the site, that is likely drained into. This tributary eventually flows into the Lachlan River.
Existing land use	Cropped pasture.

1.2.2 Landscape features

Table 1-2 describes the landscape features of the proposed development site, in accordance with the BAM.

Table 1-2 – Landscape features

Patch size	5 - <25 ha.
IBRA bioregions and subregions	NSW Southwestern Slopes – Lower slopes (Figure 1-5 and Figure 1-6).
NSW landscape region and area (ha)	Calarie Plains.
Native vegetation extent in the buffer area (1500 m)	50.45 ha. Cover class 0–10% (3.51%).
Cleared areas	Approximately 90% of the study area is cleared.
Evidence to support differences between mapped vegetation extent and aerial imagery	Mapped vegetation closely matches aerial imagery. Unmapped vegetation is exotic.
Rivers and streams classified according to stream order	As shown in Figure 4-2, the southern portion of the study area contains the head of a primary tributary of Lake Forbes.
Wetlands within, adjacent to and downstream of the site, including important wetlands	As shown in Figure 4-2, there are three (3) man-made farm dams across the study area.
Connectivity features	There is very poor connectivity to the development footprint. There is an existing residential development to the east, while there are large areas of cleared grassy pasture to the south, west, and north with sparsely scattered trees. Figure 1-6 shows the extent of native vegetation in the locality.
Geology and soils	Geology: Sandstones are the dominant lithology with minor shales, mudstones, limestones and volcanics (King 1998). Quaternary colluvial deposits - Lithology: Colluvial deposits are unconsolidated sediments that are found downslope from hills. They form by erosion of hills and by creep or sheetwash. Silurian-Devonian sedimentary rocks - Lithology; Sedimentary rocks including sandstone, siltstone, mudstone, and basal conglomerate units. May be fossiliferous. Soil: Predominantly Bald Hill (bh) soil landscape. Narrow crests and ridges with gentle sideslopes made of red earths and red podzolic soils. Parkes (pa) soil landscape is at top right-hand corner of lot. This is also of narrow crests with red earths and red podzolic soils overlying siltstones and sedimentary sequences with volcanic sandstones.
Identification of method applied (i.e., linear, or site-based)	Site based assessment.

1.2.3 Zoning

The site is currently zoned RU1 Primary Production, RE1 Public Recreation, and R5 Large Lot Residential, under the Forbes Shire Council LEP 2013 (Figure 1-2). To comply with the LEP, a planning proposal is required to rezone the site to facilitate future residential development.

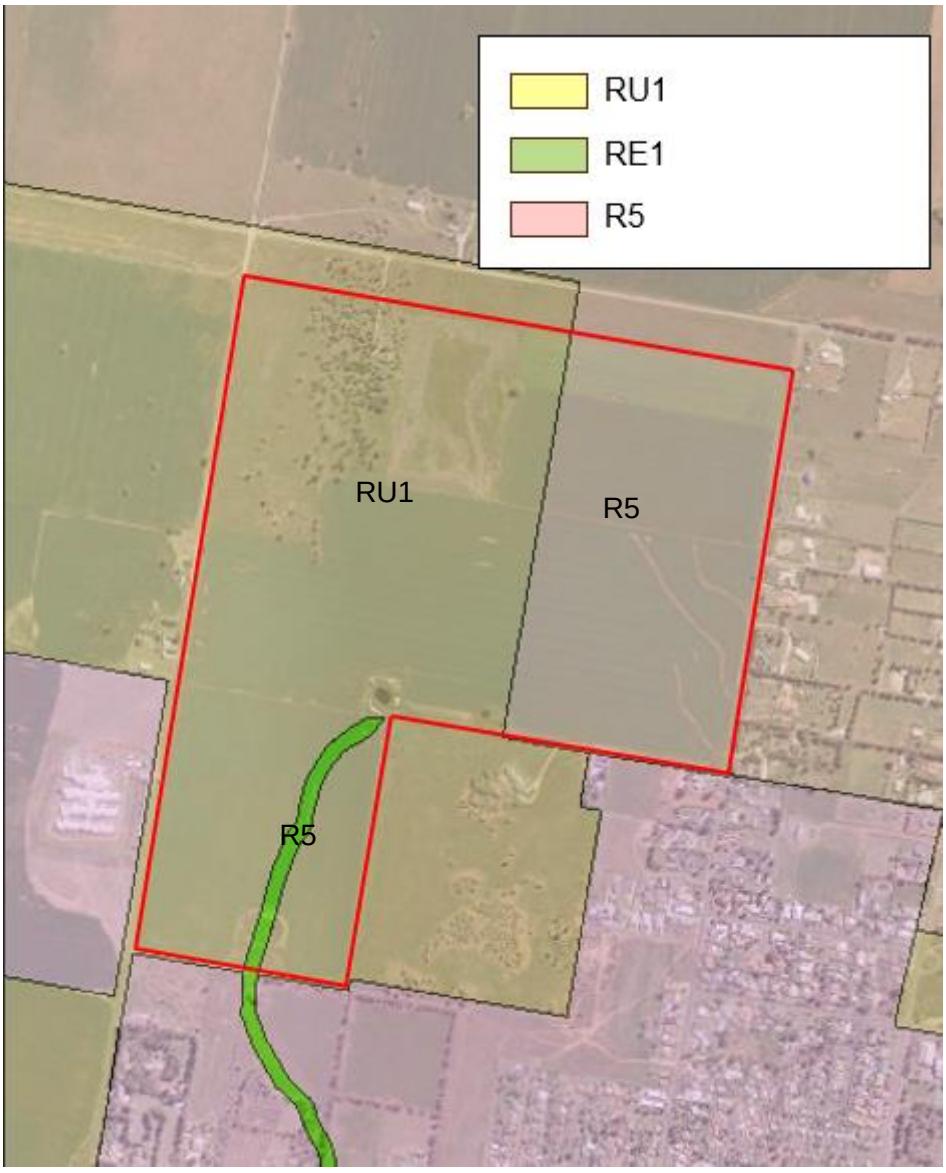


Figure 1-2 – Zoning
(Source: Planning Portal, 2023)

1.3 Proposed development

Allera, on behalf of ForbesView, is preparing a Planning Proposal to rezone a 92.39 ha parcel of land within the Forbes Shire Council local government area, referred to as School Road, Forbes ('the Site'). The site is legally identified as Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 in DP 750158. Road access to the lots as well as services will be along the existing clearance off School Road. The proposed layout is shown on Figure 1-3.

The immediate surrounding context exhibits a rural and large lot residential zoning. Other land uses in the vicinity of the site include Catholic Healthcare, Jemalong Residential Village, Jenny Murphy Park, Forbes High School, and Goldridge Estate – being developed by Forbes Shire Council (comprising of 221 lots ranging in size from 55 m^2 to over 5,000 m^2).

Under the Forbes Local Environmental Plan 2013, the land is currently zoned RU1 - Primary Production, R5 - Large Lot Residential, and RE1 - Public Recreation. A Planning Proposal is required to rezone the site to facilitate future residential development.

1.3.1 Identification of development site footprint

The entire site covers 92.39 ha. As shown in Table 1-3, the amount of native vegetation is estimated at 11.9 ha with approximately 87% of the site being associated with agricultural production in the form of cultivated pasture and includes a residential home and exotic pasture. Council designed Precinct 4 and Precinct 5 at this location (Figure 1-3) under its proposed Forbes Housing Strategy (Currajong 2023). Figure 1-4 provides a revised concept design Masterplan in support of Council's Strategy and remnant native vegetation across the site.

This revised concept design Masterplan provides for an avoidance area including environmental protection for remnant native vegetation. This environmental protection area is proposed to protect an estimated 4.07 ha of native vegetation (Table 1-3).

Table 1-3 – Vegetation and Impact measures

	Total (ha)	Impacted
Total area of site	92.39	
PCT76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern slopes and Riverina bioregions – derived native grassland (PCT76 – DNG)	4.17	4.17
PCT76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern slopes and Riverina bioregions. (PCT76)	7.74	3.8
Total verified native vegetation on site and total impacted native vegetation	**11.9**	**7.97**
PCT76 - Proposed Environmental Protection area	4.07	-
Total area of planted pasture	71.76	71.75
Total area of residential, exotic pasture, farm dam and gardens.	7.42	7.33



Figure 1-3 – Precinct No. 4 and No. Edwards Street (North and East) Release Area
(Source: Forbes Housing Strategy, Currajong Pty Ltd 2023)

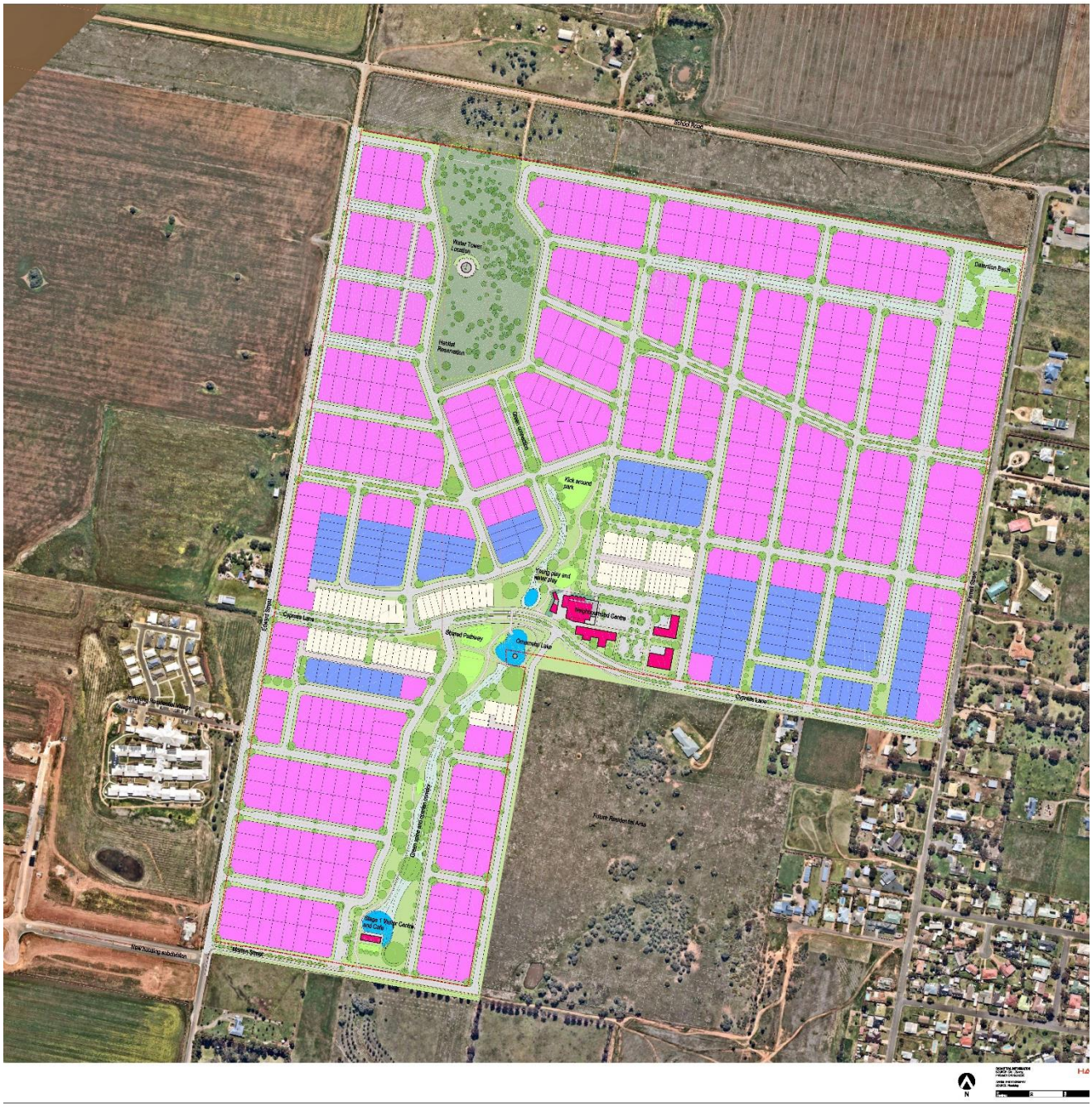


Figure 1-4 – Concept Design Masterplan (23 September 2023)
(Source: Hatch 2023)

1.4 Statutory assessment requirements

The following outlines the statutory assessment requirements and procedures involved in assessing development in New South Wales (NSW).

1.4.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

Prior to any development taking place in NSW a formal assessment needs to be made of the proposed work to ensure it complies with relevant planning controls and, according to its nature and scale, confirm that it is environmentally and socially sustainable. State, regional, and local planning legislation indicates the level of assessment required, and outlines who is responsible for assessing the development. The development assessment and consent

system are outlined in Part 4 and the infrastructure and environmental impact assessment system is outlined in Part 5 of the *EP&A Act*.

1.4.2 Biodiversity Conservation Act 2016 (BC Act)

The *BC Act* repealed the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*.

The *BC Act* and the *BC Reg* establishes a regulatory framework for assessing and offsetting impacts on biodiversity values due to proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method 2020 (BAM).

The BOS applies to:

- local development (assessed under Part 4 of the *EP&A Act*) that triggers a BOS threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the *BC Act*.
- state significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning, Industry and Environment and the environment agency head determine that the project is not likely to have a significant impact.
- biodiversity certification proposals.
- clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds a BOS threshold and does not require development consent.
- clearing of native vegetation that requires approval by the Native Vegetation Panel (NVP) under the *Local Land Services Act 2013*, and
- activities assessed and determined under Part 5 of the *EP&A Act* (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Proponents will need to supply evidence relating to the triggers for the BOS thresholds and the test of significance (where relevant) when submitting their application to the consent authority.

Development consent cannot be granted for non-state significant development under Part 4 of the *EP&A Act* if the consent authority is of the opinion that it is likely to have serious and irreversible impacts (SAII) on biodiversity values. The determination of SAII is to be made in accordance with principles prescribed under Section 6.7 of the *BC Regulation 2017*. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales.

The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. It is applied as part of the BOS entry requirements and for Part 5 activities under the *EP&A Act.*

The test of significance is set out in s.7.3 of the *BC Act.* If the activity is likely to have a significant impact or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the BOS or prepare a species impact statement (SIS).

The environmental impact of activities that will not have a significant impact on threatened species will continue to be assessed under s.111 of the *EP&A Act.*

1.4.3 Fisheries Management Act 1994 (FM Act)

The *FM Act* provides a list of threatened aquatic species that require consideration when addressing the potential impacts of a proposed development. Where a proposed activity is located in an area identified as critical habitat, or such that it is likely to significantly affect threatened species, populations, ecological communities, or their habitats, an SIS is required to be prepared.

1.4.4 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The *EPBC Act* requires that Commonwealth approval be obtained for certain actions. It provides an assessment and approvals system for actions that have a significant impact on Matters of National Environmental Significance (MNES). These may include:

- World Heritage Properties and National Heritage Places.
- Wetlands of International Importance protected by international treaty.
- Nationally listed threatened species and ecological communities.
- Nationally listed migratory species, and
- Commonwealth marine environment.

Actions are projects, developments, undertakings, activities, and series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on an MNES matter.

Where a proposed activity is in an area identified to be of MNES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species, or their habitats, then the matter needs to be referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for assessment. In the case where no listed federal species are located on site then no referral is required. The onus is on the proponent to make the application and not the Council to make any referral.

A threshold criterion applies to specific MNES which may determine whether a referral is or is not required, such as for the *EPBC*-listed ecological community Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia. Consultation with DCCEEW may be required to determine whether a referral is or is not required. If there is any doubt as to the significance of impact or whether a referral is required, a referral is generally recommended to provide a definite decision under the *EPBC Act* thereby removing any further obligations in the case of 'not controlled' actions.

A significant impact is regarded as being:

> *important, notable, or of consequence, having regard to its context or intensity and depends upon the sensitivity, value, and quality of the environment which is impacted and upon the duration, magnitude, and geographical extent of the impacts. A significant impact is likely when it is a real or not a remote chance or possibility.*

Source: EPBC Policy Statement

Guidelines on the correct interpretation of the actions and assessment of significance are located on the department's web site http://www.environment.gov.au/epbc/publications.

1.4.5 State Environmental Planning Policy (Resilience and Hazards) 2021 – Division 1 Coastal wetlands and littoral rainforests area

The *Coastal Management Act 2016* (*CM Act*) established the framework and overarching objects for coastal management in New South Wales. The Act commenced on 29 June 2018 and replaced the previous *Coastal Protection Act 1979*. This was replaced by the Resilience and Hazards SEPP.

The purpose of the SEPP is to protect and manage coastal areas of NSW. A planning proposal must not rezone land which would enable increased development or more intensive land-use on land within a coastal wetlands and littoral rainforests area identified by Chapter 2 of the State Environmental Planning Policy (Resilience and Hazards) 2021.

1.4.6 Licences

Individual staff members of *TBE* are licensed under Clause 20 of the *National Parks and Wildlife (Land Management) Regulation 1995* and Sections 120 and 131 of the *National Parks and Wildlife Act 1974* to conduct flora and fauna surveys within service and non-service areas. NPWS Scientific Licence Numbers: SL100848.

TBE staff are licensed under an Animal Research Authority issued by the NSW Department of Primary Industries. This authority allows *TBE* staff to conduct various fauna surveys of native and introduced fauna for the purposes of environmental consulting throughout New South Wales.

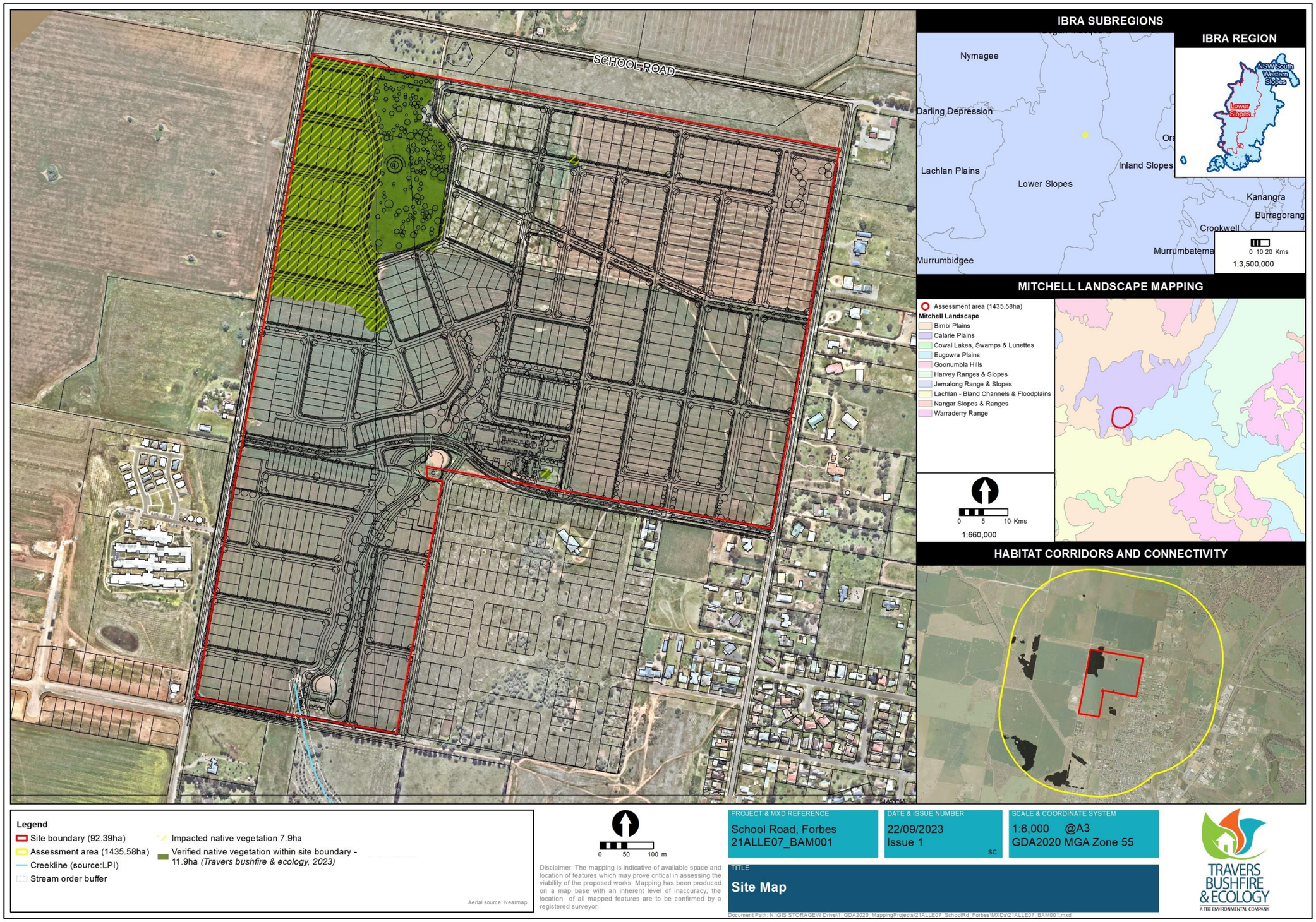


Figure 1-5 – Site Map

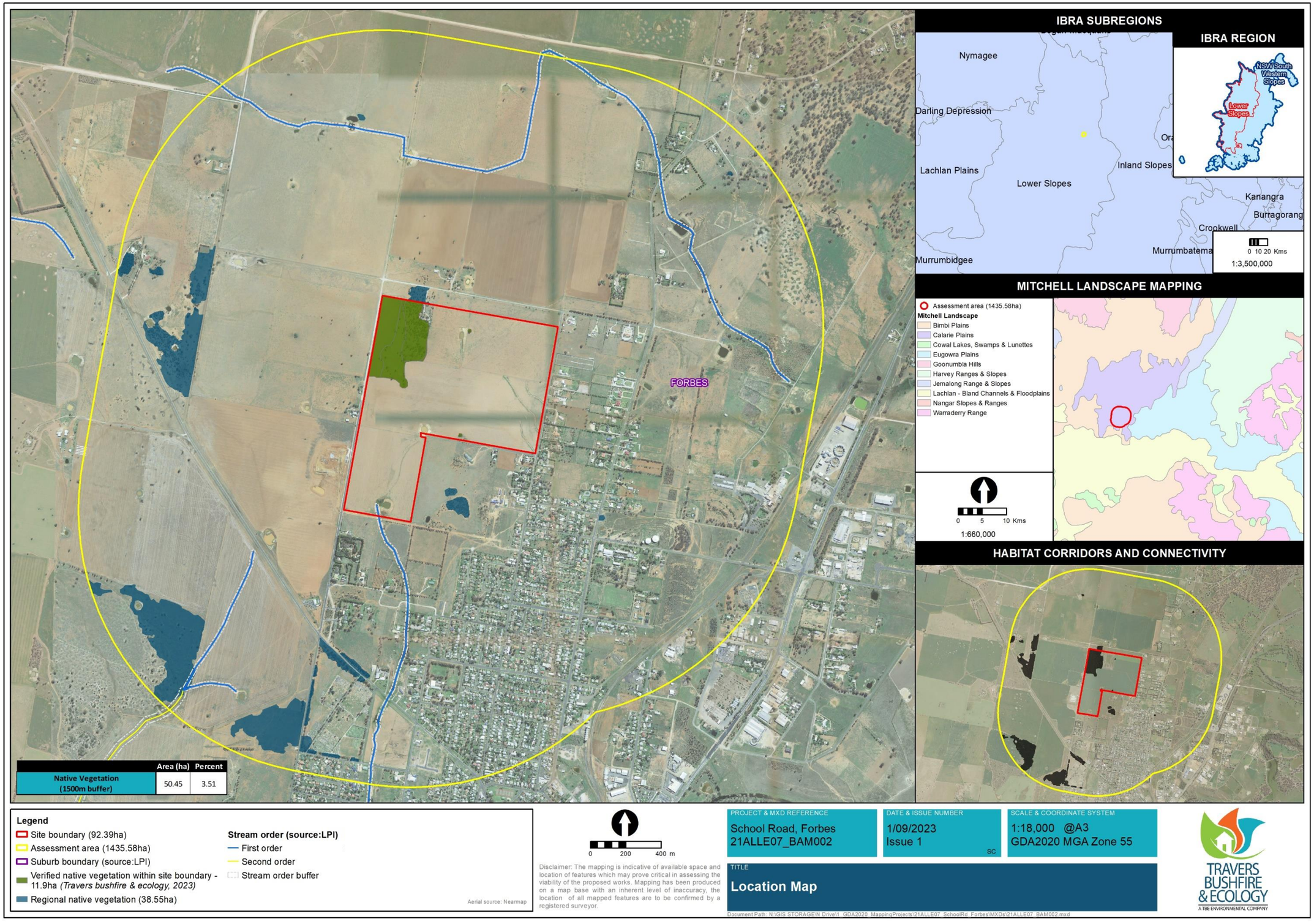


Figure 1-6 – Location map

2. SURVEY METHODOLOGY

2.1 Presurvey information collation and resources

Documents reviewed:

The following documents, reports and information sources were utilised in the preparation of this report:

- Forbes Housing Strategy 2021-2041 (2023).
- Forbes Local Environmental Plan (2013), and
- Masterplans provided by Hatch (2023)

Technical resources utilised:

Legislation

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*
- *Biodiversity Conservation Regulation 2017 (BC Reg.), and*
- *Fisheries Management Act 1994 (FM Act).*
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021, and*
- *State Environmental Planning Policy (Resilience and Hazards) 2021.*

Survey guidelines

- Survey guidelines for Australia's threatened birds (DEWHA 2010).
- Survey guidelines for Australia's threatened frogs (DEWHA 2010).
- Matters of National Environmental Significance (Commonwealth of Australia 2013).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities 2004 (working draft), Department of Environment and Conservation (DEC).
- Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC April 2009a).
- Hygiene Protocol for the Control of Diseases in Frogs (DECC 2008).
- Region based guide to the echolocation calls of Microchiropteran bats (DEC 2004)
- Field survey methods: Best practice field survey methods for environmental consultants and surveyors when assessing proposed development sites or other activities on sites containing threatened species, populations, or ecological communities (OEH 2004).
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (DPE 2020).

Mapping resources

- Aerial photographs (Google Earth Pro / Spatial Information Exchange / NearMap).
- Topographical maps (scale 1:25,000).
- LiDAR data for contours (Land and Property Information, est. 2015 estimated), and
- ESpade – DPE tool for checking soil types.

Threatened species records.

- BioNet database which holds data from several custodians (7/09/23 to 10 km).
- Birdata (Birdlife Australia 2017), and
- EPBC Protected Matters Search Tool - DCCEEW (2023 to 10 km).

Vegetation mapping / resources

- BioNet Vegetation Classification System (DPE 2023).
- State Vegetation Type Map (DPE 2022), and
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (DPIE 2020).

Vegetation mapping

The State Vegetation Type Map (DPE 2022) mapped the following vegetation community within the site shown in Figure 2-1:

- PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.

Field verification of the study area found the following vegetation communities:

- PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions (7.74 ha).
- PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions – DNG (4.17 ha)
- Exotic Planted Vegetation (7.42 ha), and
- Planted pasture (71.76 ha).

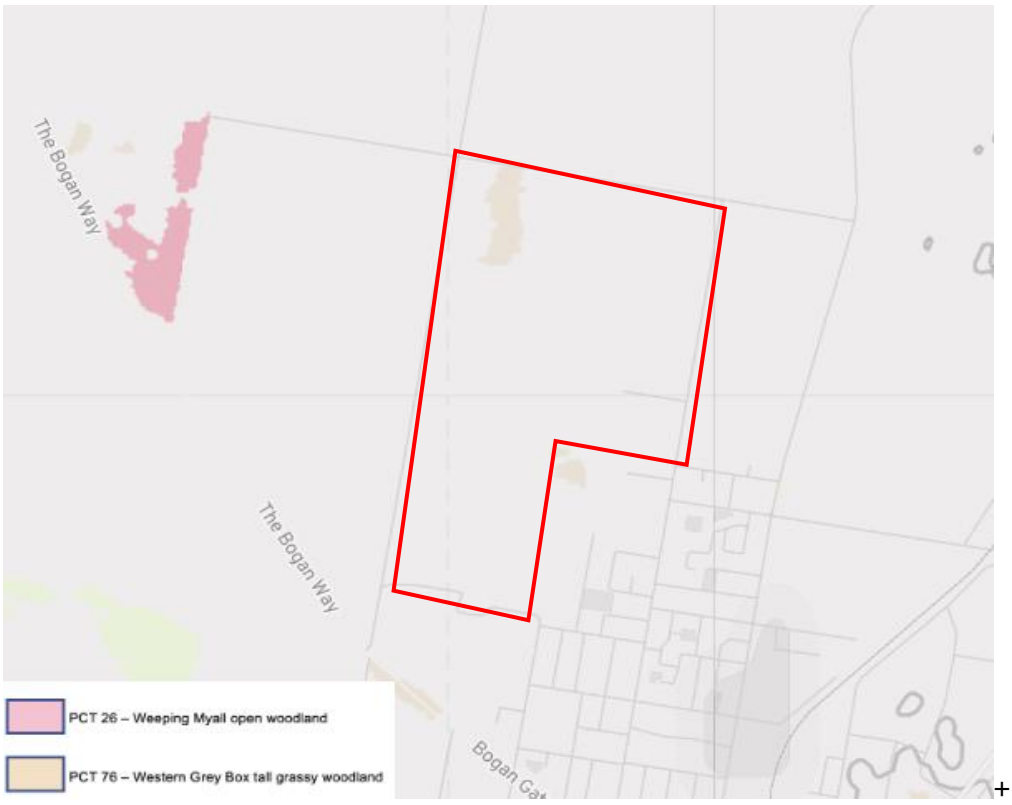


Figure 2-1 – The State Vegetation Type Map(Study area identified by red outline)
(Source: SVTM, DPE 2022)

2.2 Flora survey methodology

The flora survey was undertaken on 9 and 10 August 2023. A review of the *BioNet Atlas of NSW Wildlife* (DPE 2023) was undertaken prior to the site visit to determine threatened species previously recorded within 10 km of the subject site, and a random meander was undertaken. Targeted flora surveys will be undertaken across the native vegetation remnant, in September/October, to align with optimal seasonality for native flora. The BDAR will be updated accordingly.

The following information was collected at each of three (3) Biodiversity Assessment Method (BAM) plots. The surveys were stratified using the BAM.

- Native canopy, mid-storey and ground cover was recorded for all observed species and an estimate of stems (20 m x 20 m, 10 m x 50 m).
- Stratum (and layer): stratum and layer in which each species occurs (20 m x 20 m).
- Growth form: growth form for each recorded species (20 m x 20 m).
- Species name: scientific name and common name (20 m x 20 m).
- Percent projected foliage cover of the understorey strata and exotic vegetation (20 m x 20 m).
- Number of trees with hollows visible from the ground (20 m x 50 m).
- The total length of fallen logs >10 cm in diameter (20 m x 50 m).
- The proportion of regenerating canopy species (20 m x 50 m).
- Number of large trees (20 m x 50 m), and
- Estimates of leaf litter cover, bare ground, cryptograms, and rocks in 1 m x 1 m subplots at five (5) locations along the central transect (20 m x 50 m).

Based on the mapped PCTs, Protected Matter Search Tool (PMST 2023) information for the area and *BioNet Atlas of NSW Wildlife* (2023) records, the following species (full nomenclature given) were considered for survey. This was undertaken across the native vegetation remnant (Figure 2-2). Seasonally optimal times for targeted survey of these species is recommended (Table 2-4), i.e., September-October. A random meander was used in the meantime.

- *Austrostipa wakoolica* S.W.L.Jacobs & J.Everett (Family: Poaceae)
- *Diuris tricolor* Fitzg. (Family: Orchidaceae)
- *Eleocharis obicis* L.A.S.Johnson & O.D.Evans (Family: Cyperaceae)
- *Lepidium aschersonii* Thell. (Family: Brassicaceae)
- *Swainsona murrayana* Wawra. (Family: Fabaceae Subfamily Faboideae)
- *Swainsona recta* A.T.Lee (Family: Fabaceae Subfamily Faboideae)
- *Swainsona sericea* J.M.Black ex H.Eichler. (Family: Fabaceae Subfamily Faboideae)

Completed plot sheets utilised for the BAM calculator are provided in Appendix 3.

2.3 Fauna survey methodology

Site survey effort accounting for techniques deployed, duration, and weather conditions are outlined in Table 2-1 and are depicted on Figure 2-2.

Diurnal birds

Three (3) diurnal bird census points were undertaken within the development footprint. A minimum of 15 minutes of survey was undertaken at each census point in an area radiating

out to between 30-50 m. Bird census points were selected to give an even spread and representation across the site and its communities (Figure 2-2). Census points were also commenced in locations where bird activity was apparent, as often different small bird species are found foraging together. Opportunistic diurnal bird survey was conducted between census points and whilst undertaking other diurnal surveys.

Raptor nest search

Raptor nest and roost searches were utilised to observe eyries within the foreshore region of study site and extending into the surrounding habitat. Areas considered to be suitable nesting and roosting habitat were searched with binoculars and inspected for whitewash and feathers at ground level.

Nocturnal birds

Given the local records of Barking Owl (*Ninox connivens*), and Australian Bittern (*Botaurus poiciloptilus*) were targeted by call-playback techniques.

Diurnal survey included searches for any signs of Owl roosting activity. This was undertaken where dense mid-storey foliage was present, typically in the dense vegetation on site. Search areas are shown on Figure 2-2.

Arboreal and terrestrial mammals

Diurnal survey included opportunistic searches involving identification of scats, bones, diggings and scratching in the soil synonymous with mammal species.

Nocturnal survey involved spotlighting and opportunistic survey to identify terrestrial and arboreal mammal species.

Bats

Micro-chiropteran bats are surveyed by echolocation using ultrasonic recording detectors. Passive recording was undertaken through the deployment of ultrasonic recorders over one night that were positioned to target species preferred roosting and foraging habitat.

Diurnal searches investigating potential micro-chiropteran bat roosting sites were undertaken on 8-9 August 2023. Searches included the inspection of trees exhibiting small hollows and large basal trunk hollows were searches for evidence of guano.

Amphibians

Potential frog habitat searches included scoping the study area and surrounds for favourable features known for threatened frogs' species with the potential to occur within the area and associated plant community types. These searches were undertaken for one (1) hour during a diurnal survey period. Habitat searches included scoping suitable within range waterbodies, the presence of perennial and ephemeral pools and drainage lines and analysing habitat and vegetation types that may be suitable for threatened frog species known to occur within the locality. Given the disturbed nature of the study site, these searches were focus within the existing dams and surrounding vegetation.

Target surveys involved spotlighting along the drainage channel for calling frogs over one session. The survey efforts utilised habitat searches, call-playback, and call identification.

A song meter was also deployed overnight to record species present within the dam that had contained the most frogs calling during the diurnal habitat searches.

Amphibian survey was undertaken in accordance with the *Hygiene Protocol for the Control of Diseases in Frogs* (DECC 2008).

Habitat trees

Hollow-bearing trees were identified and recorded within the development footprint on a *Trimble* handheld GPS unit during surveys. All data such as hollow types, hollow size, tree species, diameter at breast height, canopy spread, and overall height were collected and a metal tag with the tree number placed on the trunk for field relocation purposes. Other habitat features such as nests and significant sized mistletoe for foraging were also noted.

A summary of hollow-bearing tree results is provided in Table 3-9.

Significant habitat trees

Significant habitat trees are defined as trees containing large hollows suitable for use by owls and/or containing several good quality hollows typically consisting of more than one medium (10 – 30 cm) sized hollow. A tree may also be considered significant where evidence of use by select fauna is found such as Yellow-bellied Glider sap feed tree, raptor nest, or owl roost.

Data such as the number of hollows present in each size category (or other reason for selection), tree species, diameter at breast height, canopy spread, and overall height were collected. A summary of significant habitat tree results is provided in Table 3-9.

2.4 Field survey effort

Table 2-1 and Table 2-2 below detail the flora and fauna survey effort undertaken for the development footprint.

Table 2-1 – Fauna survey effort

Fauna group	Date	Weather conditions	Survey technique(s)	Time effort (24hr)
Diurnal birds	8/8/23	2/8 cloud, 17 km/hr wind, no rain, temp 0.6-18.2ºC	Diurnal census x1	Commenced @ 16:30
	9/8/23	1/8 cloud, 31 km/hr wind, no rain, temp 0.6—20.6 ºC	Diurnal census x2	Commenced @ 9:40
			Raptor nest searches	Commenced @ 10:00
Nocturnal birds	8/8/23	2/8 cloud, 17 km/hr wind, no rain, temp 0.6-18.2 ºC	Opportunistic habitat searches	Commenced @ 16:45
	9/8/23	1/8 cloud, 31 km/hr wind, no rain, temp 0.6—20.6 ºC	Spotlighting	Commenced @ ~17:30
Arboreal & terrestrial mammals	8/8/23	2/8 cloud, 17 km/hr wind, no rain, temp 0.6-18.2 ºC	Opportunistic habitat searches	Commenced @ 15:00
			Spotlighting	Commenced @ ~17:30
	9/8/23	1/8 cloud, 31 km/hr wind, no rain, temp 0.6—20.6 ºC	Opportunistic habitat searches	Commenced @ 8:40
Bats	8/8/23	2/8 cloud, 17 km/hr wind, no rain, temp 0.6-18.2 ºC	Passive ultrasonic recording	Overnight
Amphibians	8/8/23	2/8 cloud, 17 km/hr wind, no rain, temp 0.6-18.2 ºC	Opportunistic habitat searches	Commenced @ 15:00
			Spotlighting / call identification	Commenced @ ~17:30
			Songmeter recording	Overnight

Table 2-2 – Flora survey effort

Flora survey	Survey technique(s)	Dates
Vegetation communities	Survey of the boundaries of all communities – field verification, plotting vegetation boundaries on aerial photographs.	9 and 10 August 2023
Stratified sampling	Three (3) 20 m x 50 m BAM plots spaced throughout the development footprint in areas of native vegetation. Opportunistic observations of flora species during all on-foot traverses of the development footprint.	9 and 10 August 2023
Targeted searches	Opportunistic searches during all on-foot traverses across the site due to off season of most species identified with potential.	9 and 10 August 2023

Table 2-3 – Plot and transect survey effort – development footprint

Veg zone no.	PCT	Condition	Area (Ha)	Minimum plots required	Plot sampled	Plot identifier	Plot size	Easting at 0 m	Northing at 0 m	Bearing
2	76	Poor-Moderate	3.8	2	2	Q1 Q3	20 m x 50 m	592938E 592926E	6309345N 6309172N	150 70
DNG	76	Derived Native Grassland (DNG)	4.17	2	1	Q2	20 m x 50 m	592792E	6309236N	0

2.5 Survey limitations

It is important to note that field survey data collected during the survey period is representative of species occurring within the development footprint on that occasion. Due to effects of fire, breeding cycles, migratory patterns, camouflage, weather conditions, time of day, visibility, predatory and / or feeding patterns, increased species frequency or richness may be observed within the development footprint outside the nominated survey period. Habitat assessments based on the identification of micro-habitat features for various species of interest, including regionally significant and threatened species, have been used to minimise the implications of this survey limitation.

Flora survey limitations

The species list does not include all household or exotic garden / landscaping species and those species which could not be identified at the time of the survey past genus level. Cryptic species not flowering at the time of the survey may not be observed during survey outside of peak flowering periods. Likewise cryptic orchid species are generally only recognisable when flowering.

Burrows (2004) highlights those surveys in winter result in less than 50% of plant species present, in plots across western NSW and the Southwestern Slopes (SWS). Due to the flowering season being less than optimal for native grass, herb and forbs, native species are unlikely to be adequately represented. Over summer, native herbaceous perennials die back to their rootstock, and to corms and tubers. These are not likely to re-emerge until late spring (Burrows 2004). It is recommended that a follow-up survey be conducted in September – October, as per Table 2-4, when native species are more likely to be present. A minimum of four plots is required for the survey area.

Table 2-4 – Survey adequacy for species credit species (flora)

Common name	*BC Act*	Potential to occur (presence status) / Habitat	Preferred survey period (DPE)	Actual survey period	Survey sufficient to rule out presence
Austrostipa wakoolica	E	✓	Oct-Dec	August 2023	x
Diuris tricolor	V	✓	Sept-Oct	August 2023	x
Eleocharis obicis	V	✓	Oct-Nov	August 2023	x
Lepidium aschersonii	V	✓	Nov-Dec	August 2023	x
Swainsona murrayana	V	✓	Sept	August 2023	x
Swainsona recta	E	✓	Sept-Nov	August 2023	x
Swainsona sericea	V	✓	Sept-Nov	August 2023	x

Fauna survey limitations

Microbat survey was undertaken during winter when activity is typically low. Two detectors were left out for one night. It is recognised that both activity and species diversity, possibly including threatened species may occur in warmer month's conditions.

Assumed presence of species

The BAM-C has identified a list of threatened fauna credit species with potential habitat associated with the recorded PCTs in the development footprint (Table 2-5). Species credit species require survey to rule out presence on site otherwise these species must be assumed to be present and will generate subsequent credits for offsetting.

It is important to note that where species credits cannot be ruled on vagrancy, geographic limitations or specific habitat features being absent, the species were assumed to be present given that adequate and / or compliant surveys have not been undertaken across the full extent of the site.

Following a habitat assessment of the site and surrounding study area, as well as the elimination of select species where breeding habitat is absent, the species listed in Table 2-5 require seasonal survey.

Table 2-5 – Survey adequacy for species credit species (fauna)

Common name	*BC Act*	Potential to occur (presence status) / Habitat	Preferred survey period (DPE)	Actual survey period	Survey sufficient to rule out presence
Sloane's Froglet	V	✓ (low)	Oct-Dec	Aug	x
Major Mitchell's Cockatoo	V	✓ (low)	Sep-Dec	Aug	x
Squirrel Glider	V	✓ (low)	All months	Aug	x
Koala	E	✓ (low)	All months	Aug	x
Superb Parrot	V	✓ (moderate)	Sep-Nov	Aug	x

2.6 Accuracy of identification

Plant specimens were identified to species level, where possible, though due to most species not exhibiting floral material due to suboptimal period for surveying native flora during winter, most were identified to genera where possible. PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney. https://plantnet.rbgsyd.nsw.gov.au was used to identify plants.

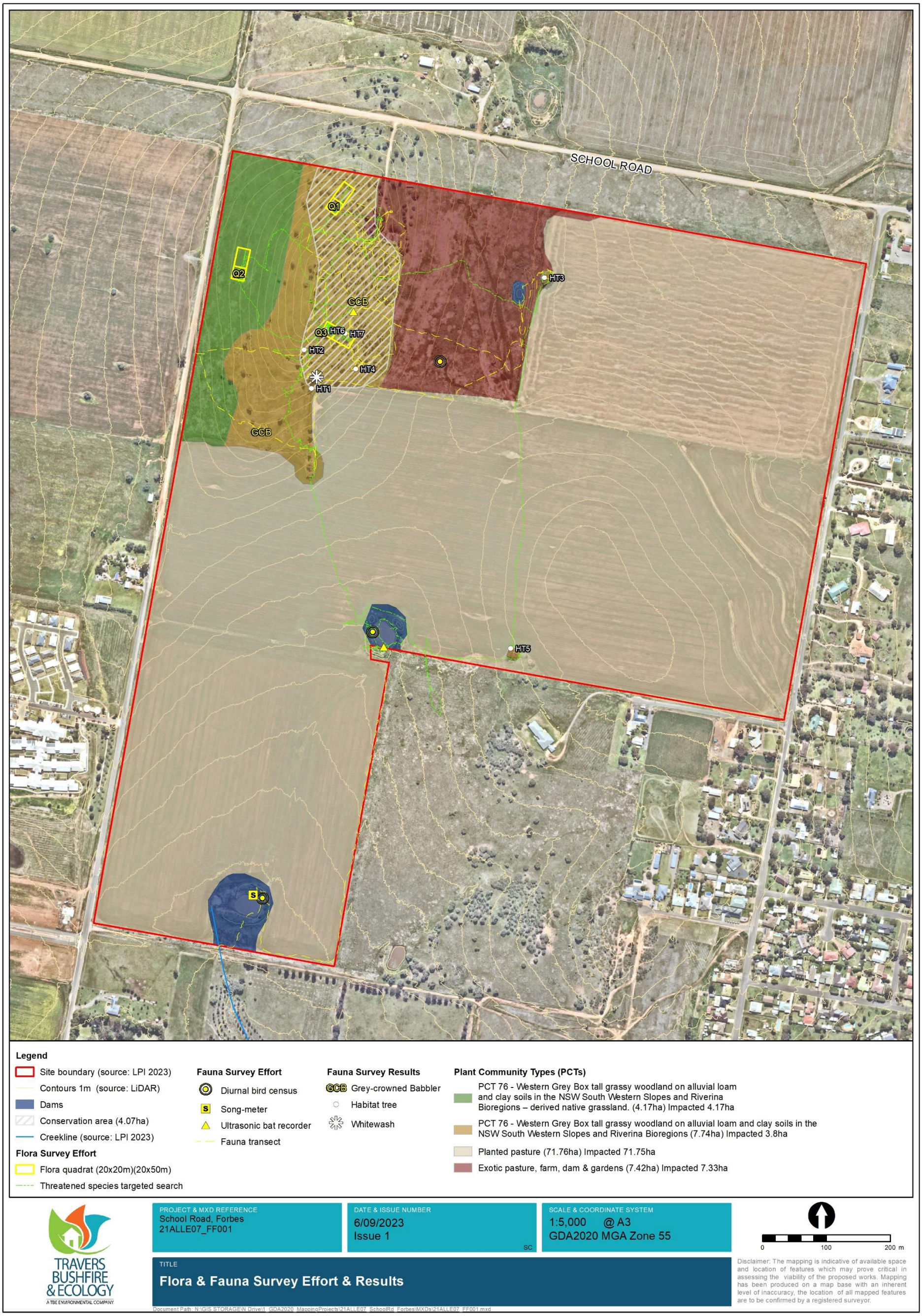


Figure 2-2 – Flora and fauna survey effort and results.

3. SURVEY RESULTS

3.1 Flora results

3.1.1 Native vegetation extent

The extent of native vegetation within the study area was assessed. The amount of native vegetation totalled an estimated 11.9 ha. An environmental protection area (4.07 ha) is planned to be integrated into the design.

3.1.2 Native flora

Native flora observed across the study area are listed in Table 3-1 below.

Table 3-1 – Native flora observations within the study area

Family	Scientific name	Common name
TREES		
Cupressaceae	*Callitris glaucophylla*	White Cypress Pine
Myrtaceae	*Eucalyptus microcarpa*	Western Grey Box
SHRUBS		
Scrophulariaceae	*Myoporum montanum*	Western Boobialla
GROUNDCOVERS		
Poaceae	*Austrostipa* sp.	Spear-grass
Asteraceae	*Calotis* sp.	Burr-Daisy
Convolvulaceae	*Convolvulus erubescens*	Blushing Bindweed
Convolvulaceae	*Dichondra repens*	Kidney Weed
Poaceae	*Cynodon dactylon*	Native Couch
Chenopodiaceae	*Einadia nutans* subsp. *nutans*	Climbing Saltbush
Poaceae	*Enteropogon acicularis*	Windmill Grass
Juncaceae	*Juncus* sp.	Juncus
Brassicaceae	*Lepidium pseudohyssopifolium*	Peppercress
Campanulaceae	*Lobelia concolor*	Poison Pratia
Lomandraceae	*Lomandra filiformis*	Wattle Mat-rush
Poaceae	*Rytidosperma caespitosum*	Ringed Wallaby Grass
Chenopodiaceae	*Sclerolaena bicornis*	Goathead Burr
Chenopodiaceae	*Sclerolaena birchii*	Galvanized Burr
Other		
Loranthaceae	*Muellerina* sp.	Mistletoe
**** denotes exotic species***		
TS denotes threatened species		

3.1.3 Plant community types (PCTs)

Evidence used to identify a PCT

The entire list of PCTs was exported from the online *BioNet Vegetation Classification* tool. Dominant canopy species, mid-stratum species, ground cover species, and Interim Biogeographic Regionalisation for Australia (IBRA) region and sub-region information were utilised to produce a short list of potential PCTs (Table 3-2). Final PCTs were then chosen based on species composition and presence, and similarity to descriptive attributes and distributional information provided in the *BioNet Vegetation Classification* tool. The PCT chosen is provided in Table 3-2.

Table 3-3 identifies the PCT occurring within the development site, including vegetation formation, percent cleared within and extent within the development site.

All plot sheets utilised for the BAM calculator are in Appendix 3.

Table 3-2 – PCT shortlist and justification

Zone	Shortlisted PCTs	PCT name	Match	Justification
1	76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions	Yes	Correct species composition and landscape position.
2	76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions – derived native grassland.	Yes	Correct species composition and landscape position.

Zone 1:

The identification of the most suitable PCTs was based upon comparing the similarity with BAM plot data against the recently mapped NSW State Vegetation Type Mapping (2023).

Table 3-3 – Plant Community Types within study area

PCT code	PCT name	Species relied upon	Vegetation formation	Vegetation class	% Cleared	Area within development site (ha)	TEC status
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South-western Slopes and Riverina Bioregions.	*Eucalyptus microcarpa* and *Callitris glaucophylla*	Grassy Woodlands	Floodplain Transition Woodlands	92	11.9 ha	Inland Grey Box Woodland in the Riverina, NSW Southwestern Slopes, Cobar Peneplain, Nandewar, and Brigalow Belt South Bioregions *BC Act* Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia *EPBC Act*

PCT76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions

IBRA Subregion: Occurs within the NSW Southwestern Slopes IBRA region and Lower Slopes IBRA subregion.

Vegetation formation/class: Grassy Woodlands / Floodplain transition Woodlands.

Landscape position: Occurs on texture contrasting red or brown earths or grey clay soils on undulating alluvial plains.

The vegetation community contained several species listed in the Final Determinations for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia including *Callitris glaucophylla, Enteropogon acicularis, Eucalyptus microcarpa, Einadia nutans* subsp. *nutans* and *Lomandra filiformis*. PCT76 is the equivalent recognised plant community type for this EEC.

PCT76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions



Photo 3-1 – Good quality and more intact remnant vegetation in the western portion of the study area (Photo: D. Warman).



Photo 3-2 – Eucalyptus microcarpa *(Grey Box) canopy among a mid-storey dominated by high threat weed, African Boxthorn (Lycium ferocissimum) with native and exotic groundcover (Photo: D. Warman).*



Photo 3-3 – Mistletoe on Callitris glaucophylla (White Cypress Pine) (Photo: D. Warman).

Description

PCT76 is described (BioNet Vegetation 2023) as a tall woodland dominated by Grey Box (*Eucalyptus microcarpa*) to the exclusion of other tree species except where White Cypress Pine (*Callitris glaucophylla*) forms part of the canopy, as it does within the study area. The mid-storey is often absent except for a low diversity of native flora, including *Acacia* sp. Burrows (2004) highlights that shrubs and trees generally constitute less than 8% of species recorded in plots across the southwestern slopes. This was the case within the study area. The only shrub species observed was the high threat weed, African Boxthorn (*Lycium ferocissimum*) justifying the condition as poor to moderate. Typically, the ground cover is dense with grasses, herbs, and forbs and the climbing scrambler, *Einadia nutans* subsp. *nutans*. This was the case across the study area with this species, along with the grasses, *Enteropogon acicularis* and *Austrostipa* sp., among others. At the time of the survey native grasses, herbs and forbs were less likely to be present. There is likely to be more native species present within the seedbank which are likely to emerge late in September to October.

The following describes the species identified during the winter survey (9 and 10 August 2023).

Canopy – Sparsely scattered individual or clumps of trees 5 to 20 m high with less than 1% cover across the study area. The dominant species was *Callitris glaucophylla* followed by *Eucalyptus microcarpa.*

Mid-storey – There was no native shrub layer beyond the fence line dividing the residential area from the native vegetation on the western boundary. Within the native vegetation area, the high threat weed, African Boxthorn (*Lycium ferocissimum*), dominated.

Ground layer – The ground cover was dominated by a mixture of native and exotic grasses, herbs and forbs including *Dichondra repens* and *Calotis* sp. Native grasses included *Cynodon dactylon*, *Enteropogon acicularis, Rytidosperma* sp. Exotic grasses within this community included *Avena sativa* and *Lolium perenne.*

Zone 2 - PCT76 - Derived Native Grassland



Photo 3-4 – Grassy vegetation beyond the grassy woodland

Description:

This describes the predominantly grassed vegetation within the area mapped as PCT76.

Canopy – There was no canopy in this area.

Mid-storey – There was no mid-storey in this area.

Ground layer – Dominated by a mixture of native and exotic grasses, herbs, and forbs. Native tussock grasses and *Austrostipa* sp. were scattered across the site, however, no floral material was available to key these native grasses to species level. A diversity of forbs was present; however, no floral material was available to identify the species. Low perennial shrubs were, however, available, with dried plant material such as burrs to enable identification to species level. These included *Einadia nutans* subsp. *nutans, Lepidium pseudohyssopifolium, Sclerolaena bicornis* and *S. birchii.*

Area surrounding dams



Photo 3-5 – Vegetation surrounding three dams on property

Description:

This describes the vegetation around the three dams.

Canopy – There was no canopy in this area.

Mid-storey – There was no native shrublayer in this area. However, the high threat weed African Boxthorn (*Lycium ferocissimum*) was extensive around the dam edges.

Ground layer – The ground layer was often bare due to grazers using the dams for hydration. Where there was vegetation, it was dominated by exotic grasses, herbs and forbs, as well as extensive tussocks of *Juncus* sp.

Cropped paddocks



Photo 3-6 – Cropped pasture land

Description:

Most of the site is cropped pastureland.

Canopy – There was no canopy across this area.

Mid-storey – There was no shrub layer across this area.

Ground layer – The ground layer was dominated by exotic Oats (*Avena sativa*).

3.1.4 Vegetation integrity assessment

A vegetation integrity assessment is an assessment on the site's condition. Vegetation patches are broken into zones of roughly equal quality and then surveyed by transect plots. The number of required transect plots is dependent upon the size of the zone.

Table 3-4 – Number of plots required per area of zone.

Vegetation zone area (ha)	Minimum number of plots/transects
<2	1 plot/transect
>2–5	2 plots/transects
>5–20	3 plots /transects
>20–50	4 plots/transects
>50–100	5 plots/transects
>100–250	6 plots/transects
>250–1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

Once data from the transect plot has been collected, the composition of native plant species per growth form is assessed, along with numbers of stems, percentages of exotic or high threat exotic species present, number and sizes of eucalypt and non-eucalypt tree stems, litter cover, rock cover, cryptogram cover, hollows and fallen logs. Therefore, the vegetation integrity assessment is a measure of composition, structure, and function. The breakdown of PCTs is shown in Figure 2-1. Impacted areas (the development footprint) are shown cross-hatched. Figure 2-2 shows the location of the plots in relation to the impacted areas.

The vegetation integrity score is obtained using equations and weightings based upon several entities to calculate scores for composition, structure, and function, for an overall current vegetation integrity score.

Table 3-5 shows the current vegetation integrity score. PCT76_DNG which is a grassland, scores poorly for structure (39.6) and function (0.1) compared with PCT76_poor_moderate which scores comparatively high for structure (80.7) and function (38.2).

Table 3-5 – Current vegetation integrity score

Vegetation zone name	Area (ha)	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
76_poor_moderate	3.8	18.1	80.7	38.2	38.3
76_DNG	4.17	30.3	39.6	0.1	5.3

The vegetation integrity score is measured assuming there will be no vegetation retained across the building sites, including area for APZs, access roads and fence lines.

For PCT 76_poor_moderate, the impact area of 3.8 ha (Table 3-5) includes building lots and associated infrastructure. It is expected that almost all trees will be removed from this area. Preliminary BAM calculations assume all will be removed and the future vegetation integrity score will be 0, as indicated in Table 3-6. Please note that this is post the environmental protection area being excluded.

For PCT76_DerivedNativeGrassland, the impact area is 4.17 ha (Table 3-5). Impacts include building lots and associated infrastructure. It has been assumed all shrubs and groundcover will be removed. Preliminary BAM calculations assume all will be removed and the future vegetation integrity score will be 0, as indicated in Table 3-6.

Table 3-6 – Future vegetation integrity score

Vegetation zone name	Area (ha)	Composition condition score	Structure condition score	Function condition score	Future vegetation integrity score
Zone 1 76_poor_moderate	3.8	0	0	0	0
Zone 2 76_DerivedNativeGrassland	4.17	0	0	0	0

3.2 Fauna results

Fauna species observed throughout the duration of fauna surveys are listed below.

Table 3-7 – Fauna recorded within the study area

Common name	Scientific name	Method observed	
Birds		8 Aug	9 Aug
Australian Hobby	*Falco longipennis*	-	O
Australian Magpie	*Gymnorhina tibicen*	OW	OW
Australian Raven	*Corvus coronoides*	OW	OW
Australian Wood Duck	*Chenonetta jubata*	OW	-
Bar-Shouldered Dove	*Geopelia humeralis*	O	-
Black-shouldered Kite	*Elanus axillaris*	O	-
Brown Goshawk	*Accipiter fasciatus*	-	O
Common Starling *	*Sturnus vulgaris*	OW	OW
Crested Pigeon	*Ocyphaps lophotes*	OW	OW
Crimson Rosella	*Platycercus elegans*	OW	OW
Eastern Rosella	*Platycercus eximius*	OW	OW
Eurasian Coot	*Fulica atra*	OW	-
Galah	*Eolophus roseicapillus*	OW	OW
Grey-crowned Babbler	*Pomatostomus temporalis*	OW	-
Greater Bluebonnet	*Northiella haematogaste*	OW	OW
Hoary-headed Grebe	*Poliocephalus poliocephalus*	OW	O
Inland Thornbill	*Acanthiza apicalis*	OW	-
Long-billed Corella	*Cacatua tenuirostris*	-	OW
Magpie-lark	*Grallina cyanoleuca*	OW	OW
Nankeen Kestrel	*Falco cenchroides*	O	O
Noisy Friarbird	*Philemon corniculatus*	-	OW
Noisy Miner	*Manorina melanocephala*	OW	OW
Pacific Black Duck	*Anas superciliosa*	-	OW
Pied Butcherbird	*Cracticus nigrogularis*	OW	OW
Pied Currawong	*Strepera graculina*	OW	OW
Red-rumped Parrot	*Psephotus haematonotus*	OW	-
Rock Dove *	*Columba livia*	O	O
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	-	OW
Straw-necked Ibis	*Threskiornis spinicollis*	-	O
Superb Fairy-wren	*Malurus cyaneus*	OW	OW
Tawny Frogmouth	*Podargus strigoides*	O	-
Weebill	*Smicrormis brevirostris*	OW	-
Welcome Swallow	*Hirundo neoxena*	O	O
White-browed Babbler	*Pomatostomus superciliosus*	OW	OW
White-eared Honeyeater	*Lichenostomus leucotis thomasi*	-	OW

Common name	Scientific name	Method observed	
Willie Wagtail	*Rhipidura leucophrys*	OW	OW
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	OW	OW
Yellow-throated Miner	*Manorina flavigula*	OW	OW
Zebra Finch	*Taeniopygia guttata castanotis*		OW
Mammals			
Brown Hare *	*Lepus capensis*	O	O
Bush Rat	*Rattus fuscipes*	T	-
Chocolate Wattled Bat	*Chalinolobus morio*	U	-
Alpaca	*Camelidae* sp	O	O
Domesticated Dog *	*Canis lupus familiaris*	OW	OW
Domesticated Sheep	*Ovis aries*	HK	H
Eastern Coastal Free-tailed Bat[TS]	*Micronomus norfolkensis*	U	-
Eastern Grey Kangaroo	*Macropus giganteus*	O	-
European Red Fox *	*Vulpes vulpes*	P	P
Unknown Forest Bat	*Vespadelus* sp	U	-
Amphibians			
Smooth Toadlet	*Uperoleia laevigata*	WAR	W

*Note: * indicates introduced species*

TS indicates threatened species

MS indicates Migratory species

All species listed are identified to a high level of certainty unless otherwise noted as:

PR indicates species identified to a 'probable' level of certainty – more likely than not

PO indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

AR - Acoustic Recording	*H - Hair/feathers/skin*	*P - Scat*	*W - Heard call*
E - Nest/roost	*K- Dead*	*Q- Camera*	*X- In scat*
F- Tracks/scratchings	*O - Observed*	*T - Trapped/netted*	*Y - Bone/teeth/shell*
FB - Burrow	*OW- Obs & heard call*	*U- Anabat/ultrasound*	*Z- In raptor/owl pellet*
G - Crushed cones			

3.3 Habitat results

3.3.1 Fauna habitat observations

The fauna habitats present within the site are identified within the following table.

Table 3-8 – Observed fauna habitat

Topography				
Flat ✓	Gentle ✓	Moderate	Steep	Drop-offs
Vegetation structure				
Closed Forest	Open Forest	Woodland ✓	Heath	Grassland ✓
Disturbance history				
Fire	Under-scrubbing ✓	Cut and fill works		
Tree clearing ✓	Grazing ✓			
Soil landscape				
DEPTH:	Deep	Moderate ✓	Shallow ✓	Skeletal
TYPE:	Clay ✓	Loam ✓	Sand	Organic
VALUE:	Surface foraging ✓	Sub-surface foraging ✓	Denning/burrowing ✓	
WATER RETENTION:	Well Drained ✓	Damp / Moist	Water logged	Swamp / Soak ✓
Rock habitat				
CAVES:	Large	Small	Deep	Shallow
CREVICES:	Large	Small	Deep	Shallow

ESCARPMENTS:	Winter / late sunny aspects			Shaded winter / late aspects			
OUTCROPS:	High Surface Area Hides		Med. Surface Area Hides		Low Surface Area Hides		
SCATTERED / ISOLATED:	High Surface Area Hides		Med. Surface Area Hides		Low Surface Area Hides		
Feed resources							
FLOWERING TREES:	Eucalypts ✓		Corymbias		Melaleucas		
	Banksias		Acacias				
SEEDING TREES:	Allocasuarinas		Conifers ✓				
WINTER FLOWERING EUCALYPTS:	*C. maculata*	*E. crebra*	*E. globoidea*	*E. sideroxylon*			
	E. squamosa	*E. grandis*	*E. multicaulis*	*E. scias*			
	E. robusta	*E. tereticornis*	*E. agglomerata*	*E. siderophloia*			
FLOWERING PERIODS:	Autumn ✓	Winter ✓	Spring	Summer ✓			
OTHER:	Mistletoe ✓	Figs / Fruit	Sap / Manna ✓	Termites			
Foliage protection							
UPPER STRATA:	Dense		Moderate		Sparse ✓		
MID STRATA:	Dense		Moderate		Sparse ✓		
PLANT / SHRUB LAYER:	Dense		Moderate		Sparse ✓		
GROUNDCOVERS:	Dense		Moderate		Sparse ✓		
Hollows / logs							
TREE HOLLOWS:	Large		Medium ✓		Small ✓		
TREE HOLLOW TYPES	Spouts / branch ✓	Trunk ✓	Broken Trunk ✓	Basal Cavities ✓	Stags ✓		
GROUND HOLLOWS:	Large		Medium		Small		
Vegetation debris							
FALLEN TREES:	Large		Medium		Small ✓		
FALLEN BRANCHES:	Large		Medium		Small ✓		
LITTER:	Deep		Moderate		Shallow ✓		
HUMUS:	Deep		Moderate		Shallow ✓		
Drainage catchment							
WATER BODIES	Wetland(s)	Soak(s)	Dam(s) ✓	Drainage line(s) ✓	Creek(s)	River(s)	
RATE OF FLOW:	Still ✓		Slow		Rapid		
CONSISTENCY:	Permanent ✓		Perennial		Ephemeral ✓		
RUNOFF SOURCE:	Urban / Industrial ✓	Parkland	Grazing ✓	Natural			
RIPARIAN HABITAT:	High quality	Moderate quality	Low quality ✓	Poor quality			
Artificial habitat							
STRUCTURES:	Sheds ✓		Infrastructure		Equipment ✓		
SUB-SURFACE	Pipe / culvert(s)		Tunnel(s)		Shaft(s)		
FOREIGN MATERIALS:	Sheet		Pile / refuse ✓				

3.3.2 Habitat tree data

Hollow-bearing trees and significant habitat trees observed within the study area are tabled below. Significant habitat trees are defined as trees containing large hollows suitable for use by owls and/or containing several good quality hollows typically consisting of more than one medium (10-30 cm) sized hollow. A tree may also be considered significant where evidence of use by select fauna is found such as Yellow-bellied Glider sap feed tree, raptor nest, or owl roost.

Table 3-9 – Habitat tree data

Tree No	Scientific Name	Common Name	DBH (cm)	Height (m)	Spread (m)	Vigour (%)	Hollows & Other Habitat Features Recorded
T001	E. microcarpa	Grey Box	83	18	6	85	1 x 20 cm trunk @ 3m, 6 x stick nests, native beehive in basal cavity
T002	E. microcarpa	Grey Box	90	15	6	75	1 x 20cm broken branch @ 3m
T003	E. microcarpa	Grey Box	115	22	13	95	>8 stick nests, Magpie Lark mud nests
T004	-	Stag	-	-	-	-	4x 15cm broken branch, 5 x 0-5 cm broken branch, Red-rumped Parrot nest

4. BIODIVERSITY ASSESSMENT

4.1 Flora

No threatened flora species were observed during the survey periods (9 and 10 August 2023). Native flora species observed are listed in Table 3-1.

4.1.1 State legislative flora matters

(a) Endangered flora populations (NSW)

There are no known endangered populations within the Forbes local government area.

(b) Threatened ecological communities (NSW)

One (1) threatened ecological community (TEC) – Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia was observed within the development footprint.

(c) Species credit species

Based upon the BAM calculator and field surveys to date, predicted threatened species were considered as candidate species for species credit calculation as per Table 4-1 below.

Table 4-1 – Species credit species (flora)

Scientific name	Associated PCTs	Geographic limitations	Habitat constraint (Bionet - Aug 2023)	Habitat degraded or micro habitats absent	Confirmed candidate species	Survey Adequacy			Presence / absence Notes
						Required survey effort and period	Actual survey effort and period	Survey Compliant (yes / no)	
Austrostipa wakoolica	76	No. Grows on floodplains of the Murray River tributaries. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No	No	Yes	Oct – December (mainly in response to rain).	9-10 August	No	Present (assumed) based on associated species (*Eucalyptus microcarpa* and *Callitris glaucophylla)*. PCT76 listed as a likely vegetation type in the TBDC.
Diuris tricolor	76	No. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No	No	Yes	Sept-Oct	9-10 August	No	Present (assumed) based on associated species (*Callitris glaucophylla)*. PCT76 listed as a likely vegetation type in the TBDC.
Eleocharis obicis	76	No. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No. Periodically waterlogged areas including farm dams.	No	Yes	Oct-Nov	9-10 August	No. Survey after soaking rains.	Present (assumed) based on presence on Lachlan River floodplain. PCT76 listed as a likely vegetation type in the TBDC.
Lepidium aschersonii	76	No. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No	No	Yes	Nov-Apr	9-10 August	No. Survey in warmer weather. Use fruit for id.	Present (assumed). Has been found in disturbed locations and growing on ridges with *Eucalyptus microcarpa.* PCT76 listed as a likely vegetation type in the TBDC.
Swainsona murrayana	76	No. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No	No	No	September	9-10 August	No	Present (assumed). Grows in grazed paddocks with disturbance. Dies back after flowering. PCT76 listed as a likely vegetation type in the TBDC.
Swainsona recta	76	No. Known to occur on Lower Slopes in the NSW Southwestern slopes subregion	No	No	No	Sept – Nov	9-10 August	No	Present (assumed). Dies back after flowering. PCT76 listed as a likely vegetation type in the TBDC.
Swainsona sericea	76	No. Known to occur on Lower	No	No	No	Sept – Nov	9-10 August	No	Present (assumed). Sometimes found in association with cypress-

Scientific name	Associated PCTs	Geographic limitations	Habitat constraint (Bionet - Aug 2023)	Habitat degraded or micro habitats absent	Confirmed candidate species	Survey Adequacy			Presence / absence Notes
						Required survey effort and period	Actual survey effort and period	Survey Compliant (yes / no)	
		Slopes in the NSW Southwestern slopes subregion							pines *Callitris* sp. PCT76 listed as a likely vegetation type in the TBDC.

Exclusions based on habitat features and distributional constraints:

Exclusion of species from consideration as candidate species follows Section 5.1 of the BAM. Candidate species can be excluded from further consideration if:

- the distribution of the species does not include the IBRA subregion within which the subject land is located.
- the subject land is outside any geographic limitations of the species distribution based on information from the threatened biodiversity profile search webpage. If no geographic limitations are listed for the species, then this step is not applicable.
- none of the habitat constraints for the species as provided in the TBDC are present in a vegetation zone or subject land, and
- the species is a vagrant in the IBRA subregion.

After carrying out a field assessment, a candidate species can also be excluded if:

- the microhabitats required by a species are absent from the subject land (or specific vegetation zone).
- the habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).

If a candidate species cannot be excluded based on the above criteria, targeted survey must be undertaken, the species assumed present, or an expert report obtained that states that the species is unlikely to be present on the subject land or specific vegetation zones.

Exclusions based on geographic or distributional constraints.

No species were eliminated based on geographic or distributional constraints.

Exclusion due to taxonomic reasons

No species were eliminated based on taxonomic reasons.

(d) Local data

Local data has not been used in this case.

(e) Expert reports

Expert reports have not been utilised for flora on this project.

4.1.2 Matters of National Environmental Significance - flora

(a) Threatened flora species (national)

EPBC Act – A search of the EPBC Search Tool provided a list of nationally threatened flora species considered with potential habitat over a 20 km radius of the development footprint. One threatened species, *Austrostipa wakoolica* was considered 'likely' to occur recorded within a 20 km radius of the site. Five other species were considered 'may' occur, including *Lepidium aschersonii, L. monoplocoides, Swainsona murrayana, Tylophora linearis* and *Thesium australe*. This acknowledges potential habitat for the species within a 20 km radius but not necessarily within the development footprint.

(a) Threatened ecological communities (national)

PCT76 aligns with, and is potentially equivalent to, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia, which is listed under

the *EPBC Act* as endangered. To be classified as part of this TEC, the vegetation in question must meet key diagnostic and conditional criteria.

Key Diagnostic characteristics

Key Diagnostic characteristics of the *EPBC Act* Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia, are listed and addressed, as follows, according to the Advice (2010): -

1. The ecological community occurs on low slopes and plains from central NSW, through northern and central Victoria into South Australia.
    - ***Yes, the study area is contained across low slopes, in central NSW.***
2. The vegetation structure of the ecological community is typically a woodland to open forest.
    - ***Yes, as shown in Figure 2-2, the northwest portion of the site is an open woodland. However, the grassland/open pasture to the west does not meet the diagnostic characteristics.***
3. The tree canopy is dominated (>/- 50% canopy crown cover) by *Eucalyptus microcarpa.* Other tree species co-dominant but never dominant on their own.
    a. *Eucalyptus microcarpa was the dominant eucalypt within the northwest portion of the site.*
4. Mid-storey comprises shrubs of variable composition and cover, from absent to moderately dense, with a canopy cover of less than 30% - 40%.
    a. The mid-storey is dominated by exotic shrubs.
5. Groundlayer – highly variable in development and composition, from absent to mostly grassy to forb-rich, including *Austrodanthonia, Austrostipa, Elymus, Enteropogon, Dianella* and *Lomandra* species. And at least one of the following chenopod species: - *Atriplex, Chenopodium, Einadia, Enchylaena, Maireana, Salsola* and *Sclerolaena.*
    a. During the survey period, *Einadia* sp., *Enteropogon* sp., *Lomandra* sp. and *Sclerolaena* sp. were observed. However, native grasses were not flowering during this time.
6. Derived grasslands are a special state of the ecological community, whereby the canopy and mid-layers have been mostly removed to <10% crown cover but the native ground layer remains largely intact, with 50% or more of the total vegetation cover being native.
    a. *Yes, the grassland to the northwest (Figure 2-2) is likely a derived native grassland as the groundlayer aligns with this community. Native grasses were not flowering during this period, although spent flower heads were observed. It is evident that the canopy has been removed as isolated Grey Box trees were in the vicinity.*

Condition Thresholds

Condition Thresholds of the EPBC Act Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of Southeastern Australia apply only once the key diagnostic characteristics above, have determined this TEC applies. The condition thresholds are listed, and addressed, as follows according to the Advice (2010):

Table 4-2 – Condition Thresholds of the EPBC Act for Grey Box Grassy Woodlands TEC

Category and Rationale	Thresholds
Criteria that are broadly applicable.	1a. The minimum patch size is 0.5 ha. **AND** 1b. The canopy layer contains *E. microcarpa* as the dominant or co-dominant tree species. **AND**

Category and Rationale	Thresholds
	1c. The vegetative cover of non-grass weed species in the groundlayer is < 30%.
Additional criteria that apply to smaller woodland patches (0.5 to <2 ha in area) with tree crown cover > 10%.	2a. At least 50% of the vegetative cover in the ground layer comprises perennial native species at any time of the year. **AND** 2b. Eight (8) or more perennial native species are present in the mid and ground layer.
Additional criteria that apply to larger woodland patches with a well-developed canopy (2 ha or more in area).	3a. At least 8 trees/ha are hollow-bearing or have a diameter at breast height (dbh) of 60 cm or more. **AND** 3b. At least 10% of the vegetative ground layer comprises perennial native grasses. **OR** 4a. At least 20 trees/ha have a dbh of 12 cm or more. **AND** 4b. At least 50% of the vegetative cover in the groundlayer comprises perennial native species.
Additional criteria that apply to patches where the canopy is less developed or absent (derived grassland) (>/- 0.5 ha in area).	5a. Woodland density does not meet criteria 3a or 4a or is a derived grassland with clear evidence that the site formerly was a woodland with a tree canopy dominated or co-dominated by *E. microcarpa.* **AND** 5b. At least 50% of the vegetative cover in the ground layer is perennial native species. **AND** 5c. 12 or more native species are present in the ground layer. This number is unknown as the survey was outside the ideal survey period.
Adapted from Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of southeastern Australia – Listing Advice (2010).	

Across the northwestern portion of the site (PCT76, Figure 2-2), the perennial native understorey typically was low for a winter survey period. However, the number could be much higher during the appropriate survey period, i.e., late spring/summer. Based on this assessment and the data collected, vegetation within PCT76 is commensurate with the *EPBC*-listed TEC but a survey during spring/summer is required to adequately survey native vegetation. Vegetation around Plot 1 in the western parts of the site is borderline and would likely achieve greater than 30% perennial native groundcover during an optimal survey period. Vegetation further east contains canopy species for this TEC and indicates that PCT was more extensive prior to clearing for agricultural activity. Given this, it is reasonable to treat all PCT76, as the TEC.

As these conclusions are not absolute, the Listing Advice (2010) is noted. This highlights the following assessment conditions for a true indication of the likelihood of assessment being appropriate. Assessment should:

- Occur more than two months after a disturbance, e.g., fire or slashing.
- Occur when a minimum of 10% is covered with vegetation (either dead or alive).
- Coincide with species flowering or fruiting, for higher likelihood of correct identification, and
- Consider that some species are visually more dominant at different times of the year. For example, June/ July surveys may appear exclusively exotic annual dominant, whereas the same site in late spring – early summer may show the native grasses such as *Austrostipa* sp. as dominant.

4.2 Fauna

All fauna species recorded during survey(s), key fauna habitat observations and habitat tree data are provided in Section 3.

4.2.1 Key fauna habitat

Most notable habitat features for threatened fauna species considered with most potential to occur include:

- Medium hollow (10-30cm) particularly those with use by Yellow-bellied Glider.
- Small hollows (<10cm).
- Ephemeral drainage lines.
- Winter flowering trees.
- Seed producing *Callitris* trees.
- Open water dams, and
- Fringing wetland vegetation.

A complete assessment of the location of habitat trees and the size of hollows within was undertaken as part of surveys.

Table 3-9 provides hollow-bearing tree data and other habitat features recorded. Figure 2-2 provides locations of habitat trees.

Other notable hollow-dependent fauna species recorded during surveys include, Crimson Rosella, Eastern Rosella, Red-rumped Parrot, Greater Bluebonnet, Long-billed Corella, Galah, Chocolate Wattled Bat, Eastern Freetail-bat, and an unknown Forest Bat,

No large hollows suitable for threatened owls were recorded present within the habitat tree survey. No hollow-dependent threatened fauna species were recorded present during survey. However, additional survey is required to determine if the threatened hollow dependant species Squirrel Glider is present. Hollows recorded present may be suitable for roosting and denning by this species.

A strict removal of hollows process is recommended in Section 5.3 to prevent impacts on hollow-dependent fauna should any documented hollows be removed. This includes the initial identification of all hollows, supervision of their removal to effectively recover fauna and the relocation of hollows (or replacement with nest boxes) within the conservation areas of the site.

4.2.2 State legislative fauna matters

(a) *FM Act*

No habitats suitable for threatened aquatic species were observed within the development footprint and as such the provisions of this act do not require any further consideration.

(b) Endangered fauna populations (NSW)

There are no endangered fauna populations within the Forbes Shire Council LGA.

(c) State Environmental Planning Policy (Biodiversity and Conservation) 2021 – Koala Habitat Protection

Chapter 4 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Koala Habitat Protection) applies to land within LGAs listed under Schedule 2 of the Policy. As the study area falls under the Forbes shire LGA, it is considered that Koala SEPP 2021 applies to this development proposal.

Land to which this policy applies in accordance with Section 4.4 of the SEPP 2021 is as follows: -

(1) This Chapter applies to each local government area listed in Schedule 2.
(2) The whole of each local government area is—
- *(a) in the koala management area specified in Schedule 2 opposite the local government area, or*
- *(b) if more than 1 koala management area is specified, in each of those koala management areas.*

(3) Despite subsection (1), this Chapter does not apply to—
- *(a) land dedicated or reserved under the National Parks and Wildlife Act 1974, or acquired under Part 11 of that Act, or*
- *(b) land dedicated under the Forestry Act 2012 as a State forest or a flora reserve, or*
- *(c) land on which biodiversity certification has been conferred, and is in force, under Part 8 of the Biodiversity Conservation Act 2016, or*
- *(d) land in the following land use zones, or an equivalent land use zone, unless the zone is in a local government area marked with an * in Schedule 2—*
  - *(i) Zone RU1 Primary Production,*
  - *(ii) Zone RU2 Rural Landscape,*

(iii) Zone RU3 Forestry.

The land is listed in Schedule 2 Forbes LGA and is zoned Far west; therefore SEPP 2021 applies. Please Note that SEPP 2020 applies in lands zoned as RU1, RU2 and RU3 in accordance with SEPP 2020.

There is currently no approved Koala Plan of Management (KPoM) for the LGA that this site is located in. Therefore, before council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on Koalas or Koala habitat.

If the council is satisfied that the development is likely to have low or no impact on koalas or Koala habitat, the council may grant consent to the development application. If the council is satisfied that the development is likely to have a higher level of impact on Koalas or Koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a koala assessment report for the development.

As of July 2023, there are no Koala records within a 10 km radius of the study area. The nearest record dated in 1980 approximately 11 kms east of the site. Koala populations are surrounding the study area are limited and sporadic, with the largest population existing near the township of Newbridge approximately 152 km to the east.

Under Schedule 2 of SEPP 2021, Forbes falls within the Far West Koala Management Area. Two (2) tree species were recorded in the study area which are Koala use tree species within this Management Area under Schedule 3 of Koala SEPP 2021. These species are White Cypress Pine *(Callitris glaucophylla)*, Western Grey Box *(Eucalyptus microcarpa)*, No Spot Assessment Technique (SAT) or spotlighting transect survey was undertaken.

It is considered that this study area does not comprise Core Koala Habitat.

(d) Ecosystem credit species

Based upon the BAM calculator and field surveys to date, the following threatened fauna species were considered as predicted species for ecosystem credit calculation:

Table 4-3 – Ecosystem credit species (fauna)

Common name	*BC Act*	Potential to occur	Foraging habitat absent	Excluded (justified below)	Confirmed predicted species	Associated PCT
Black Falcon	V	Yes (low)			✓	76
Brown Treecreeper	V	Yes (moderate)		✓		76
Diamond Firetail	V	Yes (low)			✓	76
Dusky Woodswallow	V	Yes (low)			✓	76
Flame Robin	V	Yes (low)			✓	76
Grey Falcon	V	Yes (low)			✓	
Grey-crowned Babbler	V	Recorded			✓	76
Grey-headed Flying-fox (foraging)	V	Yes (low)			✓	76
Hooded Robin	V	Yes (low)			✓	76
Major Mitchell's Cockatoo	V	Yes (low)			✓	76
Masked Owl (foraging)	V	Yes (low)			✓	76
Scarlet Robin	V	Yes (low)			✓	76
South-eastern Glossy Black-Cockatoo (foraging)	V	Yes (low)		✓		76

Common name	*BC Act*	Potential to occur	Foraging habitat absent	Excluded (justified below)	Confirmed predicted species	Associated PCT
Speckled Warbler	V	Yes (low)				76
Superb Parrot	V	Yes (low)			✓	76
Swift Parrot (foraging)	E	Yes (low)			✓	76
White-bellied Sea Eagle (foraging)	V	Yes (low)			✓	76
White-throated Needletail	V	Yes (low)			✓	76

Excluded species justification (ecosystem credit species):

Brown Treecreeper (eastern subspecies)

This species has been removed from ecosystem credit obligations due to geographic limitations as the site is located west of the Newell Highway. However, it should be noted that there are 64 records of this species within a 10 km radius of the study site.

South-eastern Glossy Black-cockatoo

The single habitat constraint for this species when assessed for ecosystem credits (TBDC) is the presence of foraging habitat provided by *Allocasuarina* sp. or *Casuarina* sp. trees. These species were not observed within the study area during the survey period.

(e) Species credit species

Based upon the BAM calculator and field surveys to date, predicted threatened fauna species listed in Table 4-4 were considered as candidate species for species credit calculation.

Species polygons for all assumed candidate species, the extent of PCT 76, are mapped and shown on Figure 5-3.

Table 4-4 – Species credit species (fauna)

Common name	Associated PCTs	IBRA subregion / geographic restriction	Habitat constraint (Bionet - June 2022)	Habitat degraded or micro habitats absent	Confirmed candidate Species (yes / no)	Survey adequacy			Presence / absence
						Required survey effort and period	Actual survey effort and period	Survey compliant (yes / no)	
Sloane's Froglet	76	-	☑ Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area ☑ Within 500 m of swamp ☑ Within 500 m of waterbody		Yes	4 x nights aural/visual survey & call identification (Jul-Aug)	1 x opportunistic habitat search during Aug	No	Present (assumed)
Grey-headed Flying-fox (breeding)	76	-	☐ Breeding camps ☐ Other		No	-	-	-	Absent (no breeding habitat)
Southeastern Glossy Black-Cockatoo (Breeding)	76	-	☐ Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground	No	No	-	-	-	Absent (no breeding habitat)
Major Mitchell's Cockatoo (breeding)	76	-	☑ Living or dead trees with hollows greater than 10 cm diameter	-	Yes	look for signs of breeding on site as follows. (a) begging birds of any age or sex; or (b) lone individuals of the species identified during the breeding season (Sep- Dec); or (c) an occupied nest.	1 x Survey included hollow searches, bird census and bird call identification (Aug)	yes	Present (assumed)
Squirrel Glider	76	-	No habitat constraint		Yes	5 x trapping nights, spotlighting & call-playback (All months)	1 x spotlighting survey Aug	No	Present (assumed)

Common name	Associated PCTs	IBRA subregion / geographic restriction	Habitat constraint (Bionet - June 2022)	Habitat degraded or micro habitats absent	Confirmed candidate Species (yes / no)	Survey adequacy			Presence / absence
						Required survey effort and period	Actual survey effort and period	Survey compliant (yes / no)	
Squirrel Glider in the Wagga Wagga Local Government Area	76		The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA.	-	No	-	-	-	Absent (outside distribution)
Superb Parrot (breeding)	76	–	☑ Hollow bearing trees: Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	-	Yes	Area searches or transect surveys of suitable habitat over 12 hrs (Sep-Nov)	1 x Survey included hollow searches, bird census and bird call identification (Aug)	-	Present (assumed)
Swift Parrot (breeding)	76	-	☐ as per mapped areas ☐ Other		No	-	-	-	Absent (area not mapped)
White-bellied Sea-Eagle (breeding)	76	-	☑ Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines ☐ Other		Yes	Raptor nest searches (Aug – Oct)	Raptor nest searches during Aug	Yes	Absent (survey)
Koala	76	-	☑ Presence of koala use trees - refer to Survey Comments field in TBDC		Yes	SAT assessment and spotlighting transects (All months)	1 x spotlighting survey during Aug	No	Present (assumed)

Exclusions based on habitat features and distributional constraints:

Exclusion of species from consideration as candidate species follows Section 5.1 of the BAM. Candidate species can be excluded from further consideration if:

- The distribution of the species does not include the IBRA subregion within which the subject land is located.
- The subject land is outside any geographic limitations of the species distribution based on information from the threatened biodiversity profile search webpage. If no geographic limitations are listed for the species, then this step is not applicable.
- None of the habitat constraints for the species as provided in the TBDC are present in a vegetation zone or subject land, and
- The species is a vagrant in the IBRA subregion.

After carrying out a field assessment, a candidate species can also be excluded if:

- The microhabitats required by a species are absent from the subject land (or specific vegetation zone).
- The habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones).

If a candidate species cannot be excluded based on the above criteria, targeted survey must be undertaken, the species assumed present, or an expert report obtained that states that the species is unlikely to be present on the subject land or specific vegetation zones.

Excluded species:

- *Squirrel Glider in the Wagga Wagga Local Government Area - The extent of the endangered population is legally defined by the boundaries of the Wagga Wagga LGA.* The study area is not located within the LGAs associated with this population.

Excluded species based on absence of habitat:

- *Southeastern Glossy Black-cockatoo* – The TBDC (*DPE* 2023) identifies the habitat constraints for this species as the presence of *Allocasuarina* sp. or *Casuarina* sp. trees. These species were not observed within the study area during the survey period.

Excluded species based on the absence of breeding habitat:

- *Grey-headed Flying fox* - The TBDC (*DPE* 2023) identifies the habitat constraints for this species as the presence of breeding camps. The study area does not contain any known breeding camps.

Inclusions based on inadequacy of survey.

- *Squirrel Glider* - Whilst considered to have a ‘low’ potential to occur, no trapping surveys have been undertaken to formally rule out presence and there are no identified constraints by the TBDC for this species to rule out presence. This species therefore requires targeted trapping efforts or arboreal cameras to effectively rule out presence.

- *Superb Parrot* – This species has a ‘moderate' potential to occur. As the site contains hollow bearing trees: living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, or E. intertexta* with hollows greater than 5cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30cm, area searches or transect surveys of suitable habitat over 12 hrs (Sep-Nov) are required for this species to rule out presence. This species therefore requires targeted survey to effectively rule out presence.

- *Koala* - Whilst considered to have a ‘low’ potential to occur, the study site contains Koala use tree species which are identified as habitat constraints by the TBDC. No target surveys have been undertaken in accordance with Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (2022) to formally rule out presence. This species therefore requires targeted survey to effectively rule out presence.

- *Major Mitchell's Cockatoo* - The study site contains living or dead trees with hollows greater than 10 cm diameter which are identified as habitat constraints by the TBDC. No targeted surveys have been undertaken within the correct survey period of Sep-Dec including looking for signs of breeding on site as follows:
    - begging birds of any age or sex,
    - lone individuals of the species identified during the breeding season (Sep-Dec), or
    - an occupied nest.

  Survey was undertaken in August. This species therefore requires targeted survey within the correct survey months to effectively rule out presence.

Sloane’s Froglet - The study site contains the following features which are identified as habitat constraints by the TBDC:

- relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area.
- Within 500 m of swamp, and
- Within 500 m of waterbody.

No target surveys have been undertaken in accordance with NSW Survey Guide including for threatened frogs *(DPE 2020)* including 4 x nights aural/visual survey & call identification (Jul-Aug). Survey undertaken involved 1 x opportunistic habitat search during August.

Excluded species based on the absence of important mapped habitat:

- *Swift Parrot*

  The site is not mapped as containing important habitat for this species on the BAM - Important Areas (DPE) mapping.

(f) Local data

Local data has not been used in this case.

(g) Expert reports

Expert reports have not been utilised for fauna on this project.

4.2.3 Matters of national environmental significance - fauna

(a) Threatened fauna species (National)

EPBC Act – A search of the *BioNet Atlas of NSW Wildlife* (DPE 2023) and the EPBC Search Tool provided a list of nationally threatened fauna species previously recorded, or with considered potential habitat, within a 10km radius of the development footprint. These species have been listed and considered for habitat potential based on proximity and year of records in Table 4-5.

Based on this, it is considered that the development footprint provides varying levels of potential habitat for the following nationally listed threatened fauna species:

Table 4-5 – Nationally listed threatened fauna species with suitable habitat present

Common name	EPBC Act	Potential to occur
Superb Parrot	V	moderate
White-bellied Sea Eagle (migratory)	V	low
Australasian Bittern	E	low
Australian Painted Snipe	E	low
Spotted-tailed Quoll	E	low

No nationally listed threatened fauna species was recorded within the study site during surveys undertaken.

The Significant Impact Criteria for a vulnerable species listed under the *EPBC Act* (Appendix 2) was reviewed to assess the impacts on this species as a result of the planning proposal. As the development footprint does not contain any likely roosting or subsequent breeding habitat and foraging habitat for any *EPBC* listed species, it is concluded that there will not be any significant impact on any nationally listed threatened fauna species with potential to occur, as a result of the proposed rezoning.

(b) Protected migratory species (National)

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10 km radius of the development footprint. The habitat potential of migratory species that have not been considered in the threatened species habitat assessment are considered in Table 4-5.

No nationally protected migratory bird species were recorded present during the preliminary survey or are considered likely to constrain development within the study area.

As the development footprint does not contain any likely roosting, breeding, or other habitat of importance, and given that foraging habitat will remain well represented in the locality, there will not be any significant impact on any other nationally protected migratory bird species with potential to occur, as a result of the proposed rezoning.

4.3 Watercourses, GDEs & Wetlands

4.3.1 Endangered wetland communities

Several wetland communities have been listed as TECs under the *BC Act*. We note that 'wetlands' are included in the definition of 'waterfront lands' in accordance with the *Water Management Act 2000* (*WM Act*) due to their inclusion in the definition of a 'lake' under the same Act. TECs that are an endangered protected wetland are as follows:

- Artesian springs ecological community.
- Castlereagh Swamp Woodland Community.
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin, and Southeast Corner bioregions.
- Coastal Upland Swamp in the Sydney Basin bioregion.
- Coolibah–Black Box woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands bioregions.
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and Southeast Corner bioregions.
- Kurri sand swamp woodland in the Sydney Basin Bioregion.
- Lagunaria swamp forest on Lord Howe Island.
- Maroota Sands swamp forest.
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion.
- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin, and Southeast Corner bioregions.
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin, and Southeast Corner bioregions.
- The shorebird community occurring on the relict tidal delta sands at Taren Point.
- Upland wetlands of the drainage divide of the New England Tableland Bioregion, and
- Wingecarribee Swamp.

No endangered wetland communities were present within the development footprint and therefore a referral to NRAR is not required for impacts on waterfront land.

4.3.2 Groundwater dependent ecosystems (GDEs)

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- wetlands
- red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation
- ecosystems in streams fed by groundwater
- limestone cave systems
- springs; and
- hanging valleys and swamps.

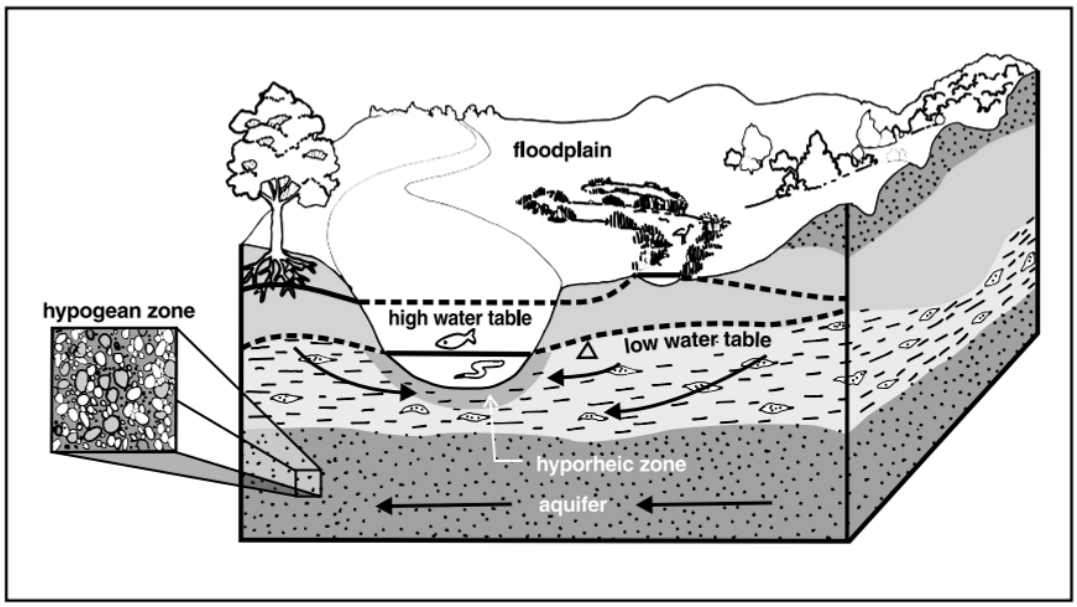


Figure 4-1 – Alluvial groundwater system discharging into a river

GDEs are therefore ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

GDEs were not observed within the development footprint and therefore the policy does not require any further consideration. A referral to NRAR is not required for impacts on waterfront land.

4.3.3 Watercourses

There are currently three dams on the site associated with agricultural use of the land. The most southern dam is connected to an unnamed tributary, that feeds into Lake Forbes (Figure 4-2). It is proposed to dedicate a green corridor of land to active public recreation which will result in a linkage between the three dams, resulting in a 'chain of ponds.' This area will function for both public recreation and stormwater management, in line with Council's Housing Strategy (2023).



Figure 4-2 – Mapped hydroline spatial data (approximate study area in red)
(Source: geo.seed.nsw.gov.au)

4.3.4 State Environmental Planning Policy (Resilience and Hazards) 2021 – Division 1 Coastal wetlands and littoral rainforests area

There are no Coastal wetlands or Littoral rainforests within a 10 km radius of the subject land. Therefore, there will be no impact on those areas.

5. IMPACT ASSESSMENT

5.1 BOS thresholds

The BOS includes three (3) elements to the threshold test – an area trigger, a Biodiversity Values Land Map trigger, and the Test of Significance. If impacts exceed at least one of these triggers, the Biodiversity Offset Scheme (BOS) applies to the proposed clearing.

5.1.1 Biodiversity Values Land

The study area is not located on lands mapped as Biodiversity Values Land (Figure 5-1), therefore, an offset is not required as an outcome of this threshold test.

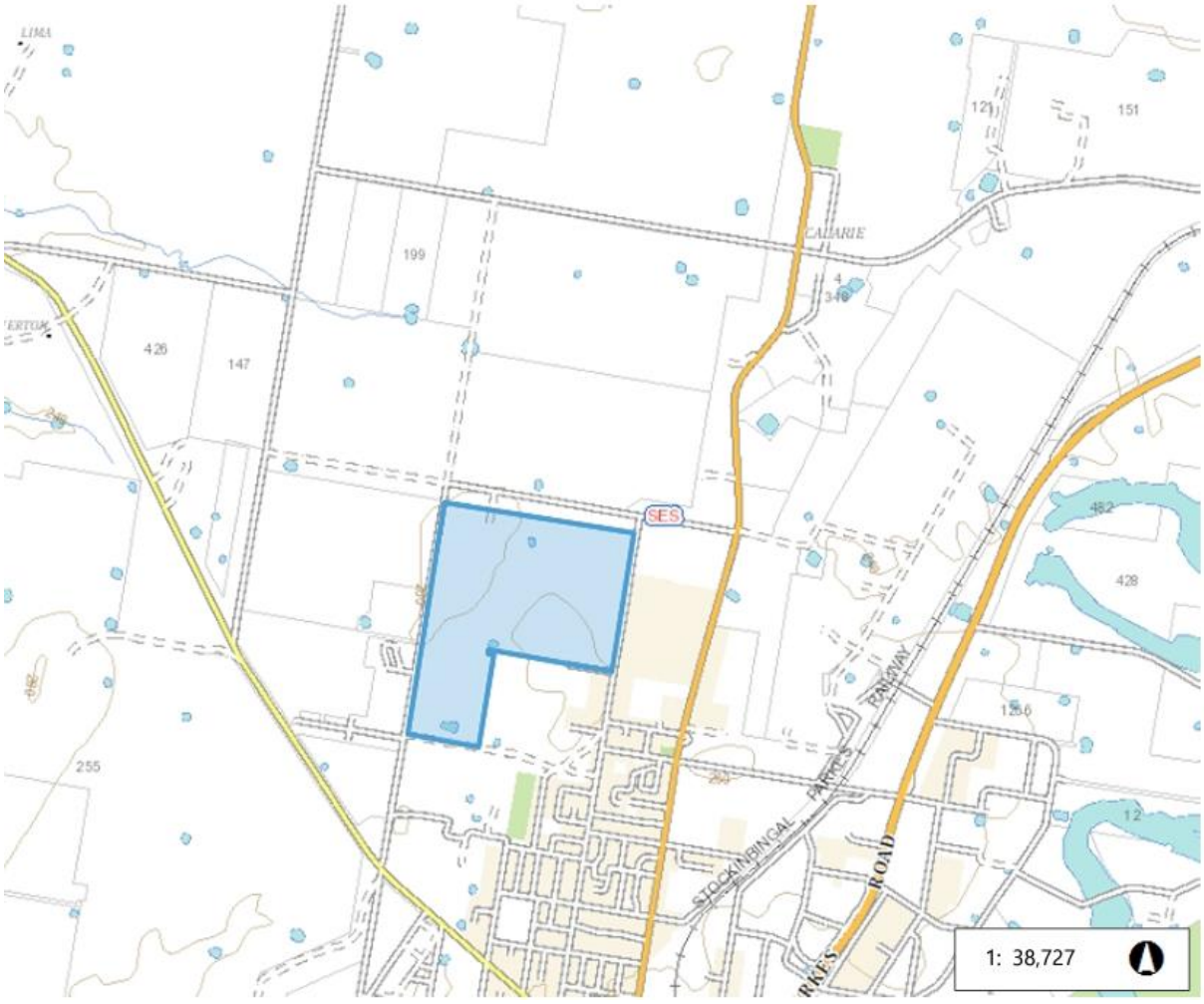


Figure 5-1 – Biodiversity Land Map (purple) relative to the study area (yellow)
(Source: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BosetMap)

5.1.2 Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

The area threshold applies to all proposed native vegetation clearing associated with a development proposal – for example in the case of a subdivision; all future clearing across the lots subject to the subdivision, must be considered. Thresholds outlined under the BOS are outlined in the table below.

Table 5-1 – BOS entry threshold report. Table 5-1 identifies that the site has a minimum lot size of 1 ha, and the clearing area threshold for which the BOS applies is 0.5 ha. Based on the preliminary concept plans (Figure 1-3), the proposed development will remove greater than 0.5 ha of of native vegetation, therefore, offsetting under BOS applies.

Table 5-1 – BOS entry threshold report

Biodiversity Values Map and Threshold Report		
Date of Report Generation		07/07/2023 11:56 AM
Biodiversity Values (BV) Map Threshold - Results Summary		
1	**Does the development Footprint intersect with BV mapping?**	no
2	**Was ALL of the BV Mapping within the development footprinted added in the last 90 days?** (dark purple mapping only, no light purple mapping present)	no
3	**Date of expiry of dark purple 90 day mapping***	N/A
4	**Is the Biodiversity Values Map threshold exceeded?**	no
Area Clearing Threshold - Results Summary		
5	**Size of the development or clearing footprint**	921,299.9 sqm
6	**Native Vegetation Area Clearing Estimate (NVACE)**	55,384.6 sqm
7	**Method for determining Minimum Lot Size**	LEP
8	**Minimum Lot Size** (10,000sqm = 1ha)	10,000 sqm
9	**Area Clearing Threshold** (10,000sqm = 1ha)	5,000 sqm
10	**Is the Area Clearing Threshold exceeded?**	yes
Is the proposed development assessed above the Biodiversity Offsets Schema (BOS) threshold? Exceeding the BOS threshold will require completion of a Biodiversity Development Assessment Report (BDAR). More details provided on page 2.		**yes**

5.1.3 Test of Significance

As the BOS clearing threshold is triggered, and the BOS applies, a Test of significance is not required.

5.2 Avoidance and minimisation actions

Avoidance and minimisation actions

The following strategies and actions have been undertaken to either avoid or minimise impacts on biodiversity values:

Direct and indirect impact avoidance & minimisation

Based on the observed ecological constraints and habitat present an environmental protection area has been identified. This environmental protection area avoids development within the remnant native vegetation. This specifically avoids six remnant Eucalyptus macrocarpa trees which include hollow-bearing trees and habitat for the Grey-crowned Babbler (Pomatostomus temporalis temporalis). There will be an exception where the water tower is located, as this water tower needs to be located at a high point for gravity distribution.

The primary avoidance actions may be described as the following:

- The subdivision has been designed to utilise the lower biodiversity value areas of the site based on the extent of existing cleared landscape.
- PCT 76 is a threatened ecological community. A large avoidance action has been undertaken to retain the areas of higher vegetation integrity, i.e., areas containing remnant trees and shrubs (although there is still an impact on the derived native grassland with low vegetation integrity scores).
- Avoiding six (6) of the habitat (*Eucalyptus microcarpa*) trees.
- Avoidance of prescribed impacts.
- Utilisation of cleared paddocks that have been pasture improved and no longer considered derived native grassland area.
- Avoidance of the Grey-crowned Babbler habitat area.

It should be reiterated that the vegetation integrity score was low to the remnant vegetation area, and below the threshold for offsetting in the derived native grassland area. Also, remnants of native vegetation that are fully structured are very fragmented locally and isolated, therefore subject to natural attrition due to agricultural land management, and edge effects.

The proposal seeks to consolidate the small remnant to help with its longevity by providing some long-term environmental protection measures, but also allowing some degree of passive recreational pursuits.

The proposed development layout has considered the main ecological features of importance within the site and provided an avoidance measure over most of the features, generally meeting the requirements of Stage 2 of BAM 2020.

Further minimisation actions may include:

- Avoid clearing the existing canopy in particular on steeped sloped areas,
- Retain areas of derived native grassland within the environmental protection area for increased habitat diversity.

Mitigation measures

The following mitigation measures are recommended for the subdivision design:

Landscaping and connective linkages

- Utilise 50% of the locally occurring native species in landscaping and creating arboreal and on ground steppingstones, and
- Avoidance of connective roads across the Arboreal links to the environmental protection area.

Protection and restoration of Grey Box Grassy Woodlands

Protection and conservation of Grey Box Grassy Woodlands to the northwest of the development footprint.

- Restoration of Inland Grey Box Woodland in the Riverina within the environmental protection area.
- Enrichment of on ground and arboreal habitat via the restoration of high foraging value species.
- Limit access to remnant PCT76 vegetation by placement of permanent fencing.
- Targeted weed control to minimise the spread of invasive weed species and eradicate where possible, and
- Standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres. Any equipment onsite found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with fungicides.

Sediment and erosion control measures

- Sediment and erosion control measures in accordance with Managing Urban Stormwater: Soils and Construction (Landcom 2004) to minimise impact of possible sedimentation to local drainage lines, and
- Undertake water quality testing within retained waterbodies to monitor for any increase in nutrient or sediment.

Fencing

- Temporary fencing – Where they adjoin the development areas, the boundaries of the conservation areas containing remanent vegetation shall be clearly marked out on-site to ensure their protection. All areas of natural vegetation retention shall be protected by fencing, prior to construction, to ensure that these areas are not damaged during the construction phase.
- Protection of core habitats – a core conservation area is to be identified within the environmental protection area excluding all access for the provision of secluded breeding and foraging habitat for the local fauna. Access into this area is to be restricted.

Ecological supervision

- Construction activities are to be intermittently supervised on-site and monitored. All staff involved with the development shall undergo an induction and training program to reinforce the ecological and environmental objectives of the development.
- Prior to any habitat removal, a comprehensive search for fauna and habitat is to be undertaken to relocate any terrestrial individuals and identify any important nesting to be protected until fledging.

Management of hollows and hollow-dependent fauna:

- The felling of hollow-bearing trees is to be conducted under the supervision of a fauna ecologist to ensure appropriate animal welfare procedures are taken, particularly for threatened species. Hollows of high quality or with fauna recorded residing within should be dismantled for relocation and all hollows should be inspected for occupation, signs of previous activity and potential for reuse.
- Subsequent hollows of retention value are to be relocated to nearby conservation areas. If these are placed as on ground habitat and are not reattached to a new recipient tree then they are to be replaced with appropriately sized nest boxes affixed to a retained tree. All hollow sections considered suitable for Squirrel Glider should where possible be recovered and prepared for placement into an appropriate retained tree.
- Constructed nest boxes should as priority target recorded hollow-dependent threatened species (and their prey species). Boxes should be constructed in weatherproof timber (marine ply), fasteners and external paint and appropriately affixed to a recipient tree under the guidance of a fauna ecologist.
- If a threatened species is found to be occupying the hollow at the time of removal, then this hollow section is to be reattached to a recipient tree within the nearby conservation areas as selected and directed by the fauna ecologist. The welfare and temporary holding of the residing animal(s) is at the discretion of the fauna ecologist.
- The relocated hollow section and nest boxes should be well secured in the recipient tree in a manner that will not compromise the current or future health of that tree, and
- Monitoring of nest boxes and relocated hollows.

Management of any other displaced fauna

- If any fauna species, a nest, or roost is located during development works, then works should cease until safe relocation can be advised by a contact fauna ecologist.

Dam dewatering management

- Where required, dam dewatering is to be undertaken in accordance with appropriate protocols to ensure consideration is given to all potentially impacted aquatic fauna within the dam (e.g., eels / turtles) and breeding water birds as well as species potentially indirectly impacted elsewhere. Protocols are to include frog hygiene, relocating aquatic fauna to recipient sites and appropriate euthanasia of Gambusia.

Pest control and grazing management

- Appropriate feral / pest terrestrial species management e.g., fox and rabbit is to be undertaken to maximise the regeneration of the native vegetation.

5.3 Mitigation measures

The following mitigation measures are recommended to avoid, minimise or ameliorate the above potential ecological impacts, address threatening processes and to guide a more positive ecological outcome for threatened species and their associated habitats.

Table 5-2 – Measures to mitigate and manage impacts

Action / Technique	Outcome	Timing / Frequency	Responsibility
(a) Protection and restoration of Grey Box Grassy Woodlands to the northwest of the development footprint. • **Restoration of Inland Grey Box Woodland in the Riverina within the environmental protection area.** • **Enrichment of on ground and arboreal habitat via the restoration of high foraging value species.** • **Limit access to remnant PCT76 vegetation by placement of permanent fencing.** • **Targeted weed control to minimise the spread of invasive weed species and eradicate where possible, and** • **Standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres. Any equipment onsite found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with fungicides.**	Prevent indirect impacts on PCT 76 conserved habitats	Prior to any clearing works. Ongoing	Project Ecologist as guided by the VMP

Action / Technique	Outcome	Timing / Frequency	Responsibility
(b) Sediment and erosion control measures in accordance with Managing Urban Stormwater: Soils and Construction (Landcom 2004) to minimise impact of possible sedimentation to local drainage lines. **(c) Undertake water quality testing within retained waterbodies to monitor for any increase in nutrient or sediment.**	Maintain integrity of PCT 76 habitat and natural topsoil soil by preventing deposition	Prior to any clearing works. Ongoing during all exposed soil stages until landscaping is completed	Project Ecologist / Contractors
(d) Temporary fencing - Where they adjoin the development areas, the boundaries of the conservation areas containing remanent vegetation shall be clearly marked out on-site to ensure their protection. All areas of natural vegetation retention shall be protected by fencing, prior to construction, to ensure that these areas are not damaged during the construction phase. **(e) Protection of core habitats – a core conservation area is to be identified within the environmental protection area excluding all access for the provision of secluded breeding and foraging habitat for the local fauna. Access into this area is to be restricted.**	Maintain integrity of Remanent vegetation	Prior to construction / habitat clearance	Project Ecologist / Contractors
(f) Ecological Supervision during construction activities is to be intermittently supervised on-site and monitored. All staff involved with the development shall undergo an induction and training program to reinforce the ecological and environmental objectives of the development. **(g) Prior to any habitat removal, a comprehensive search for fauna and habitat is to be undertaken to relocate any terrestrial individuals and identify any important nesting to be protected until fledging.**	Ensure that the recommendations of the BDAR are implemented.	Prior to and during habitat clearance and construction of services	Project Ecologist
(h) Undertake water quality testing within retained waterbodies to monitor for any increase in nutrient or sediment.	Ensure no indirect impacts on adjacent water quality or quantity	Prior to and during habitat clearance and construction	Project Ecologist

Action / Technique	Outcome	Timing / Frequency	Responsibility
(i) Prior to any habitat removal, a comprehensive search for fauna and habitat is to be undertaken to relocate any terrestrial individuals and identify any important nesting to be protected until fledging.	Reduce potential for impact on native species	Immediately prior to land clearance	Project Ecologist
(j) Management of hollows and hollow-dependent fauna: • **The felling of hollow-bearing trees is to be conducted under the supervision of a fauna ecologist to ensure appropriate animal welfare procedures are taken, particularly for threatened species. Hollows of high quality or with fauna recorded residing within should be dismantled for relocation and all hollows should be inspected for occupation, signs of previous activity and potential for reuse.**	Protection of hollow-dependent wildlife	At time of removal	Project Ecologist
• **Subsequent hollows of retention value are to be relocated to nearby conservation areas. If these are placed as on ground habitat and are not reattached to a new recipient tree then they are to be replaced with appropriately sized nest boxes affixed to a retained tree. All hollow sections considered suitable for Squirrel Glider should where possible be recovered and prepared for placement into an appropriate retained tree.**	Maintain quality denning / hollow shelter opportunities	At time of removal	Project Ecologist
• **Constructed nest boxes should as priority target recorded hollow-dependent threatened species (and their prey species). Boxes should be constructed of weatherproof timber (marine ply), fasteners and external paint and appropriately affixed to a recipient tree under the guidance of a fauna ecologist.**	Protection of hollow-dependent wildlife	Prior to hollow removal	Project Ecologist

Action / Technique	Outcome	Timing / Frequency	Responsibility
• **If a threatened species is found to be occupying the hollow at the time of removal, then this hollow section is to be reattached to a recipient tree within the nearby conservation areas as selected and directed by the fauna ecologist. The welfare and temporary holding of the residing animal(s) is at the discretion of the fauna ecologist.**	Priority protection of hollow-dependent threatened species	At time of removal	Project Ecologist
• **The relocated hollow section and nest boxes should be well secured in the recipient tree in a manner that will not compromise the current or future health of that tree.**	Ensure hollow integrity is maintained	Time of installation	Project Ecologist
• **Monitoring of nest boxes and relocated hollows.**	Ensure hollow integrity is maintained	Each year for 5 years	Project Ecologist
(k) Management of any other displaced fauna. If any fauna species, a nest, or roost is located during development works, then works should cease until safe relocation can be advised by a contact fauna ecologist.	Prevent direct impacts on nesting and terrestrial native fauna species	Prior to and during habitat removal / Adaptive management required	Project Ecologist
(l) If any fauna species, a nest, or roost is located during development works, then works should cease until safe relocation can be advised by a contact fauna ecologist.	Prevent direct impacts on nesting and terrestrial native fauna species	At time of removal / Adaptive management required	Project Ecologist / Contractors
• **Dam dewatering is to be undertaken in accordance with appropriate protocols to ensure consideration is given to all potentially impacted aquatic fauna within the dam (e.g., eels / turtles) and breeding water birds as well as species potentially indirectly impacted elsewhere. Protocols are to include frog hygiene, relocating aquatic fauna to recipient sites and appropriate euthanasia of Gambusia.**	Reduce potential for direct impact on aquatic species present and indirect impacts on aquatic species elsewhere	Prior to land clearance	Project Ecologist

Action / Technique	Outcome	Timing / Frequency	Responsibility
• **Appropriate feral / pest terrestrial species management. e.g., fox and rabbit is to be undertaken to maximise the regeneration of the native vegetation.**	Reduce potential for impact on native species	Prior to land clearance	Project Ecologist

5.4 Potential ecological impacts

5.4.1 Prescribed impacts

Table 5-3 – Prescribed impacts

Feature	Present (yes / no)	Description of feature characteristics and location	Threatened species or community using or dependent on feature	Potential impact	Predicted consequences and justification
Karst, caves, crevices, cliffs, rocks or other geological features of significance	No	N/A	N/A	N/A	N/A
Human-made structures or non-native vegetation	Yes	Planted non-native trees		Removal of potential foraging, roosting and nesting habitat	Threatened species recorded that are known to utilise non-native vegetation including Grey-crowned Babbler. The Grey-crowned Babbler was observed utilising planted vegetation for foraging resources. The removal of this vegetation may limit habitat resources for this species however given the proposed conservation areas containing PCT 76, with remediation measures including restricted access and the preparation of a VMP it is expected that the enhancement of PCT 76 will provide adequate compensation for the loss of planted vegetation.

Feature	Present (yes / no)	Description of feature characteristics and location	Threatened species or community using or dependent on feature	Potential impact	Predicted consequences and justification
Habitat connectivity	no	n/a	n/a	n/a	n/a
Waterbodies, water quality and hydrological processes	yes	dams	Threatened species with potential to occur including Blue-billed Duck and Freckled Duck	Degradation and or removal of aquatic habitat	3 dams within the study site provide suitable foraging pools >3 m wide. The dams on site may provide potential habitat for Sloane's Froglet which is considered to have the potential to occur. Given that adequate seasonal survey has not been undertaken to confirm the presence/absence of this species, it is recommended that survey be undertaken prior to the removal of dams within the site in order to assess potential impacts on this species.
Wind farm development	no	n/a	n/a	n/a	n/a
Vehicle strikes	yes	internal roads	Terrestrial mammals and frogs as well as birds in flight.	Collision leading to injury or death	The proposal will increase internal vehicle traffic, which could potentially lead to an increase in vehicle collisions with native fauna. All internal roads will have a low-speed limit and as such collisions are very unlikely for most species.

5.4.2 Direct impacts

Table 5-4 – Direct impact assessment

Direct impact	*BC Act* status	SAII entity	Project phase/timing of impact	Extent (ha, number of individuals)
Removal of PCT76 / Grey Box Grassy woodlands EEC (proposed environmental protection area reduces this impact to 3.83 ha.)	EEC	No	Demolition / clearing	3.8 ha
Removal of one significant habitat tree (HT3) providing potential roosting and breeding habitat for fauna.	Various	No	Demolition / clearing	one habitat tree
Assumed direct impact on species credit species *Austrostipa wakoolica, Diuris tricolor, Eleocharis obicis, Lepidium aschersonii, Swainsona murrayana, Swainsona recta, Swainsona sericea,* Sloane's Froglet, Major Mitchell's Cockatoo, Superb Parrot, Squirrel Glider, and Koala.	Various	No	Demolition / clearing	3.8 ha
Removal of foraging resources for ecosystem species Black Falcon, Grey Falcon, Grey-crowned Babbler, Dusky Woodswallow, Speckled Warbler, White-bellied Sea-Eagle, White-throated Needletail, Superb Parrot, Swift Parrot, Hooded Robin (south-eastern form), Scarlet Robin, Flame Robin, Grey-headed Flying-fox and Diamond Firetail.	Various	No	Demolition / clearing	3.8 ha

5.4.3 Indirect impacts

Table 5-5 – Indirect impact assessment

Indirect impact description	Impacted entities (PCT, species, TEC)	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Edge effects	All retained vegetation within c. 10 m of development	Constant	Lifetime of development	Clearing, construction and ongoing	• Increased soil nutrients from changes to runoff that may provide further opportunities for weeds. • Spill-over from noise, activity, scent and lighting effects • Inappropriate use of remaining native vegetation areas such as additional clearing, dumping of materials and waste
Concentrated stormwater runoff from solid surfaces and subsequent increased flows	All retained vegetation, watercourses and habitat downslope of the development	During rainfall events	Lifetime of development	Clearing, construction and ongoing	• Potential increased flow, nutrient and sediment loads that may provide further opportunities for weeds within retained vegetation. • Potential increased flow, nutrient and sediment loads within watercourses on site.
Reduced inter-site connectivity	Small bird species, arboreal mammals	Once	Lifetime of development	Clearing, construction	• Reduced cross-site movements by local and transient fauna

5.4.4 Serious & Irreversible Impacts (SAIIs)

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community most at risk of extinction. Threatened species and communities that are potential for serious and irreversible impacts are identified in the BioNet TBDC, and a list is provided on the DPE webpage: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/local-government-and-other-decision-makers/serious-and-irreversible-impacts-of-development. The principles for determining serious and irreversible impacts are set out under Section 9.1 of the BAM.

No SAII entities were recorded or have potential to occur within the study area as prompted by the BAM calculator.

The site also does not likely support any breeding habitat or likely important roosting/foraging for other candidate SAII species with potential to occur including Swift Parrot.

Communities:

The SAII assessment provisions for TECs are outlined under Section 9.1.1 of the BAM (2020). No TEC listed SAII entities were recorded or have potential to occur.

5.5 Vegetation connectivity and habitat corridors

The development footprint is comprised of agricultural land with limited habitat connectivity as a result of areas of open pasture. This restricts the movement of various species between different habitats. There are, however, isolated, and fragmented patches of vegetation which may offer refuge to fauna species, most notably avian species, in particular, around the proposed environmental protection area in the northwest, the farm dams, roadside reserves and non-cropped land.

Due to the lack of connective values within the development footprint, the proposed rezoning is not expected to further restrict the movement of wildlife species, impede gene flow between populations, or hinder the natural migration patterns of animals. The proposed masterplan will retain significant trees as shown on Figure1-3 which will further enable roosting and foraging opportunities for a variety of bird species.

It is proposed to create a green corridor, in line with Council's Housing Strategy (2023), that will result in a chain of ponds within active public recreation areas. This proposed chain of ponds will provide further landscaping opportunities and provide stormwater management. This active recreation area will link dams and provide vegetative connectivity to the southernmost dam and enhance connectivity to Lake Forbes (Figure 5-2).



Figure 5-2 – Local connectivity (study area in red)
(Source: geo.seed.nsw.gov.au)

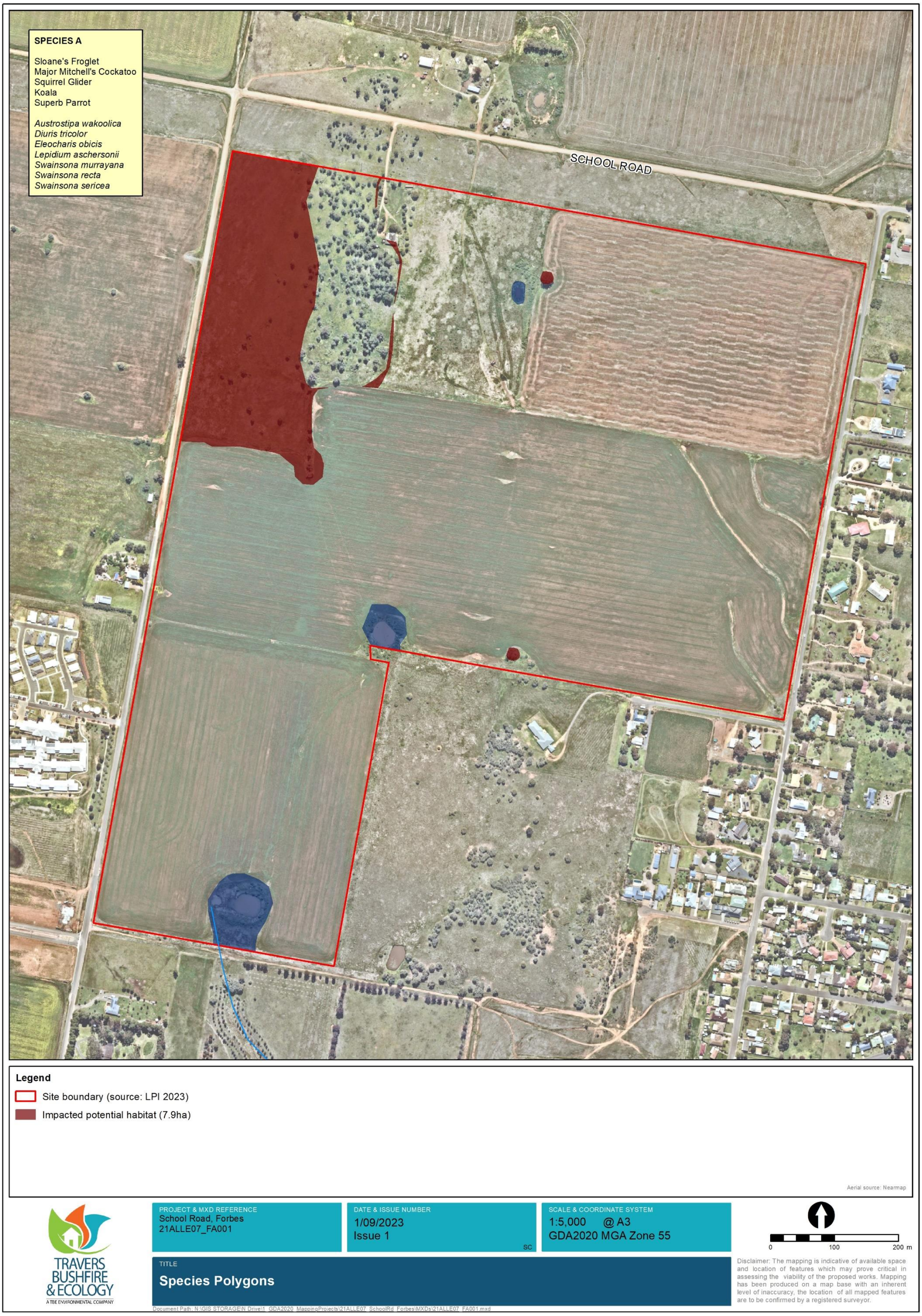


Figure 5-3 – Species credit species polygons

6. CONCLUSION

Travers bushfire & ecology was engaged to undertake a Biodiversity Assessment at Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 in DP 750158 School Road, Forbes. The planning proposal is for a rezoning application to facilitate a subdivision. See Figure 1-4 for proposed subdivision layout.

An Ecological Survey and Assessment was undertaken in accordance with relevant legislation including the *Environmental Planning and Assessment Act 1979*, the *Biodiversity Conservation Act 2016*, the commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the *Fisheries Management Act 1994*.

6.1 Legislative compliance

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Biodiversity Conservation Act 2016*, One (1) threatened fauna species Grey-crowned Babbler, no threatened flora species, and one (1) TEC, Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia was recorded within the study area.

Offsetting under the Biodiversity Offsets Scheme (BOS) is required for the proposal as:

- The proposed clearing of 3.8 ha of native vegetation exceeds the area clearing threshold of 0.5 ha.

The proposal will also not cause any Serious or Irreversible Impacts (SAII) on threatened biodiversity most at risk of extinction.

A biodiversity credit assessment has been prepared as part of this BDAR.

In respect of matters required to be considered under the *Environment Protection and Biodiversity Conservation Act 1999*, No threatened fauna species, no threatened flora species, and one TECs listed under this Act was recorded within the study area.

The proposal was not considered to have a significant impact on or be constrained by matters of national environmental significance. As such a referral to Department of Climate Change, Energy, the Environment and Water is not required.

In respect of matters relative to the *Fisheries Management Act 1994*, no suitable habitat for threatened marine or aquatic species was observed within the development footprint and there are no matters requiring further consideration under this Act.

6.2 Biodiversity credit requirements

6.2.1 Impacts requiring offset

The following impacts will require offsetting:

- 3.8 ha of PCT 76 (where the proposed environmental protection area is not included), and
- loss of habitat for threatened species, including species credits for Grey-crowned Babbler.

Locations of the abovementioned communities within the development footprint are shown on Figure 2-2.

**Note: the BAM calculator rounds impact requirements to the nearest 0.1 ha, hence the discrepancy with the values stated elsewhere in the BDAR.*

6.2.2 Impacts not requiring offset

The following impacts do not require offset:

- Impacts on non-native vegetation, and
- Indirect impacts on remaining native vegetation areas as outlined in Section 5.4.3.

All areas of native vegetation impact will require offsetting and have been accounted for in the BAM calculator. All the zones had a vegetation integrity score above the minimum requirements; however, it was suboptimal time for surveying native vegetation within the region.

6.2.3 Areas not requiring assessment

The proposal includes a large allotment over approximately 92.39 ha consisting of 11.9 ha of native vegetation with all remaining vegetation consisting of planted vegetation, exotic weeds, and pasture. The proposal is located within the cleared portions of the site and impacts upon native vegetation have been reduced by providing an environmental protection area (4.07 ha). All vegetation (and habitat) outside of these impact areas does not require assessment, but utilised for determining habitat values, connectivity, etc.

Indirect impacts are not anticipated to be large or permanent. The proposed management actions will assist in reducing these, so they are only temporary, potential only, or immeasurable. Based on the assessment, conducted by suitably qualified BAM assessor, the land is recommended suitable for rezoning.

7. BAM CREDIT RESULTS

7.1 Ecosystem credits and species credits

All impacted areas are assumed to be full impact and the future vegetation integrity score will be 0.

Habitat suitability for threatened species has been considered in Section 4. Some species are considered for species credits, particularly if potential breeding habitat is compromised or impacted.

Ecosystem credits for plant community types (PCTs), ecological communities and threatened species habitat is shown below in Table 7-1 Species credits for threatened species are shown in Table 7-2.

Table 7-1 – Requirement for ecosystem credits

Zone	Veg. zone name	Veg. integrity loss	Area (ha)	Sensitivity to loss	Sensitivity to loss justification	Sensitivity to gain	Biodiversity risk weighting	Potential SAII	Ecosystem credits
1	76_DNG	5.3	4.2	Moderate	EPBC Act listing status	High	2.0	no	0
2	76_poor_moderate	38.3	3.8	Moderate	EPBC Act listing status	High	2.0	no	73
									Total: 73

Table 7-2 – Requirement for species credits

Vegetation zone name	Habitat condition (vegetation integrity) loss	Area (ha)	Sensitivity to loss	Sensitivity to loss (Justification)	Sensitivity to gain	Sensitivity to gain (Justification)	Biodiversity risk weighting	Potential SAII	Species credits
Austrostipa wakoolica / A spear-grass (Flora)									
76_DNG	5.3	4.2	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	11
76_poor_moderate	38.3	3.8	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	73
									Subtotal:84
Crinia sloanei / Sloane's Froglet (Fauna)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Ability to colonise improved habitat	1.5	FALSE	8

Vegetation zone name	Habitat condition (vegetation integrity) loss	Area (ha)	Sensitivity to loss	Sensitivity to loss (Justification)	Sensitivity to gain	Sensitivity to gain (Justification)	Biodiversity risk weighting	Potential SAII	Species credits
76_poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Ability to colonise improved habitat	1.5	FALSE	55
									Subtotal:63
Diuris tricolor / Pine Donkey Orchid (Flora)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	1.5	FALSE	8
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	1.5	FALSE	55
									Subtotal:63
Eleocharis obicis / Spike-Rush (Flora)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ecology or response to management is poorly known	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ecology or response to management is poorly known	2	FALSE	73
									Subtotal:84
Lepidium aschersonii / Spiny Peppercress (Flora)									
76_DNG	5.3	4.2	High Sensitivity to Loss	Geographic Distribution	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	11
76_Poor_moderate	38.3	3.8	High Sensitivity to Loss	Geographic Distribution	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	73

Vegetation zone name	Habitat condition (vegetation integrity) loss	Area (ha)	Sensitivity to loss	Sensitivity to loss (Justification)	Sensitivity to gain	Sensitivity to gain (Justification)	Biodiversity risk weighting	Potential SAII	Species credits
									Subtotal:84
Lophochroa leadbeateri / Major Mitchell's Cockatoo (Fauna)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	73
									Subtotal:84
Petaurus norfolcensis / Squirrel Glider (Fauna)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	73
									Subtotal:84
Phascolarctos cinereus / Koala (Fauna)									
76_DNG	5.3	4.2	High Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	11
76_Poor_moderate	38.3	3.8	High Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	73
									Subtotal:84
Polytelis swainsonii / Superb Parrot (Fauna)									

Vegetation zone name	Habitat condition (vegetation integrity) loss	Area (ha)	Sensitivity to loss	Sensitivity to loss (Justification)	Sensitivity to gain	Sensitivity to gain (Justification)	Biodiversity risk weighting	Potential SAII	Species credits
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Species dependent on habitat attributes	2	FALSE	73
									Subtotal:84
Swainsona murrayana / Slender Darling Pea (Flora)									
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	73
									Subtotal:84
Swainsona recta / Small Purple-pea (Flora)									
76_DNG	5.3	4.2	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	11
76_Poor_moderate	38.3	3.8	High Sensitivity to Loss	Biodiversity Conservation Act listing status	Moderate Sensitivity to Gain	Effectiveness of management in controlling threats	2	FALSE	73
									Subtotal:84
Swainsona sericea / Silky Swainson-pea (Flora)									

Vegetation zone name	Habitat condition (vegetation integrity) loss	Area (ha)	Sensitivity to loss	Sensitivity to loss (Justification)	Sensitivity to gain	Sensitivity to gain (Justification)	Biodiversity risk weighting	Potential SAII	Species credits
76_DNG	5.3	4.2	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	11
76_Poor_moderate	38.3	3.8	Moderate Sensitivity to Loss	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Ability to colonise improved habitat	2	FALSE	73
									Subtotal:84

7.2 Ecosystem credit classes

Table 7-3 – Ecosystem credit summary

PCT	TEC	Area (ha)	Credits
76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW Southwestern Slopes and Riverina Bioregions	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	7.9	73

Table 7-4 – Credit classes for PC76 - Like for like options

PCT	Vegetation Class	Trading group	TEC	Containing hollow-bearing trees?	Credits
76	Floodplain Transition Woodlands	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia This includes PCT's: 76, 80, 81, 82, 110, 237, 248, 250, 267, 3405	No	No	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 km of the outer edge of the impacted site.
76	Floodplain Transition Woodlands	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia This includes PCT's: 76, 80, 81, 82, 110, 237, 248, 250, 267, 3405	Yes	Yes	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 km of the outer edge of the impacted site.

7.3 Species credit classes

Table 7-5 – Species credit summary

Species	Area (ha)	Credits
Austrostipa wakoolica	8	84
Sloane's Froglet	8	63
Diuris tricolor	8	63
Eleocharis obicis	8	84
Lepidium aschersonii	8	84
Major Mitchell's Cockatoo	8	84
Squirrel Glider	8	84
Koala	8	84
Superb Parrot	8	84
Slender Darling Pea	8	84
Small Purple Pea	8	84
Silky Swainson Pea	8	84
	Total	**966**

All above-listed species need to be offset with the same species but anywhere in NSW.

As of October 2022, accredited assessors cannot access the BOP-C payment calculator to provide an estimation of costs for credits. For estimates on credit values, the proponent may need to speak with the Biodiversity Conservation Trust (BCT). The BCT will be providing a credit costing service in early 2023 for a nominal fee.

8. BIBLIOGRAPHY

Auld, B. A., and R.W. Medd (1996) *Weeds.* Inkata Press.

Barker, J., Grigg, G. C. & Tyler, M. J. (1995) *A Field Guide to Australian Frogs.* Surrey Beatty & Sons.

Brooker, M.I.H and D.A. Kleinig (2006) *Field Guide to Eucalypts. Volume 1. South-eastern Australia, 3rd edition.* Bloomings Books, Melbourne.

Burrows, G.E. (2004) *The importance of seasonality in the timing of flora surveys in the South and Central Western Slopes of New South Wales.* Cunninghamia, 8(4). Pp 514-520.

Churchill, S. (2008) *Australian Bats*, 2nd Ed., Jacana Books, Crows Nest, Sydney.

Cogger, H. G. (1996) *Reptiles and Amphibians of Australia*. Reed Books, Australia.

Currajong Pty Ltd (2023) *Forbes Housing Strategy 2021-2041.* Prepared for Forbes Shire Council by Currajong Pty Ltd.

DCCEEW (2023) Environmental Protection and Biodiversity Conservation Act 1999 - Protected Matters Search Tool - http://www.environment.gov.au/webgis-framework/apps/pmst/pmst-coordinate.jsf.

DECC (2008) *Hygiene protocol for the control of disease in frogs*. Information Circular Number 6. DECC (NSW), Sydney South.

DEWHA (2010a) *Approved Conservation Advice for the Grey Box* (Eucalyptus microcarpa) *Grassy Woodlands and Derived Native Grasslands of South-east Australia*. Canberra, ACT. Commonwealth Department of Environment, Water, Heritage, and the Arts.

DEWHA (2010b) *Survey guidelines for Australia's threatened bats*. Department of Environment Water Heritage and Arts.

DPIE (2019) *Biodiversity Assessment Method Operational Manual: Stage 2.* State of NSW and Department of Planning, Industry and Environment.

DPIE (2020a) *Biodiversity Assessment Method.* State of NSW and Department of Planning, Industry and Environment.

DPIE (2020b) *Biodiversity Assessment Method Operational Manual: Stage 1.* State of NSW and Department of Planning, Industry and Environment.

DPIE (2020c) *Surveying threatened plants and their habitats NSW survey guide for the Biodiversity Assessment Method.* State of NSW and Department of Planning, Industry and Environment.

DPIE (2020d) *NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method.* State of NSW and Department of Planning, Industry and Environment.

DPE (2023) *BioNet Atlas of NSW Wildlife* (BioNet). State of NSW and Department of Planning, and Environment.

DSEWPC (2012) *Grey Box* (Eucalyptus microcarpa) *Grassy Woodlands and Derived Native Grasslands of South-eastern Australia: A guide to the identification, assessment, and*

management of a nationally threatened ecological community EPBC Act 1999. Department of Sustainability, Environment, Water, Population and Communities.

Ehmann, H. (1997) Threatened Frogs of New South Wales. FATS Group.

Harden, G. (2002) *Flora of New South Wales.* University NSW Press.

Hoser, R. (1989) *Australian Reptiles and Frogs.* Pierson & Co.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction.* Landcom, NSW Government. Vol 1. 4th edition.

Lunney, D., Urquhart, C.A. and Reed, P. (1988) *Koala Summit,* NPWS.

Morrison, R. G. B. (1981) A Field Guide to the Tracks & Traces of Australian Animals. Rigby.

OEH (2018) 'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method

OEH (2018) Biodiversity Assessment Method Operational Manual – Stage 1.

Parnaby, H. (1992) An interim guide to identification of insectivorous bats of south-eastern Australia. The Australian Museum, Sydney, Technical Report, No. 8.

Pennay, M., Law, B., Reinhold, L. (2004). Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats. NSW Department of Environment and Conservation, Hurstville.

Phillott, A. D, Skerratt, L. F., McDonald, K. R., Speare, R., Hines, H. B., Meyer, E., Cashins, S. D, Mendez, D., and L. Berger (2010) Minimising exposure of amphibians to pathogens during field studies. Inter-research. Diseases of Aquatic Organisms, *Contribution to DAO Special 4: 'Chytridiomycosis: an emerging disease'*

Pizzey, G. & Knight, F. (1997) *A Field Guide to the Birds of Australia.* Angus & Robertson. Mobile Field App.

PlantNET (2023). Royal Botanic Gardens and Domain Trust, Sydney. https://plantnet.rbgsyd.nsw.gov.au [accessed: August 2023] The NSW Plant Information Network System.

Robinson, M. (1996) *A Field Guide to Frogs of Australia*. Reed.

Schodde, R. and Tidemann, S. (Eds) (1986) *Readers Digest complete book of Australian Birds.* Second Edition. Reader's Digest Services Pty Ltd, Sydney.

Simpson & Day (1996) Field Guide to the Birds of Australia. Viking.

Triggs, B. (1996) Tracks, Scats & Other Traces: A Field Guide to Australian Mammals. Oxford University Press, Melbourne.

Trounson, Donald & Molly (1998) *Australian Birds Simply Classified*. Murray David Publishing Pty Ltd, NSW.

Van Dyke, S. and Strahan, R. (Eds) (2008) *The Mammals of Australia* (3rd Edn). Reed New Holland. Sydney.

Wilson, K. W. and Knowles, D. G. (1988) Australia's Reptiles - A Photographic Reference to the Terrestrial Reptiles of Australia. Cornstalk Publishing.

Appendix 1. SAII impact assessment - species

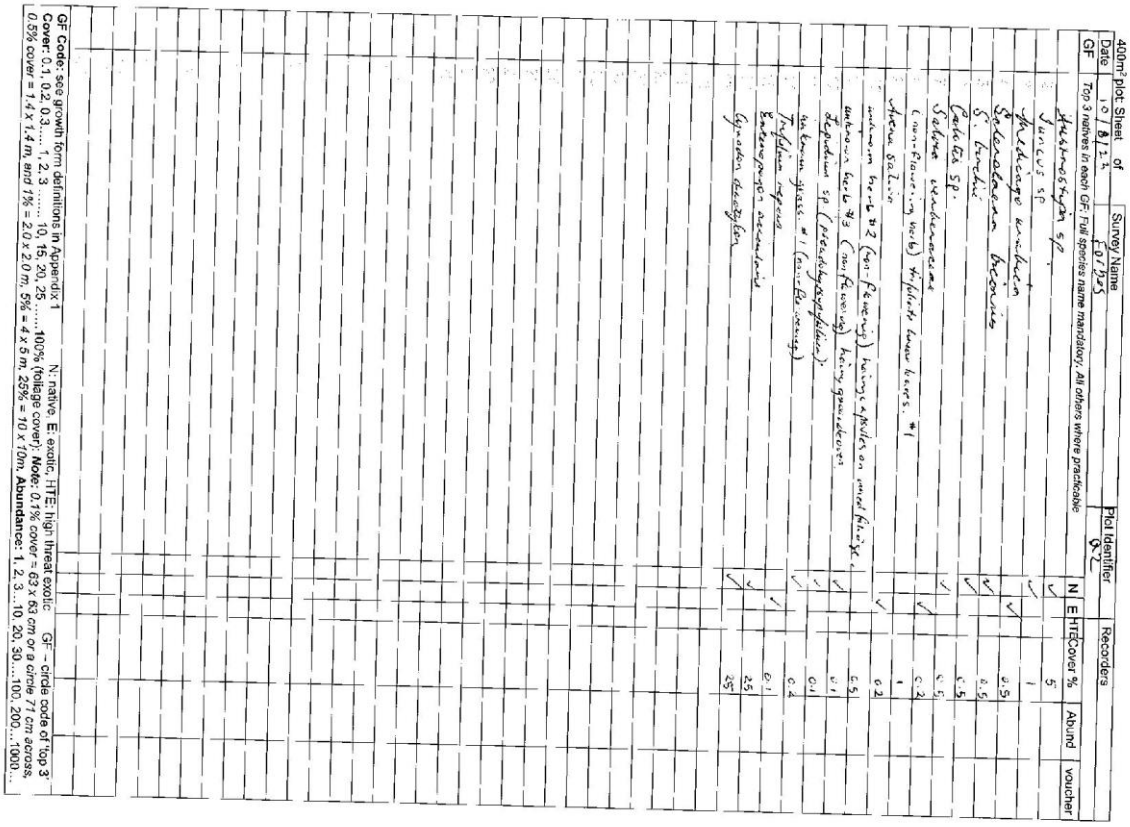
The additional impact assessment provisions for threatened species to determine a Serious and Irreversible Impact (SAII) are outlined under Section 9.2 of the BAM (2020). No flora or fauna listed SAII entities were recorded during survey. No flora or fauna listed SAII entities were prompted for assessment by the BAM calculator. The study area does not contribute to Important Mapped Areas for Swift Parrot and therefore SAII assessment provisions do not require further assessment.

Appendix 2. SAII impact assessment - communities

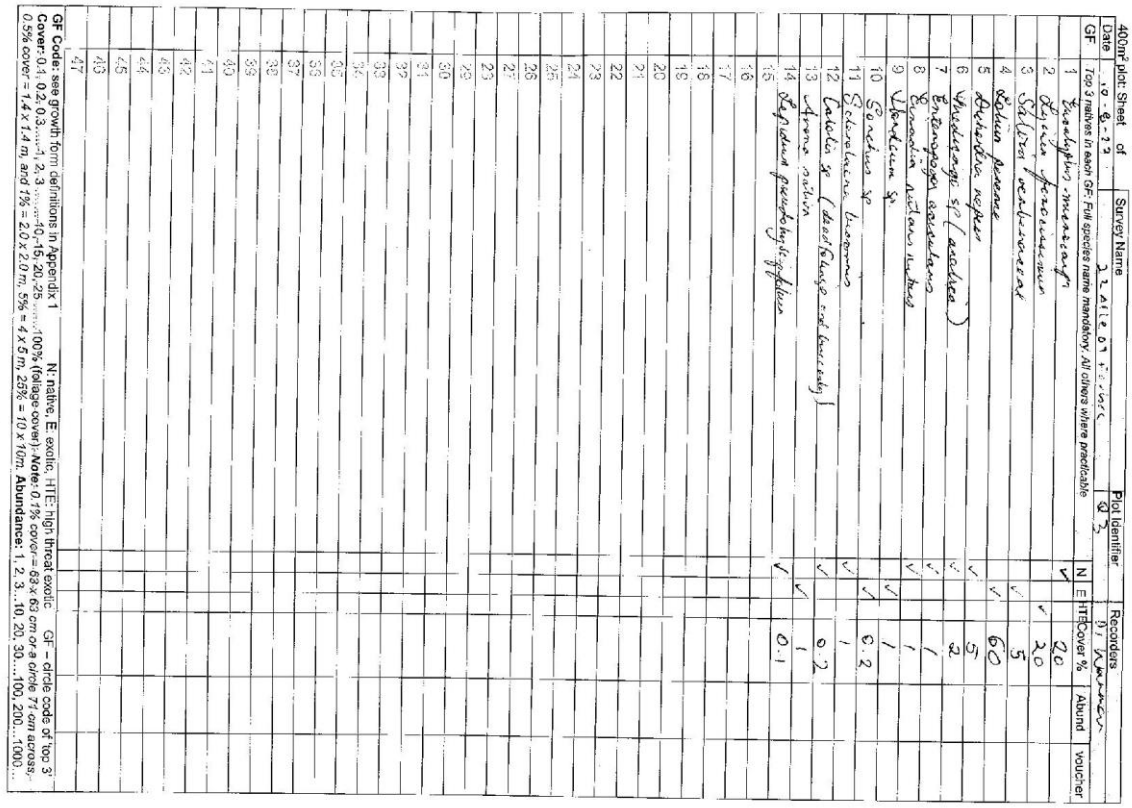
The additional impact assessment provisions for threatened ecological communities (TECs) to determine a Serious and Irreversible Impact (SAII) are outlined under Section 9.1.1 of the BAM (2020). One (1) TEC listed as an SAII entity was recorded during survey and, therefore, SAII assessment under this provision requires further assessment.

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia has no risk weighting aligned to it in the Threatened Biodiversity Calculator (www.environment.nsw.gov.au). **Therefore, this community is removed from further assessment under the SAII guidelines.**

Appendix 3. Plot data sheets



400m² plot Sheet of
Survey Name
Date
Plot Identifier
Recorders
GF | Top 3 natives in each GF. Full species name mandatory. All others where practicable | N | E | HTE | Cover % | Abund | voucher
GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3.....1, 2, 3.....10, 15, 20, 25.....100% (foliage cover). Note: 0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m. Abundance: 1, 2, 3...10, 20, 30....100, 200...1000...



400m² plot Sheet of
Survey Name
Date
Plot Identifier
Recorders
GF | Top 3 natives in each GF. Full species name mandatory. All others where practicable | N | E | HTE | Cover % | Abund | voucher
GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3.....1, 2, 3.....10, 15, 20, 25.....100% (foliage cover). Note: 0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m. Abundance: 1, 2, 3...10, 20, 30....100, 200...1000...

400m² plot: Sheet of | Survey Name 22 ALLE07 | Plot Identifier B1 | Recorders D. HARMAN

Date	10/8/2023						
GF	Top 3 natives in each GF: Full species name mandatory. All others where practicable	N	E	HTE	Cover %	Abund	voucher
	1 Callitris glaucophylla	✓			25	12	
	2 Eragrostis nutans nutans	✓			1		
	3 Muellerina sp (Mistletoe on Callitris)	✓			1		
	4 Lycium ferocissimum			✓	1		
	5 Dichanthium sepens	✓			0.5		
	6 Sclerolaena bicornis	✓			0.2		
	7 Trifolium repens		✓		0.2		
	8 Lolium perenne		✓		25		
	9 Salvia verbenaceae		✓		0.5		
	10 Medicago arabica		✓		0.5		
	11 Austrostipa sp	✓			25		
	12 (unknown native sp #1)				0.1		
	13 Echium plantagineum		✓		0.1		
	14 Senecio sp		✓		0.1		
	15 Convolvulus erubescens	✓			0.1		
	16						
	17						
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						
	41						
	42						
	43						
	44						
	45						
	46						
	47						

GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3 ..... 1, 2, 3 ..... 10, 15, 20, 25 ..... 100% (foliage cover): ***Note:*** *0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m.* **Abundance:** 1, 2, 3...10, 20, 30....100, 200...1000...

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no:

Date	10/8/23	Survey Name	Zone ID	Recorders
Zone 55	Datum	Plot ID	82 Q2	Plot dimensions / Photo #
Easting 592790	Northing 6309223	IBRA region		Midline bearing from 0 m: 0
Vegetation Class	(Derived) Grassland			Confidence: H M L
Plant Community Type		EEC:		Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)		

Counts apply when the **number** of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). **For a multi-stemmed tree,** only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For hollows, count only the presence of a stem containing hollows. **For a multi-stemmed tree,** only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 5 5 5 5			
Average of the 5 subplots				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern	Microrelief
Lithology		Soil Surface Texture		Soil Colour	Soil Depth
Slope		Aspect		Site Drainage	Distance to nearest watercourse

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness	2	0	
Other			

Severity: 0=no evidence, 1=slight, 2=moderate, 3=severe Age: R=recent (<3yrs), hR=not recent (3-10yrs), O=old (>10yrs)

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no:

Survey Name	Zone ID	Recorders
		Di Warmour

Date	10 · 8 · 23			Plot dimensions	20x50	Photo # ✓
Zone 56H	Datum GDA94	Plot ID	Q1			
Easting 572938	Northing 6302345	IBRA region		Midline bearing from 0 m	15°	
Vegetation Class		Open woodland				Confidence: H M L
Plant Community Type				EEC:		Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	
50 – 79 cm	0	
30 – 49 cm	1	
20 – 29 cm	2	
10 – 19 cm	0	
5 – 9 cm	0	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	4 m	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the **presence of a stem containing hollows**. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 5 5 5 5	0 5 0 0 0		0
Average of the 5 subplots				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

5 4 3 2 1

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	crest	Landform Pattern		Microrelief	
Lithology	red Soil	Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	0	
Cultivation (inc. pasture)	–		
Soil erosion	–		
Firewood / CWD removal	–		
Grazing (identify native/stock)			Native grass
Fire damage	–		
Storm damage	–		
Weediness	1	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

-This document has not been endorsed or approved by Office of Environment and Heritage or Muddy Boots Environmental Training-

BAM Site – Field Survey Form

Site Sheet no:

Survey Name	Zone ID	Recorders
		Di Warmour

Date	10 · 8 · 23			Plot dimensions	20x50	Photo # ✓
Zone	Datum	Plot ID	Q3			
Easting 572926	Northing 6302172	IBRA region		Midline bearing from 0 m	70°	
Vegetation Class		Open Woodland				Confidence: H M L
Plant Community Type		PCT76		EEC:		Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
Sum of Cover of native vascular plants by growth form group	Trees	
	Shrubs	
	Grasses etc.	
	Forbs	
	Ferns	
	Other	
High Threat Weed cover		

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	23 +	1 + HTI
50 – 79 cm	11	1
30 – 49 cm	–	
20 – 29 cm	–	
10 – 19 cm	–	
5 – 9 cm	/	
< 5 cm	–	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	46	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. Tree stems must be living.

For **hollows**, count only the **presence of a stem containing hollows**. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	5 5 0 5 5			5 –
Average of the 5 subplots				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element	Slope	Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	–		
Soil erosion	–		
Firewood / CWD removal	–		
Grazing (identify native/stock)	–		Native grass
Fire damage	–		
Storm damage	–		
Weediness	1	0	
Other	–		

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Appendix 4. EPBC impact criteria

Under the *EPBC Act* an action will require approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The following significant impact criteria were sourced from the *EPBC Act* Policy Statement 1.1 (May 2006):

CRITICALLY ENDANGERED AND ENDANGERED SPECIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- Lead to a long-term decrease in the size of a population.
- Reduce the area of occupancy of the species.
- Fragment an existing population into two or more populations.
- Adversely affect habitat critical to the survival of a species.
- Disrupt the breeding cycle of a population.
- Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline.
- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
- Introduce disease that may cause the species to decline; or
- Interfere with the recovery of the species.

What is a population of a species?

A 'population of a species' is defined under the *EPBC Act* as an occurrence of the species in a particular area. In relation to critically endangered, endangered, or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations; or
- a population, or collection of local populations, that occurs within a particular bioregion.

What is an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species range.

What is habitat critical to the survival of a species or ecological community?

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal.
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators).
- To maintain genetic diversity and long-term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

VULNERABLE SPECIES

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species.
- reduce the area of occupancy of an important population.
- fragment an existing important population into two or more populations.
- adversely affect habitat critical to the survival of a species.
- disrupt the breeding cycle of an important population.
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
- introduce disease that may cause the species to decline, or

- interfere substantially with the recovery of the species.

CRITICALLY ENDANGERED AND ENDANGERED ECOLOGICAL COMMUNITIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community.
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.
- Adversely affect habitat critical to the survival of an ecological community.
- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    - assisting invasive species, that are harmful to the listed ecological community, to become established; or
    - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- Interfere with the recovery of an ecological community.

MIGRATORY SPECIES

Significant impact criteria

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or

- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

(a) a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
(b) b) Habitat that is of critical importance to the species at life-cycle stages; and/or
(c) c) Habitat utilised by a migratory species which is at the limit of the species range; and/or
(d) d) Habitat within an area where the species is declining.

What is an ecologically significant proportion??

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

What is the population of a migratory species??

'Population,' in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

Appendix 5. Microbat call analysis

SUMMARY OF RESULTS			
ID Method	**Result**	**Threatened**	**ID Confidence**
Curved, down-sweeping tail and characteristic frequency of 51 kHz	*Chalinolobus morio*	No	High
flat calls (i.e., low bandwidth) around 27 kHz	*Ozimops planiceps*	No	High
Characteristic frequency around 45 kHz	*Vespadelus* sp	No	High

CALL REFERENCE LIBRARY
Calls were identified using 1) “Bat Calls of NSW” by Pennay *et al*. (2004) regional guide, 2) “Key to the bat calls of south-east Queensland and north-east New South Wales” by Reinhold *et al*. (2001), 3) “Bat Calls of Central Eastern NSW” by Chris Corben (2009), 4) Call metrics obtained from discussions with recognised bat experts including Michael Pennay, Brad Law, Chris Corben, and Greg Ford, and 5) Travers Bushfire & Ecology (Lachlan McRae) collected reference calls. The combination of reference calls and call metrics from these five sources results in a sufficient local reference-call library for identifying microbat species that occur in the greater Sydney region.

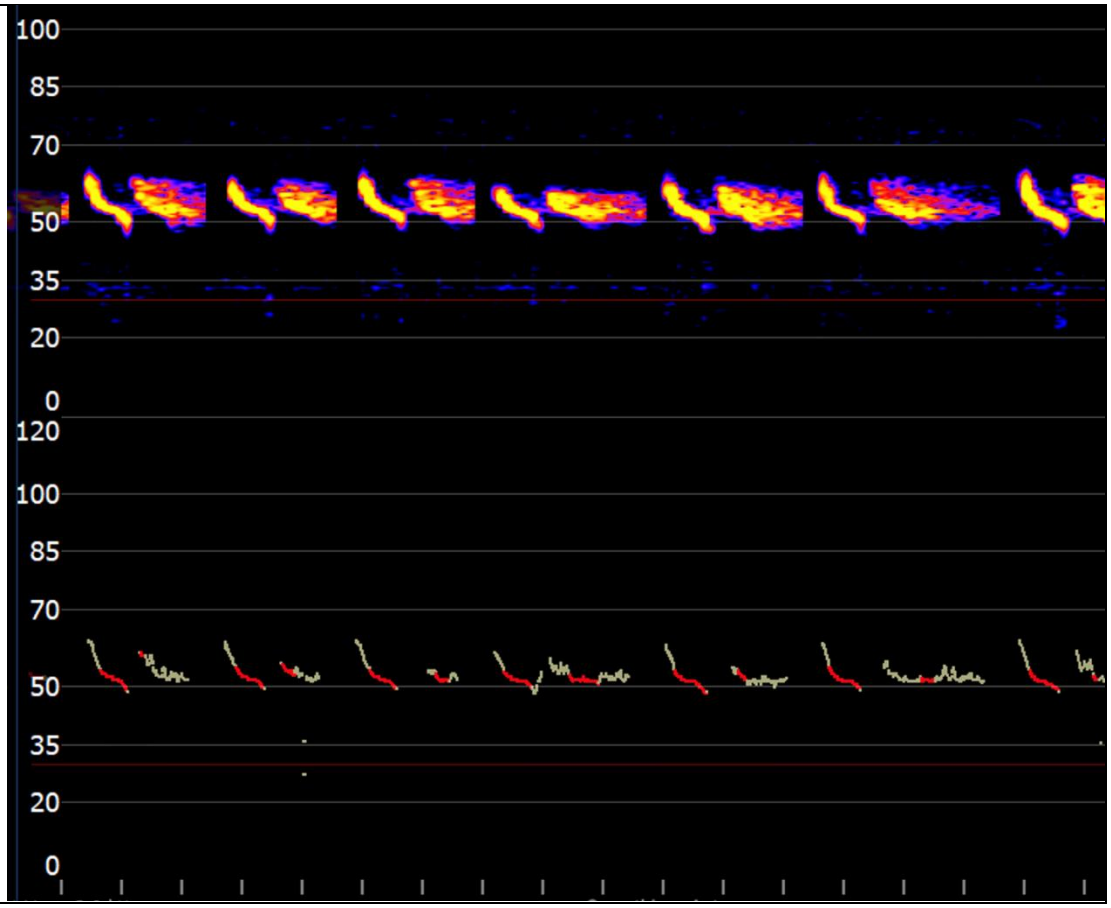


Figure 1: Chocolate Wattle Bat (*Chalinolobus morio*).

This sequence was identified as *C. morio* call due to the curved, down-sweeping tail and characteristic frequency of 51 kHz

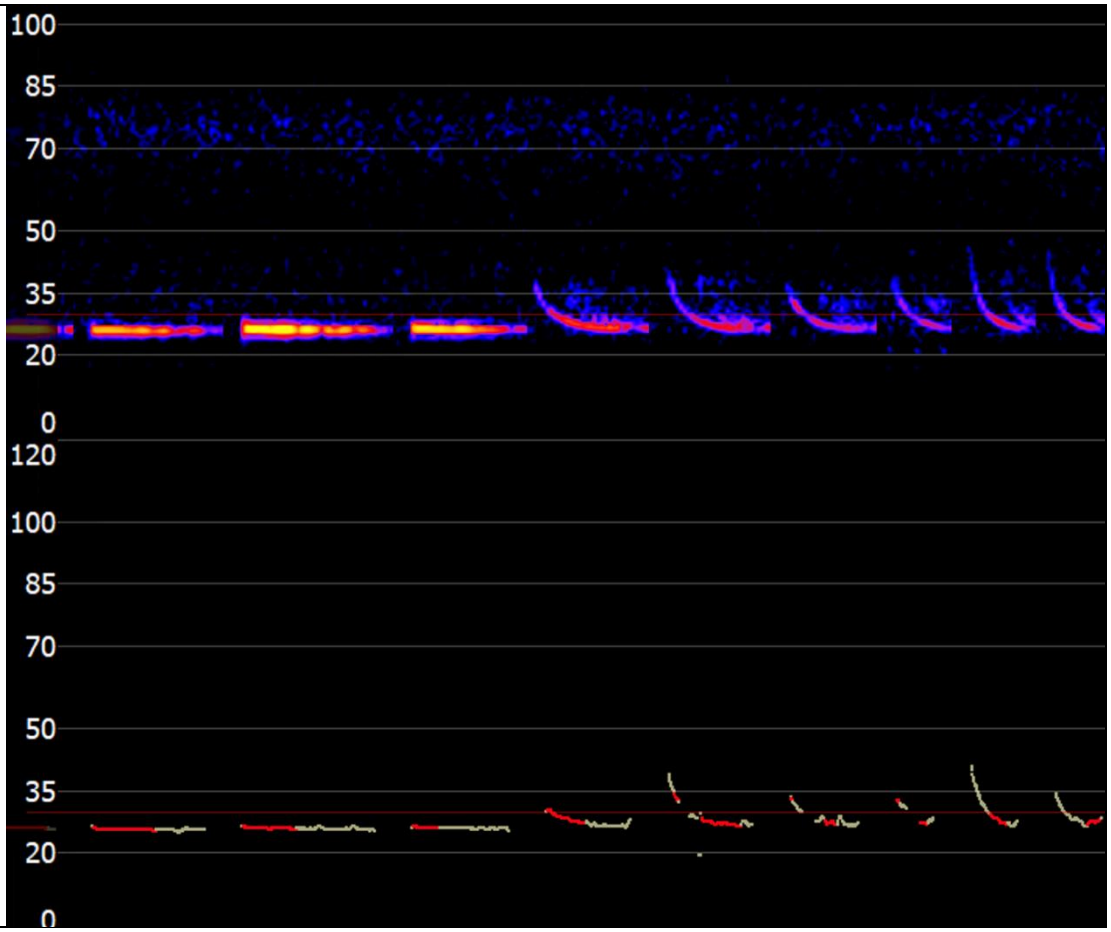
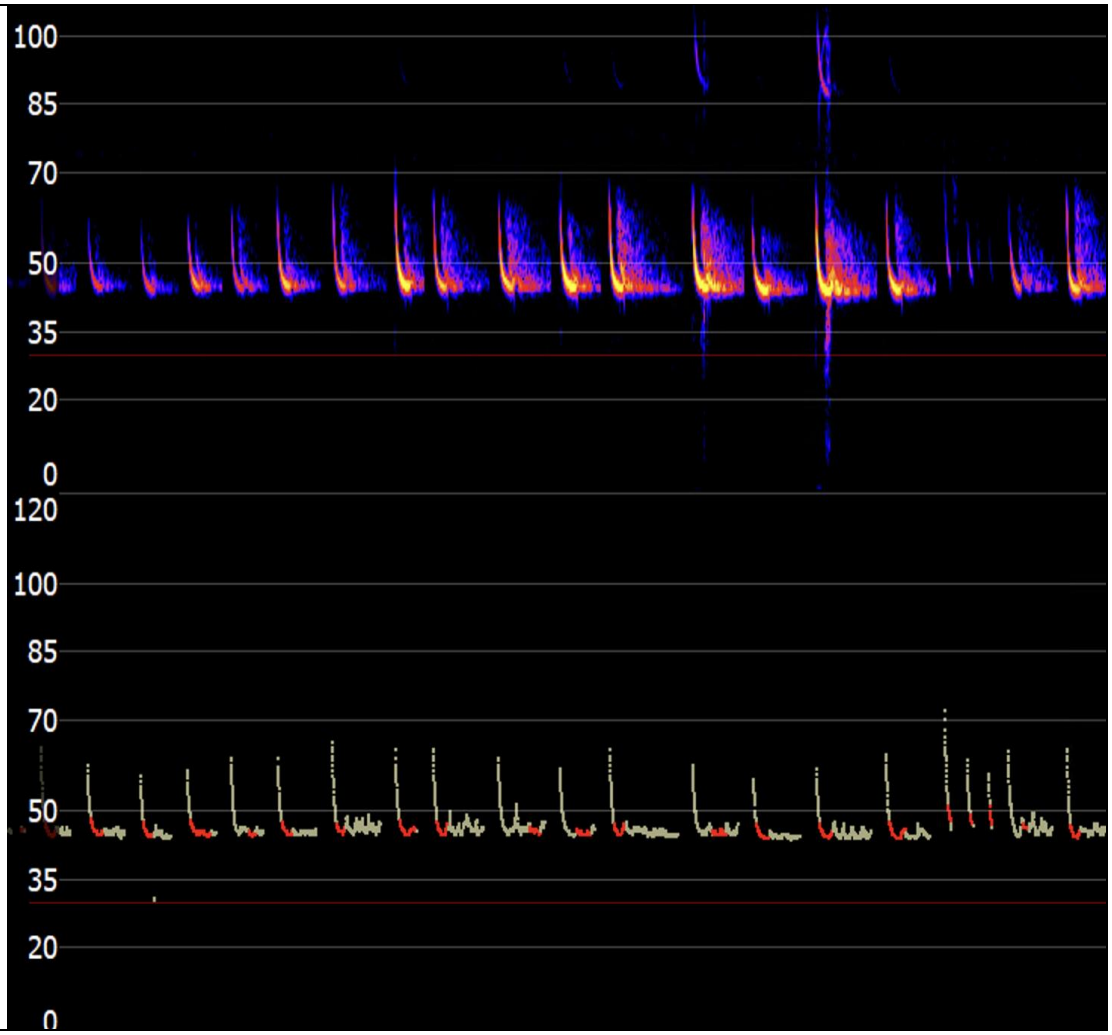


Figure 2: South-Eastern Free-Tailed Bat (*Ozimops planiceps*) in compressed mode.

This sequence was identified as *O. planiceps* call due to the flat calls (i.e., low bandwidth) around 27 kHz

Figure 3: Unidentified Forest Bat *Vespadelus regulus* or *V. darlingtoni*

This sequence was identified as either a *V. regulus* or *V. darlingtoni* call due to Frequency being around 45 kHz.



Appendix 6. Staff qualifications and experience

Table A6.1 – Staff qualifications

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Lindsay Holmes (Manager of Ecology)	• Biodiversity Assessment Method (BAM) Assessor (BAAS17032) • Bachelor of Science – Biology, James Cook University, Qld • Bush Regeneration II Certificate, Ourimbah TAFE • NSW WorkCover OHS Construction Induction • Senior First Aid Certificate • BioBanking Assessor (No. 199)	Lindsay has 24 years of experience as a flora ecologist and bushland regeneration supervisor and has expertise in botanical survey, ecological analysis, maintain and improve analysis, biometric analysis and geo-plotting of ecological data.	• 2007-Current: Senior Botanist, Travers bushfire & ecology • 2006-2007: Ecologist, Conacher Travers Pty Ltd • 1999-2006: Field Operations Manager, Microclimate	• Highly experienced in botanical survey and ecological analysis • Vegetation management planning • Flora and fauna assessment • Species impact statement • Threatened species, ecological communities and endangered population surveys and analysis • Preparation of BioBanking and Biodiversity Development Assessment Reports • Riparian, bushland and wetland restoration • Habitat tree analysis and assessment • Noxious weed identification and control • SULE assessment
Diane Warman (Botanist)	• Biodiversity Assessment Method (BAM) Assessor (BAAS22026) • Bachelor of Science (Hons) UoN 2012 • Basic 4wd training and experience • First Aid Certificate (expired) • White Card (expired) • Bush Regen Certificate II TAFE 2003 • Australian Flora ID TAFE 1991.	Diane has more than 23 years' experience working in the environmental industry with a particular focus on Australian plant identification, threatened species survey assessment and monitoring, biodiversity monitoring and riparian rehabilitation.	• 2021 – Current: Botanist *TBE* • 2016-2021 Consultant Botanist. • 2018-19 – RPS Senior Ecologist • 2919-2020 – NGH Botanist • 2002-2019 – University of Newcastle Casual Academic (Research Assistant, Tutor, Demonstrator, Guest/Acting Lecturer) - • 1999-2006 – Project Coordinator. Community Environment Network (Riparian Rehabilitation, Bush Stone Curlew, Tree Planting Events, COSS Connections).	• Threatened Species Targeted Search, Survey, Monitoring and Reporting. • Biodiversity Assessment Methodology (BAM) Plot surveys, Constraints Assessment and reporting (BAR, BCA and BDAR) • Australian Flora Identification Tutor and Mentor for Australian Plants Society CC and University of Newcastle • Bushland /Habitat/Riparian Weed Condition Assessment, Reporting and Monitoring. On-ground bush regeneration methods and supervision.

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Michael Sheather-Reid (Managing Director)	• Bachelor of Natural Resources (Hons), University of New England • BioBanking Assessor • Engineering Assistant – CAD Drafting • MUSIC Modelling – Stormwater quality and quantity modelling (RMIT) • Bush Regeneration II Certificate, Ryde TAFE • NSW WorkCover OHS Construction Induction • Chemical Handling Certificate, Ryde TAFE	Michael has a wealth of experience in environmental consulting and on ground management of bushland, wetland and riparian habitats having undertaken environmental assessment, ecological consultancy and restoration in both the private and public sectors for over 25 years.	• 2007- Current: Senior Ecologist, Travers bushfire & ecology • 2004 -2007: Senior Ecologist, Conacher Travers Pty Ltd • 2002-2004: Project Manager, Urban Bushland Management Projects Pty Ltd • 1999-2002: Project Manager Sustainable Vegetation Management Pty Ltd • 1995-1999: Managing Director Sheather-Reid & Associates Pty Ltd • 1996-1997: NSW Landcare Liaison Officer, Australian Conservation Foundation • 1992-1995: Environmental Officer, Dept. Land & Water Conservation • 1990-1992: Scientific Officer Dept. of Water Resources	• Ecological assessment • Rezoning studies • Biodiversity offset planning • Restoration management and coordination • Biotic and soil translocation • Watercourse assessment • Project ecologist services • *EPBC Act* referrals • Controlled Activity Approvals • Vegetation management plans
Sandy Cardow (GIS officer)	• Bachelor of Science (Biological Sciences) (Macquarie University)	Sandy has over twenty years of experience in Spatial Information (Geographic Information Systems (GIS)), which includes preparation of mapping in local government roles and has completed a Bachelor of Science (Biological Sciences).	• 2017 – Current: GIS Officer, Travers bushfire & ecology • 2014 – 2017: GIS Consultant, Forestry Corp. NSW • 2005 – 2011: GIS Analyst, Forests NSW • 2002 – 2005: GIS Data Librarian, Forests NSW • 2000 – 2002: GIS Operator, Forests NSW • 2000 – 2002: GIS Data Import / Export Officer, Forests NSW • 1999 2000: GIS Project Officer DECC • 1998 – 1999: GIS Support Officer DECC • 1998 – 1999: Wildlife Atlas Data Entry Officer DECC	• Geographic Information Systems • Data management and analysis • Spatial databases and database administration • GPS • Cartography • Natural resource management • Client liaison
Corrine Edwards (Fauna Ecologist)	• Bachelor of Environmental Science and Management. (Hons) (University of New South Wales) (2016-2020)	Corrine has over 10 years' experience in fauna survey techniques, researching ecological interactions and identification of vertebrate fauna within a magnitude of Australian habitats. She is experienced in leading research projects, experimental design, data collection, data analysis and report writing.	• 2021 – Current: Fauna Ecologist, Travers Bushfire and Ecology • 2020 – Recipient of the Marilyn Fox Environmental Science Prize • 2019 – 2020: Research scholarship fellow at the Fowlers Gap Research Station • 2019 – Research assistant at University of NSW • 2015-2016 – Reptile Research Assistant, Adelaide Museum	• Survey techniques for all major vertebrate fauna groups (including threatened species target searches) • Fauna identification, morphology and behaviour • Fauna field assessment • Microhabitat identification • Project ecology

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
			• 2014 – 2015 Amphibian Research Assistant, University of Western Australia • 2012-14 – Reptile Zookeeper – Australian Reptile Park.	• Experimental design and statistical analysis • Scientific report writing

Appendix 7. BAM-C outputs

DRAFT

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00042568/BAAS22026/23/00042570	21ALLE07 FORBES	22/06/2023
Assessor Name	**Report Created**	**BAM Data version ***
Diane Warman	27/09/2023	61
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS22026	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	27/09/2023	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	76_DNG	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	DNG	4.17	2	DNG (4.17 ha)
2	76_poor_moderate	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	poor_moderate	3.8	2	Zone 2 (3.8 ha)

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00042568/BAAS22026/23/00042570	21ALLE07 FORBES	22/06/2023
Assessor Name	Report Created	BAM Data version *
Diane Warman	27/09/2023	61
Assessor Number	Assessment Type	BAM Case Status
BAAS22026	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
1	BOS Threshold: Area clearing threshold	27/09/2023

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Falcon	Falco subniger	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Diamond Firetail	Stagonopleura guttata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Dusky Woodswallow	Artamus cyanopterus cyanopterus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Flame Robin	Petroica phoenicea	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey Falcon	Falco hypoleucos	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Grey-headed Flying-fox	Pteropus poliocephalus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Major Mitchell's Cockatoo	Lophochroa leadbeateri	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Scarlet Robin	Petroica boodang	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Speckled Warbler	Chthonicola sagittata	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Superb Parrot	Polytelis swainsonii	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Swift Parrot	Lathamus discolor	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
White-bellied Sea-Eagle	Haliaeetus leucogaster	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
White-throated Needletail	Hirundapus caudacutus	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
Glossy Black-Cockatoo	Calyptorhynchus lathami	76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

BAM Predicted Species Report

Common Name	Scientific Name	Justification in the BAM-C
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	Refer to BAR
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00042568/BAAS22026/23/00042570	21ALLE07 FORBES	22/06/2023
Assessor Name	Report Created	BAM Data version *
Diane Warman	27/09/2023	61
Assessor Number	BAM Case Status	Date Finalised
BAAS22026	Finalised	27/09/2023
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions												
1	76_DNG	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	5.3	5.3	4.2	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Endangered	2.00		0
2	76_poor_moderate	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	38.3	38.3	3.8	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Endangered	2.00		73
											Subtotal	**73**
											Total	**73**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Austrostipa wakoolica / A spear-grass (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	73
								Subtotal	**84**
Crinia sloanei / Sloane's Froglet (Fauna)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Endangered	False	8
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Endangered	False	55
								Subtotal	**63**
Diuris tricolor / Pine Donkey Orchid (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	8

76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	55
								Subtotal	**63**
Eleocharis obicis / Spike-Rush (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Vulnerable	Vulnerable	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Vulnerable	Vulnerable	False	73
								Subtotal	**84**
Lepidium aschersonii / Spiny Peppercress (Flora)									
76_DNG	5.3	5.3	4.2	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	11
76_poor_moderate	38.3	38.3	3.8	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	73

								Subtotal	**84**
Lophochroa leadbeateri / Major Mitchell's Cockatoo (Fauna)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	73
								Subtotal	**84**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	73
								Subtotal	**84**
Phascolarctos cinereus / Koala (Fauna)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	11

76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	73
								Subtotal	**84**
Polytelis swainsonii / Superb Parrot (Fauna)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	73
								Subtotal	**84**
Swainsona murrayana / Slender Darling Pea (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	73
								Subtotal	**84**

Swainsona recta / Small Purple-pea (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	73
								Subtotal	**84**
Swainsona sericea / Silky Swainson-pea (Flora)									
76_DNG	5.3	5.3	4.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	11
76_poor_moderate	38.3	38.3	3.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	73
								Subtotal	**84**

BAM Candidate Species Report

Proposal Details

Assessment Id 00042568/BAAS22026/23/00042570	Proposal Name 21ALLE07 FORBES	BAM data last updated * 22/06/2023
Assessor Name Diane Warman	Report Created 27/09/2023	BAM Data version * 61
Assessor Number BAAS22026	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 1	Date Finalised 27/09/2023	BOS entry trigger BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Austrostipa wakoolica A spear-grass	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia sloanei Sloane's Froglet	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris tricolor Pine Donkey Orchid	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Eleocharis obicis Spike-Rush	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lepidium aschersonii Spiny Peppercress	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophochroa leadbeateri Major Mitchell's Cockatoo	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Polytelis swainsonii Superb Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona murrayana Slender Darling Pea	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona recta Small Purple-pea	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Mossgiel Daisy	Brachyscome papillosa	Geographic limitations
Sand-hill Spider Orchid	Caladenia arenaria	Geographic limitations

Squirrel Glider in the Wagga Wagga Local Government Area	Petaurus norfolcensis - endangered population	Refer to BAR
Swift Parrot	Lathamus discolor	Habitat constraints

Appendix 6 - Flooding and Drainage Report



Forbesview
School Road, Forbes
Flooding and drainage report

ForbesView Pty Ltd

26 September 2023

The Power of Commitment

Project name		Planning proposal for School Rd, Forbes					
Document title		Forbes View Subdivision - School Road | Flooding and drainage report					
Project number		12613388					
File name		12613388-REP_Forbes_View_Subdivision_Flooding_drainage.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	N Bosworth	S Martin		S Martin		26/09/2023

GHD Pty Ltd | ABN 39 008 488 373

GHD Tower, Level 3, 24 Honeysuckle Drive

Newcastle, New South Wales 2300, Australia

T +61 2 4979 9999 | **F** +61 2 4979 9988 | **E** ntlmail@ghd.com | **ghd.com**

© GHD 2023

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Executive Summary

This Flooding, Water Cycle Management and Riparian Corridor Assessment has been prepared as part of the precinct planning for the Forbes View Subdivision, within the town of Forbes, NSW.

Allera, on behalf of ForbesView, are preparing a Planning Proposal to rezone a 92 hectare parcel of land within the Forbes Shire Council, referred to as School Road, Forbes ('the Site')

This report has been prepared to outline the findings of the engineering investigations of the flooding and water cycle management. The strategy outlined in this report has been developed using an integrated approach to flood risk management, water cycle management and urban design based on the principles of water sensitive urban design (WSUD). The Indicative Layout Plan, prepared by Hatch (drawing H371649_MasterPlan230922), incorporates urban design features with flood risk management measures, along with drainage, landscape, vegetation, and habitat values, while addressing water quality targets.

Flooding

Flooding resulting from overland flow within the precinct boundary has shaped the layout of the precinct, with a section of the land within the precinct located under the 1% Annual Exceedance Probability (AEP) flood level.

The planning constraints resulting from the outcomes of the flood modelling investigations have been incorporated in the development of the Indicative Layout Plan that guide this planning proposal. These will be incorporated into the design of the subdivision upon rezoning and at the later design stages of this project. These flood constraints include allowance for flow paths within landscaped areas, restriction of residential and commercial development to areas not inundated during the 1% AEP flood event, and layout of the road network to allow flood evacuation during extreme flood events. There are no upstream catchments that drain to the site and the are no areas of the site mapped by Council studies as being affected by mainstream flooding.

Water Cycle Management

The objective of the water cycle management measures for the Forbes View Subdivision are to achieve the treatment targets for the reducing pollutant export loads to the requirements of Forbes Shire Council. The overall water management strategy for the Forbes View Subdivision involves the implementation of water sensitive urban design features, along with traditional drainage infrastructure to achieve the objectives.

Integrated water cycle management measures have been incorporated into the master planning and development controls, with the development of the Forbes View Subdivision Indicative Layout Plan incorporating the measures outlined in this report.

These measures incorporate source control features and a traditional pit, pipe, and overland flow network, including vegetated swales located within road corridors. The plan is shaped by constraints located within the precinct. Treatment to meet water quality targets is to be provided by a water quality (bio-retention) basins incorporating gross pollutant traps, filter media and vegetation. There is provision to include open water bodies.

The water quality modelling of the measures outlined in the Forbes View Subdivision Indicative Layout Plan indicate that the water cycle management have been designed as suitable to meet pollutant removal targets.

The results of technical investigations developed as part of the precinct planning process, and the modelling of the measures outlined in this report demonstrate that the precinct plan is suitable for consideration and approval.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.2 and the assumptions and qualifications contained throughout the Report.

Contents

1. Introduction **1**
1.1 Purpose of this report 1
1.2 Scope and limitations 1
1.3 Assumptions 2
2. Project background **3**
2.1 School Road, Forbes masterplan 3
2.1.1 Site description and constraints 3
2.1.2 Indicative layout plan 4
2.2 Legislative and planning context 4
2.2.1 NSW Environmental Planning and Assessment Act 1979 5
2.2.2 Water Act 1912 / Water Management Act 2000 5
2.2.3 Water Management Amendment (Controlled Activities) Regulation 2008 5
2.2.4 Local Government Act 1993 5
2.2.5 Forbes Shire Council Local Environment Plan 2013 5
2.2.6 Forbes Shire Council Development Control Plan 2013 (V2) 6
2.2.7 New South Wales Flood Prone Land Policy 6
2.2.8 Flood Risk Management Manual 2022 7
2.2.9 Floodplain Risk Management Guidelines 7
2.2.10 Other relevant specifications and design guides 7
3. Flood investigation **8**
3.1 Data sources 8
3.1.1 Previous flood studies 8
3.1.2 Site investigations 9
3.1.3 Topographic data 9
3.1.4 Rainfall data 10
3.1.5 Buildings and structures 10
3.1.6 Land use/roughness 11
3.1.7 Losses 11
3.1.8 Boundary conditions 11
3.2 Modelling methodology 11
3.3 Flood modelling results and mapping 11
3.4 Flood planning masterplan outcomes 13
3.4.1 Flood planning levels 13
3.4.2 Flood evacuation plannings 14
3.5 Further investigations 14
4. Water cycle management plan **15**
4.1 Objectives 15
4.2 Strategy 15
4.3 Water management infrastructure 16
4.3.1 Rainwater tanks 16
4.3.2 Pit pipe and overland flow path drainage system 16
4.3.3 Central median swales and street trees 16
4.3.4 Riparian corridor/open space in south of the Site 17
4.3.5 Redirection of flow to east 17

4.3.6 Water quality basin strategy 18
4.4 Water quality modelling 19
4.5 Water cycle management masterplan design outcomes 19
4.6 Further water quality investigations 20
5. Conclusions and recommendations 21

Table index

Table 1 Peak flow rates at Site boundaries 13
Table 2 Preliminary MUSICX modelling results 19

Figure index

Figure 1 Existing features of the Site 3
Figure 2 Indicate Layout Plan prepared by Hatch 4
Figure 3 Flood mapping from Forbes DCP showing site boundary 8
Figure 4 Site photographs 9
Figure 5 Building obstructions 10
Figure 6 Preliminary 1% AEP flood map (existing conditions) 12
Figure 7 Water management features identified on Indicate Layout Plan prepared by Hatch 17

Appendices

Appendix A Model summary sheet

1. Introduction

This report has been prepared as part of the precinct planning process for the Forbes View Subdivision, within the town of Forbes, NSW. This report summarises the investigations into the flooding and overland flow paths, outlines the findings and proposed measures for water management on site, including recommendations for the water management features to be included within the two mains overland flow paths within the precinct.

1.1 Purpose of this report

The objective of this report is to present the strategy for management of flooding, drainage, and water quality from the Forbes View Subdivision, along with management measures to incorporate water cycle management features into the overland flow paths within the precinct.

The strategy outlined in this report has been developed using an integrated approach to flood risk management, water cycle management and urban design based on the principles of water sensitive urban design (WSUD), incorporating urban design features with flood risk management measures, along with drainage, landscape, vegetation, and habitat values, while addressing water quality targets.

Integrated Water Management outcomes are most effectively managed through incorporation of management plans into planning and development controls of future development areas. Effective master planning works in combination with drainage, water quality and flood management measures to achieve satisfactory planning outcomes for all stakeholders.

1.2 Scope and limitations

This report: has been prepared by GHD for ForbesView Pty Ltd and may only be used and relied on by ForbesView Pty Ltd for the purpose agreed between GHD and ForbesView Pty Ltd as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than ForbesView Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared the TUFLOW and MUSICX ("Models") for, and for the benefit and sole use of, ForbesView Pty Ltd to support preliminary flooding and water quality investigations and must not be used for any other purpose or by any other person.

The Models are a representation only and does not reflect reality in every aspect. The Models contain simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Models. Accordingly, the outputs of the Models cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The information, data, and assumptions ("Inputs") used as inputs into the Models are from publicly available sources or provided by or on behalf of the ForbesView Pty Ltd, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD's scope of work does not include review or update of the Models as further Inputs becomes available.

The Models are limited by the mathematical rules and assumptions that are set out in the Report or included in the Models and by the software environment in which the Model is developed.

The Models are customised and not intended to be amended in any form or extracted to other software for amending. Any change made to the Models, other than by GHD, is undertaken on the express understanding that GHD is not responsible, and has no liability, for the changed Models including any outputs.

GHD has prepared this report on the basis of information provided by ForbesView Pty Ltd and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.3 Assumptions

The following assumptions have been made in the preparation of this report:

– The road layout shown on the indicative layout plan will be appropriate for the development.

– Earthworks will be possible on the site to facilitate the drainage features required for the development.

– The areas assigned for drainage will be able to be utilised for drainage, water quality improvement and flood mitigation at later design stages.

2. Project background

2.1 School Road, Forbes masterplan

Allera, on behalf of ForbesView, are preparing a Planning Proposal to rezone a 92 hectare parcel of land within the Forbes Shire Council, referred to as the Forbes View Subdivision, School Road, Forbes ('the Site'). The Site is legally identified as Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272, and 1273 in DP 750158.

The immediate surrounding context exhibits a rural and large lot residential zoning. Other land uses in the vicinity of the Site include Catholic Healthcare Jemalong Residential Village, Jenny Murphy Park, Forbes High School, and Goldridge Estate – being developed by Forbes Shire Council.

The Site has been identified by Forbes Shire Council for future residential development and is included within Council's Draft Local Housing Strategy (LHS) 2021 – 2024.

The Draft LHS indicates that the Site could facilitate the development of upwards of 600 dwellings (including R5 Large Lot Residential portion). The Site is identified as Stage 4 and Stage 4a of Precinct 5 within the Draft LHS and identified for release in 2036. However, Council have indicated that they would support bringing this forward given the need for housing in the Forbes LGA.

2.1.1 Site description and constraints

The Site, shown on Figure 1, is located approximately three kilometres north of the town centre of Forbes, in NSW. The Site has an approximate area of 92 hectare and is bound on the west by Farnell Street, to the north by an electricity easement and School road, to the west by Edward Street and to the south by Morton Street.

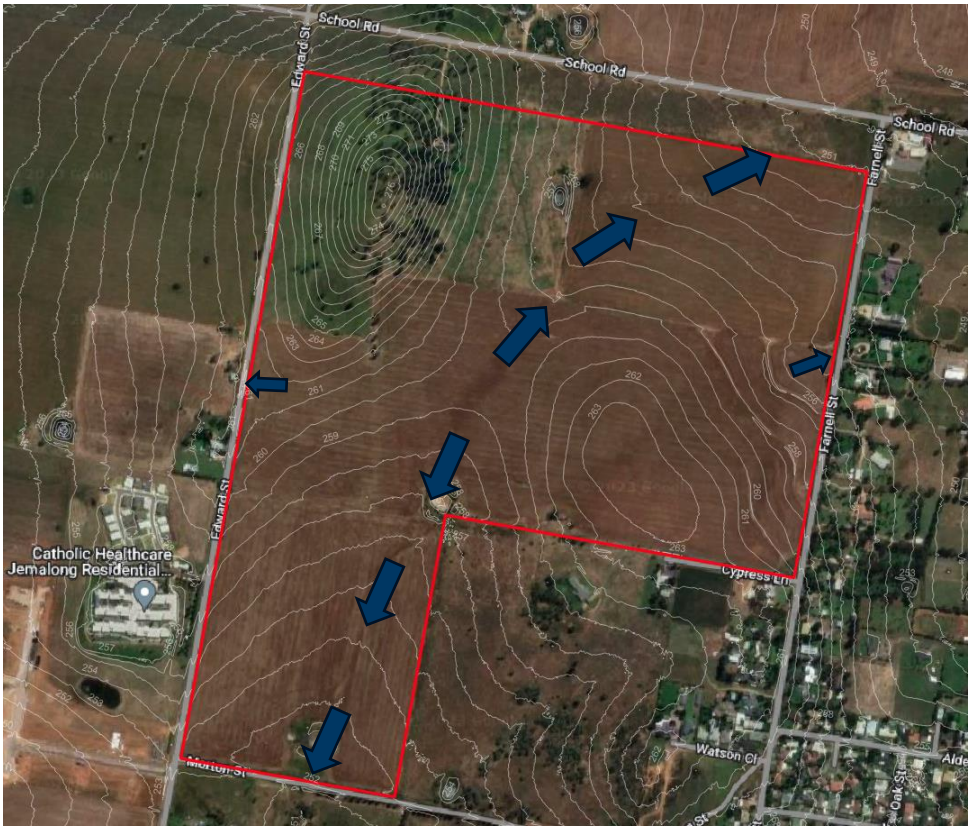


Figure 1 Existing features of the Site

The site is currently mostly used for agriculture and contains two hills. The hill located in the eastern area of the site has an elevation of approximately 263 metres AHD and gradient of approximately 1-2% and is used for cropping. The northwestern hill is relatively steeper, with grades up to 10% and an elevation of approximately 277 metres AHD. This hill is vegetated and not used for agricultural purposes.

The site is crossed centrally by ridgeline, a saddle between the two hills that roughly runs in a north-west to southeast direction. The site generally grades away from this ridgeline, the north-eastern area drains to the northeast, with the southwestern section draining to the south. There are no defined watercourses on the site and no upstream catchment draining onto the site. There are four overland flow paths and four discharge locations, with the main two are north and south, with two minor flow paths to the east on Farnell Street, and to the west on Edward Street.

There are several small farm dams on the site, one located off-line of the main flow path in the northern area of the site, with two located generally on the flow path to the south.

2.1.2 Indicative layout plan

The Indicative Layout Plan prepared by Hatch (on drawing H371649_MasterPlan230922) as part of the precinct planning process has been prepared to accommodate the input from planning and specialist studies, including this flooding and drainage assessment. The Indicative Layout Plan is provided in Figure 2.



Figure 2 Indicate Layout Plan prepared by Hatch

Key issues to note on the Indicative Layout Plan, as they relate to this flooding and water cycle management are:

– The location of the open water ponds and riparian corridor on the southern flow path (discussed in Section 4.3).
– The location of the central median swales and stormwater treatment basin for the northern flow path (discussed in Section 4.3.3).
– The road layout, incorporating roads to allow flood evacuation (discussed in Section 3.4.2).

2.2 Legislative and planning context

This section introduces the legislation and planning documents applicable to the project, providing explanations of how each relates to the development, including the relevant approvals required.

2.2.1 NSW Environmental Planning and Assessment Act 1979

This Act is the primary piece of land use and planning legislation in New South Wales. It allows for the creation, at various levels of government, of environmental planning instruments to control land use and planning. State environmental planning policies (SEPPs), regional environmental plans, Local Environment Plans (LEPs), development control plans (DCPs), and council codes and policies can all be established under Part 3 the Act. The rezoning of land as part of precinct planning is under Part 3 of the Act.

2.2.2 Water Act 1912 / Water Management Act 2000

The objects of the Acts aim to provide for the sustainable and integrated management of the water sources and to apply the principles of ecologically sustainable development. The Acts set guides for the preparation of water management plans and direct the NSW Office of Water in decision making. The NSW Office of Water is a separate office within the NSW Department of Primary Industries. It is responsible for the management of the State's surface water and groundwater resources. The Office reports to the NSW Government for water policy and the administration of key water management legislation, including the Water Act 1912 and Water Management Act 2000.

2.2.3 Water Management Amendment (Controlled Activities) Regulation 2008

This Regulation of the *Water Management Act* 2000 replaces the *Rivers and Foreshores Improvement Act* 1948 from 4 Feb 2008. Under this Regulation a *Controlled Activity Approval* (CAA) is required from the NSW Office of Water for works within 40 metres of top of bank of a defined watercourse.

A controlled activity permit is not required under this regulation, as there are no defined watercourses on the Site.

2.2.4 Local Government Act 1993

This Act creates local governments and grants them the power necessary to perform their functions, among which are the management, development, protection, restoration, enhancement, and conservation of the environment of the area the local government is responsible for, in a manner that is consistent with and promotes the principles of ecologically sustainable development. The *Local Government (Ecologically Sustainable Development) Act* 1997 amended the *Local Government Act* so that ecologically sustainable development, including the sustainable use of resources, is now a guiding operational principle.

The *NSW Flood Risk Management Manual: the management of flood liable land* 2022 relates to the management of flood liable land in accordance with Section 733 of the *Local Government Act*.

Approval for the Forbes View Subdivision is required from Forbes Shire Council under the Local Government Act 1993.

2.2.5 Forbes Shire Council Local Environment Plan 2013

LEPs are prepared in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979. The LEPs set out zoning for land within the local government area and identifies planning objectives and development controls for each zone.

This Surface Water Assessment (and the EA) will make reference to the relevant components of the LEP where appropriate. Part 5.21 of the LEP outlines objectives, planning regulations and considerations with respect to flooding.

Under the Forbes Local Environmental Plan 2013, the land is currently zoned RU1 - Primary Production, R5 - Large Lot Residential, and RE1 - Public Recreation. A Planning Proposal is required to rezone the Site to facilitate future residential development.

2.2.6 Forbes Shire Council Development Control Plan 2013 (V2)

The *Forbes Development Control Plan 2013* (V2) applies to all land within the Forbes local government area where Council is the consent authority. This document was adopted by Forbes Shire Council on 21 June 2012 and became effective on 9 August 2013.

This document aims to preserve and protect the amenity and property of existing residents, landowners, and the community and to protect the physical environment and receiving waters of catchments. The DCP contains a separate chapter (Chapter 4) on Flooding and Flood Affected Land. Section 9 of this Flooding chapter outlines guidelines for flood risk management, including development controls for various types of development within flood risk zones as defined by Council. Map 2 of this section indicates that the site is not subject to flooding by the Lachlan River.

This plan also identifies potential flood affectation of immediately surrounding lands which are the subject of prescriptive development controls prescribed in Schedule 3 of the DCP.

These controls for Subdivisions include:

– The development is to be consistent with any relevant flood evacuation strategy.
– Engineers report required to certify that the development will not increase flood affection elsewhere.
– Provided existing drainage is maintained.
– Development shall not block the conveyance of flood waters across the floodplain.
– Filling of land up to 0.5 metres above Adopted Flood level permitted provided this does not result in any significant effect on the conveyance of flood waters.
– Filling of a maximum of a 1/3 of allotment up to 0.5 metres above the Adopted Rood level permitted provided this does not result in any significant effect on the conveyance of flood waters or flood levels.
– Applicant to demonstrate the at potential development as a consequence of a subdivision proposal can be undertaken in accordance with this Plan (DCP.

For houses within these subdivisions:

– Habitable floor levels to be equal to or greater than the Adopted Flood level plus 0.5m freeboard.

The adopted flood level for the DCP is the 1952 flood in Forbes under current land use and topography conditions. Detailed rainfall data for this event is not available.

2.2.7 New South Wales Flood Prone Land Policy

The primary objective of the flood prone land policy is to reduce the impact of flooding and flood liability of owners and occupiers of flood prone land. The policy adopts a merit-based approach for development decisions in the floodplain with consideration of social, economic, and ecological factors, as well as flooding considerations.

2.2.8 Flood Risk Management Manual 2022

The Flood Risk Management Manual (2022) updates and replaces the Floodplain Development Manual (2005) as the NSW Government's manual to support the NSW Government's Flood Prone Land Policy. The manual provides sustainable strategies for managing occupation and use of the floodplain, conserving risk management principles. The manual provides for evaluation of strategies and formulation of plans that achieve effective flood risk management outcomes accounting for social, economic, ecological, and cultural factors, together with community aspirations for the use of flood prone land. These are based on a hierarchy of risk avoidance, minimisation (using planning controls) and mitigation works. The manual applies to floodplains across NSW in both rural and urban areas and is used to manage major drainage issues in overland flooding areas.

2.2.9 Floodplain Risk Management Guidelines

These series of guidelines and other resources complement the Floodplain Development Manual and provide extra support to councils when they are creating and carrying out floodplain risk management plans. These guidelines include Flood Impact and Risk Assessment Flood Risk Management Guide LU01, discussed in Section 3.

2.2.10 Other relevant specifications and design guides

The documents outlined above are to be read in conjunction with the following:

– AS/NZ3500.3 Plumbing and Drainage – Stormwater Drainage
– Australian Rainfall and Runoff 2019
– Australian Runoff Quality (Engineers Australia)
– Building Code of Australia Housing Provisions (current edition)
– Managing Urban Stormwater – Soils and Construction (current edition)
– State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

3. Flood investigation

To support this precinct plan, this report includes a ‘simple assessment” in accordance with Section 2.7 of the Department of Planning and Environment Flood Impact and Risk Assessment Flood Risk Management Guide LU01. This assessment is defined as:

> *For a preliminary or initial stage assessment of impacts in larger developments to assist in scoping a more detailed assessment. This is particularly useful where the flood behaviour and the degree of potential impact on the development site is not known.*

Recommendations for additional investigations to be undertaken at later development stages are included in Section 3.5 of this report.

3.1 Data sources

This section of the document outlines the sources of data used in the flooding, water cycle management and riparian corridor investigations. Data used in the hydrologic and hydraulic modelling is presented in the Model Summary Sheet, provided in Appendix A.

3.1.1 Previous flood studies

The Forbes Flood Study Review was prepared by Lyall and Associates in May 2020 to review and update the findings of previous flooding investigations that have been carried out for Forbes.

The mapping in the Lyall and Assoc report on Figure 6.8 indicates that the Site is not inundated during the Probable Maximum Flood by flows from the Lachlan River or Lake Forbes.

The Cypress Lane to Lachlan River Flood Study was commissioned by Forbes Shire Council in 2001. This investigation identified perspective flood affected land which Council has identified for future acquisition purposes in the Forbes Local Environmental Plan 2012. This includes the Site, which is identified as flood liable land, shown on Figure 3, taken from Section 5.0 of the DCP (Site boundary shown in red).

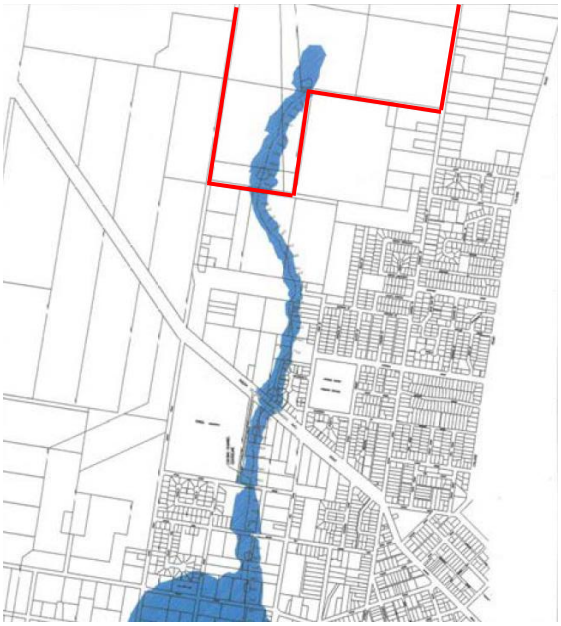


Figure 3 Flood mapping from Forbes DCP showing site boundary

3.1.2 Site investigations

A site inspection was carried out on 15 June 2023 by Nigel Bosworth of GHD. Observations include:

- The site does not have any defined flow paths or water courses.
- The agricultural area of the site is uniform in terms of roughness and gradient.
- The vegetated area has a slightly steeper gradient with rocks present at the surface, along with trees.
- The roadside swales are relatively uniform.
- Farnell Street is paved with a thin (~15-20 millimetre) layer of asphalt.
- School Road and Edward Street are unpaved.
- Morton Street is unformed.
- Piped culverts are located on Farnell Street, School Road and Edward Street are 450 millimetres in diameter, generally blocked and non-functional (noting that the culvert on Edward Street is not located at the low point in the road).



Culvert on Farnell Street (twin 450 mm diameter pipes)



Culvert on School Road (twin 450 mm diameter pipes)



Trapped low point on Edward Street (no culvert)



Culvert on Edward Street (450 mm diameter pipe)

Figure 4 Site photographs

The observations made during the site investigation have been used in the preparation of the hydraulic modelling.

3.1.3 Topographic data

Initial topographic data for the base model was obtained from the NSW Department of Land and Property Information, Spatial Data Services. Land and Property Information (LPI) have medium and high resolution orthorectified digital imagery from their Digital Image Acquisition System (ADS40) and Leica ALS50 (Airborne Laser Scanner) as well Digital Elevation Data across NSW using the latest Light Detection and Ranging Systems Technology (LiDAR), ADS40 Imagery, Radar, and or Satellite Technologies.

The airborne digital imagery used in this investigation were sourced from the LPI and have an 800 millimetre horizontal and 300 millimetre vertical resolution. The imagery used in this study is on tile BoganGate202104-LID1-AHD_5926308_55_0002_0002_1m. The data obtained from LPI was converted into a TIN using the *12d* software package and sampled into the *TUFLOW* model by the model engine at a one metre grid spacing for the entire Site.

Survey for the site was obtained by Zenith Construction Surveying, from field survey taken on 04-06-23. This survey data, shown on Drawing 8082_001 Rev 00, dated 11-06-23 has been incorporated into the TUFLOW modelling.

A grid size of 1.0 metre has been used in this investigation, with the grid aligned north-south/east-west.

3.1.4 Rainfall data

The Australian Rainfall and Runoff 2016 Intensity-Frequency-Duration (IFD) parameters have been downloaded from the Bureau of Meteorology website and used in the develop of the TUFLOW model for this assessment. Rainfall durations from 20 minutes up to 12 hours were assessed for the 1 in 100 (1% AEP) events within the hydrologic model boundary.

Coordinates entered into the IFD system were latitude -33.3565, Longitude 148.000.

As stated in Section 2.2.6, detailed rainfall data is not available for the “Adopted flood” which occurred in 1952. In lieu of this data, the 1% AEP rainfall event has been selected as the adopted flood level for the preparation of this report.

3.1.5 Buildings and structures

Buildings and other obstructions were modelled by mapping using aerial photography. A map showing the buildings identified within the model (yellow) is shown in Figure 5.



Figure 5 Building obstructions

Australian Rainfall and Runoff 2019 recommends completely removing building from models where rainfall volumes within building footprints are not significant. The approach to remove buildings has been used in this modelling investigation.

The culverts under roads surrounding the site (discussed in Section 3.1.2) have not been included in the hydraulic modelling due to their size relative to the flow rate and their blockage. The flow characteristics have been modelled with all flow travelling overland.

3.1.6 Land use/roughness

A uniform Manning's roughness (n) was used in the hydraulic model of 0.05 based on site observations. This roughness values are adopted from the Table 6.2.2. Valid Manning 'n' Ranges for Different Land Use Types in Book 6 of *Australian Rainfall and Runoff* 2019.

3.1.7 Losses

Probability neutral loss Initial losses for different storm events and duration as well as continuing losses of 1.52 mm/hr have been obtained from the ARR Data Hub (http://data.arr-software.org/). A multiplication factor of 0.4 was adopted for continuing loss as recommended by ARR Data hub-NSW Specific Data info.

3.1.8 Boundary conditions

The downstream extents of the hydraulic model have been located at a distance of between 200 to 600 metres downstream of the Site boundary in north, east, south, and west directions. The downstream boundary conditions were configured as a water level vs. flow (HQ) boundary, representing a free-discharge boundary condition with no tailwater.

This approach was used in the modelling as the location of the downstream boundary is approximately 5-10 metres lower than the property boundary. This would not impact the flood hydraulics at the boundary.

3.2 Modelling methodology

This investigation used the application of rainfall directly onto the grid of the two–dimensional hydraulic model within the *TUFLOW* flood modelling software (Build 2020-10-AF). This methodology is known as the direct rainfall approach or 'rainfall on the grid.' This approach removes the need for a separate hydrological modelling package.

In traditional flood modelling, separate hydrological and hydraulic models are constructed. The hydrological model has inputs of rainfall, area losses and roughness within a lumped or partially distributed sub–catchment, calculating runoff hydrographs for modelled storm events. This hydrograph is then applied to the hydraulic model, which performs flow calculations based on hydraulic features to develop estimations of flood behaviour across the study area.

In the direct rainfall approach, the hydrological model is either partially or completely removed from the process. The hydrological routing is undertaken in the distributed two–dimensional model, rather than in a lumped hydrological package.

3.3 Flood modelling results and mapping

The flood extent map for existing conditions calculated in the hydraulic modelling of the 1% AEP flood event, is presented on Figure 6.

The results of the flood mapping presented on Figure 6 indicate that the flooding within the Site boundary is generally isolated to within the two main flow paths (north-east and south).

Peak discharge at the site boundaries are presented in Table 1

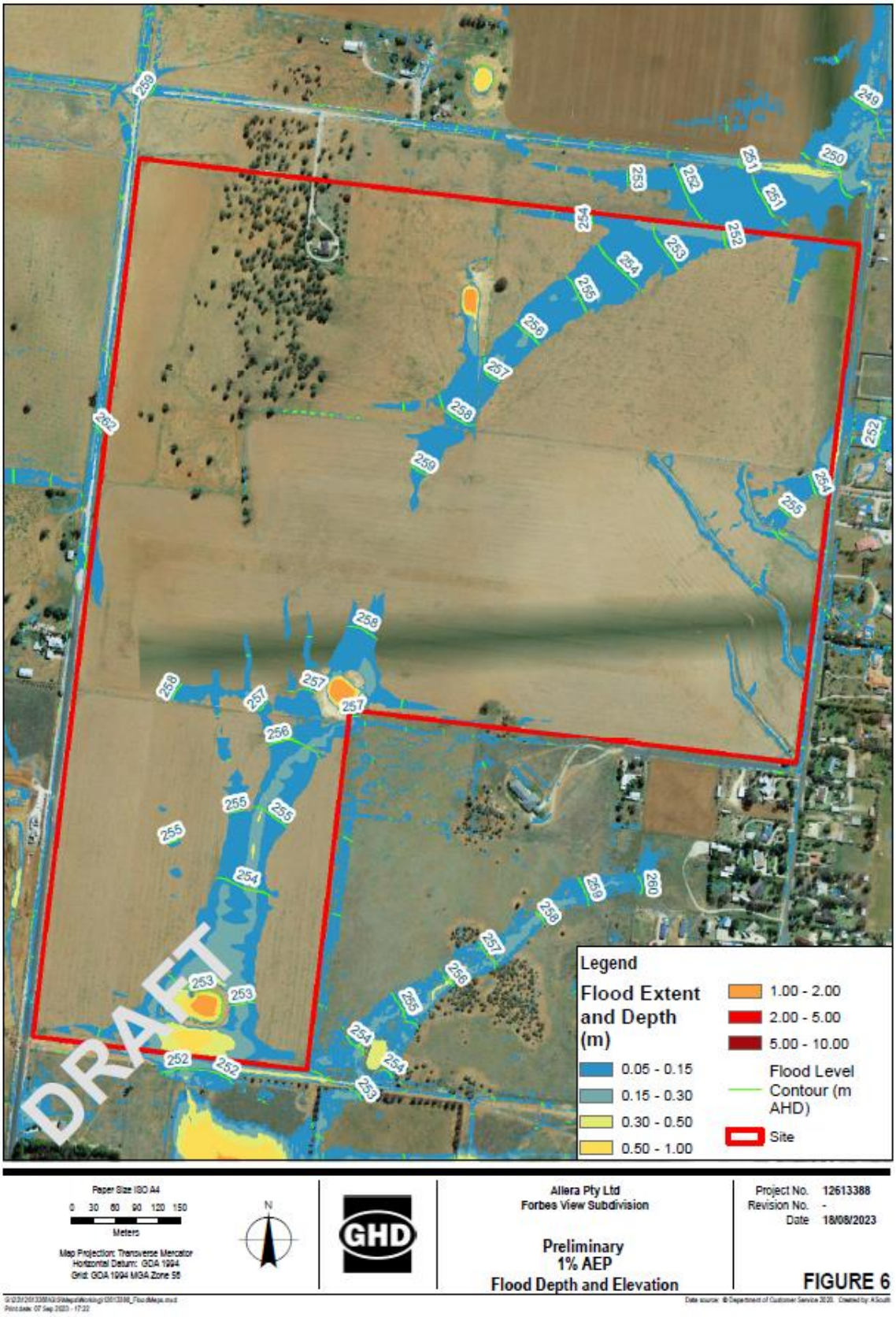


Figure 6 *Preliminary 1% AEP flood map (existing conditions)*

Table 1 Peak flow rates at Site boundaries

Location	Peak flow rate (m^3/s)
Northern boundary (School Road)	4.98
Eastern Boundary (Farnell Street)	1.67
Southern Boundary (Morton Street)	6.92
Western Boundary (Edward Street)	0.7

Maximum depths in the northern flow path are generally around 0.15 metres, which is generally classified as shallow flow. Maximum depths in the southern flow path are up to 0.3 metres in the northern, upstream area and up to 0.5 metres in the southern area downstream of the southern on-line dam. Ponding within the on-line dams is up to 1.5 metres.

Some contour grading on the eastern side of the Site results in minor ponding and redirection of flows in the 1% AEP event. No flow from upstream enters the Site in the 1% AEP event.

The discharge location on the eastern side of the site results in flooding within properties on Farnell Street. Minor ponding and flooding occur to the west of the site on Edward Street, with the overland flow continuing to the west along a property boundary.

3.4 Flood planning masterplan outcomes

The planning constraints resulting from the outcomes of the flood modelling investigations carried out as part of the precinct planning process have been incorporated in the development of the Indicative Layout Plan. These flood constraints include:

– Earthworks and drainage infrastructure to direct and manage flows within the site for the range of storm events.
– Incorporation of detention basins and flow mitigation measures to ensure peak flow rates for design developed conditions do not exceed those modelled for existing conditions.
– Restriction of residential and commercial development to areas not inundated during the 1% AEP flood event for design conditions.
– Layout of the road network, including central median swales located within the roads, to allow passage of flood flows during extreme flood events.
– Layout of the road network to allow flood evacuation during extreme flood events.

The developed scenario flood modelling will be undertaken to ensure that the precinct layout (shown on the Indicative Layout Plan but subject to change as part of the ongoing design process) does not result in inundation of areas that proposed to be developed.

3.4.1 Flood planning levels

Flood planning levels within the Forbes View Subdivision will be developed in accordance with Chapter 4 – Flooding and Flood Affected Land of the *Forbes Development Control Plan 2013* (V2). Flood planning levels will be set above the adopted flood level, the 1% AEP rainfall event:

– Habitable floor level 100 year flood elevation + 0.5 metres
– Garage floor level 100 year flood elevation + 0.1 metres

The flood planning level requirements will be applicable to both Residential and Industrial/Commercial Areas within the precinct.

3.4.2 Flood evacuation plannings

The road layout shown on the Indicative Layout Plan has been designed to allow movement of people and vehicles from lower lying areas centrally with the precinct to higher ground located on the western and eastern edges of the development area. The higher ground within the precinct is located above the 1% AEP Flood level (shown on Figure 6), allowing safe refuge. This study has not been prepared for submission to the SES but has been prepared as a preliminary study to guide further investigations.

3.5 Further investigations

This preliminary flood investigation has mapped existing flood characteristics for the site and identified the site as suitable for rezoning to residential development, as presented on the Indicative Layout Plan prepared by Hatch. The drainage and flood management measures will be updated as the design of the Forbes View Subdivision progresses, with additional investigations to occur at later design stages. The flood modelling and drainage design additional investigations will include:

– The civil design including earthworks for building pads and roads.
– The pit and piped drainage network to be designed and included within the flood model.
– Design of drainage along eastern side of site to re-direct flows to northern basin and avoid increase in flood flow rates during large events.
– Layout to allow drainage along swales within streets and other water sensitive urban design features.
– Riparian corridors and overland flow paths to allow safe passage of flood waters within the Site.
– Central median swales sized to safely accommodate flood flows.
– Detention basins to be sized to limit flows to pre-developed levels given in Table 1.

Incorporation of the measures outlined in this report into the design of Forbes View Subdivision, will allow the development to proceed in accordance with the relevant State and local flood management requirements.

4. Water cycle management plan

This section outlines the strategy and measures that are proposed as part of the Forbes View Subdivision that will meet the water management and pollution removal targets set by Forbes Shire Council.

Consultation with Forbes Shire Council as part of the precinct planning process, involving a meeting held on 4 August 2023 have indicated that standard pollutant removal targets used throughout NSW and Australia will be appropriate for Forbes View Subdivision.

Rainwater tanks, vegetated swales located within the central median of roads, and bio-retention basins have been modelled based on providing treatment for all development areas, including commercial and residential areas. This strategy has been developed in order to maximise the developable land above flood planning levels by utilising land flooded by local flooding for water quality measures and recreation.

4.1 Objectives

The objective of the water cycle management measures for the Forbes View Subdivision are to achieve the treatment targets for the reducing export loads to the requirements of Forbes Shire Council.

The per cent reduction in pollutant load targets for the project are from the *Sydney Metropolitan Catchment Management Authority, Draft NSW MUSIC Modelling Guidelines:*

– Gross pollutant (>5 mm) 90%
– Total suspended solids 85%
– Total phosphorus 65%
– Total nitrogen 45%

These targets are consistent with other stormwater documentation in NSW and were selected at the meeting held on 4 August 2023 with Forbes Shire Council as appropriate for the development of Forbes View Subdivision.

4.2 Strategy

The overall water management strategy for the Forbes View Subdivision involves the implementation of water sensitive urban design features, along with traditional drainage infrastructure to achieve the objectives for water quality. Stormwater and drainage measures within the precinct will include the following components:

– Source control features including rainwater tanks, street trees and permeable landscape features.
– Transfer of flows through a traditional pit, pipe, and overland flow network.
– The use of central median swales within the road network for conveyance of high flows and treatment of stormwater.
– Water quality (bio-retention) basins incorporating gross pollutant traps, filter media and vegetation, including provision for open water bodies where space is available.
– Discharge from the system to existing flow paths, including from the southern flow path to the receiving environment of Lake Forbes.

Preliminary designs for the infrastructure required to all the water cycle management system to meet the objectives have been prepared as part of this study in order to determine the impacts on development patterns within the precinct. These preliminary designs are discussed in detail in Section 4.3.

4.3 Water management infrastructure

This section outlines the preliminary design of water management infrastructure undertaken as part of this study.

The potential for water management infrastructure to place constraints on the pattern of development has been assessed at this precinct planning stage, in order to facilitate more detailed design of drainage infrastructure at later precinct design stages.

The preliminary design and layout of the water management infrastructure has been part of the preparation of the Indicative Layout Plan, with the development of the drainage and layout plans occurring in consultation with Hatch. The catchments have been mapped based on the existing and assumed design topography and the road layout in the Indicative Layout Plan shown on drawing H371649_MasterPlan230922, annotated with the water management features identified on Figure 7.

The water cycle management measures proposed for Forbes View Subdivision are discussed in Sections 4.3.1–4.3.6.

4.3.1 Rainwater tanks

Water quality treatment to manage runoff will be incorporated at source by the use of rainwater tanks on dwellings, Forbes Shire Council require that all residential, industrial, and commercial developments install rainwater tanks. Rainwater tank or tanks will be included in the design of residential, commercial areas within the Forbes View Subdivision to harvest roof runoff to be reused for toilet flushing and external irrigation.

The roof runoff will be collected in standard roof guttering and collected in rainwater tanks draining to a *Building and Sustainability IndeX* (BASIX) compliant reuse system. In addition to this BASIX requirement, the Forbes Subdivision will require the same requirement as Council specified for Goldridge Estate, i.e. that an additional 3000 litre storage is incorporated over and above BAISX requirements. For the purposes of this design, and the lot sizes being smaller than 1000 m^2, this is assumed to require a 5500 litre tank on each property.

Overflow from the roof drainage capture system will drain to the pit and pipe drainage network where it will be discharged into the precinct bio-retention basins.

4.3.2 Pit pipe and overland flow path drainage system

Stormwater runoff from lots and roads in excess of the capacity of source control measures will be directed to a trunk drainage system for minor storm events in a conventional pit and pipe system. Preliminary pipe sizes calculated based on the Indicative Layout Plan road and catchment layout will be prepared at later design stages, as discussed in Section 3.5.

Pipe diameters will be designed in accordance with Forbes Shire Council guidelines, including gradient and cover requirements. The overland flow network has been incorporated into the road layout of the Indicative Layout Plan. This road layout has been designed to allow free drainage of all roads. The road layout shown on the Indicative Layout Plan prepared by Hatch (shown on drawing H371649_MasterPlan230922, on Figure 7) avoids trapped low points, which can result in localised flooding.

4.3.3 Central median swales and street trees

A vegetated, central-median swale incorporating street trees will be included into the road design where required, with details included on the road design and landscape drawings. The vegetated swale, including the street trees will be irrigated passively by allowing for breaks in kerbs, with the paved road surface graded to drain to landscaped central median, which will incorporate and scour protection at the edge of the landscaped bed. This swale has been modelled within the *MUSICX* models discussed in Section 4.4 and will be incorporated in later designs of the subdivision, potentially reducing the area of bio-retention basin required.

Due to site grade and area constraints on the northwestern side of the Site resulting in basins not being a feasible option for water quality improvement, central median swale have been designed to provide all treatment prior to discharge at the western boundary.



Figure 7 *Water management features identified on Indicate Layout Plan prepared by Hatch*

4.3.4 Riparian corridor/open space in south of the Site

The drainage corridor for the southern flow path incorporates water management features along with habitat, recreation, and community amenity facilities. These features include the two water quality basins, along with vegetated channels and open water in ponds.

4.3.5 Redirection of flow to east

Constraints on the eastern side of the site require the development area that would under existing topographic conditions, drain to the eastern boundary on Farnell Street, be redirected to northern basin. This northern basin will provide quality and quantity treatment to the flows, limiting export of pollutants to target rates and flow rates to pre-development rates.

The redirection of flows will be designed to not increase flooding in 1% event in properties to the east of the site, on Farnell Street.

4.3.6 Water quality basin strategy

Water quality basins proposed for the Forbes View Subdivision are bio-retention systems, to be designed in accordance with the requirements of Forbes Shire Council. Bio-retention basins (also known as bio-retention systems, bio-filters, and rain gardens), are a form of natural water treatment that use natural processes to achieve water quality improvements from stormwater flows.

Bio-filtration systems use vegetated soil-based filters to attenuate flows, reduce runoff volumes, and improve water quality through sedimentation, filtration, sorption, and biological uptake by reed and sedge types of vegetation. Bio-retention basins have advantages over open water treatment systems such as wetlands or ponds due to decreased risk to human health via contact with untreated water. This lack of open water also provides mosquito control, odour control and minimises wildlife interactions with polluted water.

The design of bio-retention basins for the Forbes View Subdivision will be prepared in detail in later development stages and will incorporate typical design features including:

– Gross pollutant trap.
– Flow distribution/inlet structure.
– Bio-retention filter comprising of:
  - Filter media (coarse sand and organic material).
  - Planting (grass and sedge species to remove pollutants).
  - Sub-soil drainage and flow collection.
– Outlet and discharge location to creek.
– Maintenance access path for vehicles.

The design of basins within the Forbes View Subdivision will receive flows from the developed sub-catchments, directed to a splitter pit, or high flow weir. This weir directs high flows away from the bio-retention basin to prevent damage to the vegetation and filter media during high flow, high energy events. Flows lower than the design recurrence interval (to be set at four exceedances-per-year or the three month peak event) will be directed to a gross pollutant trap (GPT). The purpose of the gross pollutant trap is to remove litter, debris, and sediment to prevent blockage of the basin. Flow from the gross pollutant trap will be directed through a pipe network into a bio-retention treatment area. Flow in excess of the design event pass bypass the basin.

The bio-retention areas located downstream of the gross pollutant trap will be designed to incorporate several treatment cells. Flow from the gross pollutant trap will be distributed evenly within the cell or cells through a combination of pipe network, weirs, scour protection or flow spreaders. Water levels within the cells will be managed through hydraulic connections set at bio-retention cell operating level.

The bio-retention cell consists of a filter media, an enriched coarse sand, planted with nutrient removing vegetation. Nutrient removal occurs through sorption to soil particles, decomposition by subsoil biota, and removal by plants. An extended detention depth (ponding above the filtration media) will be provided to increase treatment volumes within a basin.

Potential open water areas have been incorporated in the layout. The development urban design features include open water to be incorporated into stormwater basins within the Forbes View Subdivision for aesthetic reasons and for possible stormwater re-use.

Northern basin

The northern basin, presented on Figure 7 is located in the northeastern area of the Forbes View Subdivision and takes drainage from the catchment to the north of the ridge line, discharging at the northeast corner of the site. The basin has been sized with a total filter area of 1500 m^2. This filter area has been modelled (in Section 4.4) to reduce pollutant export from the catchment to meet the pollutant removal targets presented in Section 4.1.

The northern basin is located within the landscaped area at the northeastern corner of the Forbes View Subdivision and could potentially be incorporated into an area of open space for recreation purposes.

Southern basin - upstream

The upstream southern basin, presented on Figure 7 is located in the central area of the Forbes View Subdivision and takes drainage from the catchment to the south of the ridge line to the main east west road, discharging into the open water body located in the northern area of the space/riparian corridor. The basin has been sized with a total filter area of 500 m^2 and an open water body of 1200 m^2. This filter area has been modelled (in Section 4.4) to reduce pollutant export from the catchment to meet the pollutant removal targets presented in Section 4.1.

The upstream southern basin is located within the northern area of the space/riparian corridor of the Forbes View Subdivision and could potentially be incorporated into an area of open space for recreation purposes.

Southern basin - downstream

The downstream southern basin, presented on Figure 7 is located on the southern boundary of the Forbes View Subdivision and takes drainage from the catchment to the south of the main east west road, discharging into the open water body located upstream of the southern boundary of the site. The basin has been sized with a total filter area of 500 m^2 and an open water body of 1000m^2. This filter area has been modelled (in Section 4.4) to reduce pollutant export from the catchment to meet the pollutant removal targets presented in Section 4.1.

The downstream southern basin is located within the southern area of the space/riparian corridor of the Forbes View Subdivision and could potentially be incorporated into an area of open space for recreation purposes.

4.4 Water quality modelling

Preliminary water quality modelling of the precinct water infrastructure presented on Figure 7 has been undertaken during the preparation of the Indicative Layout Plan. This modelling of the preliminary design, undertaken using the *MUSICX* water quality modelling software (Version 1.10.0.12491) has been prepared in accordance with the water quality targets selected for the Forbes View Subdivision and is used to determine the required bio-retention areas needed to meet the pollutant removal targets presented in Section 4.1. The results of the MUSICX modelling are presented in Table 2.

Table 2 Preliminary MUSICX modelling results

Discharge location	Pollutant removal target	Northern discharge	Western Discharge	Southern Discharge
Gross Pollutant	90%	99.5%	100	100
Total suspended solids	85%	89.8%	93.4	92.0
Total Phosphorus	65%	66.5%	70.2	73.25
Total Nitrogen	45%	51.7%	45.4	54.4

The results of the modelling in in Table 2 indicate that the water cycle management system incorporated in the Indicative Layout Plan prepared by Hatch (shown on drawing H371649_MasterPlan230922) shown on Figure 7 has been designed to address the pollutant removal targets presented in Section 4.1.

The layout of the basins and bio-retention areas will be updated for later design stages and may also include open water to use in water harvesting, along with open space for recreation. This may result in modifications to the filter area, dependent on the area of open water proposed, usage rates of the water, along with any additional treatment measures.

4.5 Water cycle management masterplan design outcomes

The planning outcomes resulting from the water cycle management study and design carried out as part of the precinct planning process have been incorporated in the development of the Indicative Layout Plan. These measures include:

– Incorporation of source control features including rainwater tanks. street trees and landscape features.

– Layout of roads to facilitate a traditional pit, pipe, and the central median swale overland flow network.
– A total of three water quality (bio-retention) basins incorporating gross pollutant traps, filter media and vegetation, including open water bodies for the potential re-use of harvested stormwater for irrigation.

The developed scenario water quality modelling indicates that the precinct layout shown on the Indicative Layout Plan will incorporate water cycle management features able to meet pollutant removal targets.

4.6 Further water quality investigations

This preliminary drainage investigation has developed water quality targets for the site and identified the site as suitable for rezoning to residential development, as presented on the Indicative Layout Plan prepared by Hatch. The drainage and water quality improvement measures will be updated as the design of the Forbes View Subdivision progresses, with additional investigations to occur at later design stages. The flood modelling and drainage design additional investigations will include:

– Design of central median swales, where required including sizing for conveyance and treatment.
– Design of channel in southern flow path and open water ponds.
– Design of bioretention basins for water quality including:
  - Gross pollutant trap.
  - Flow distribution/inlet structure.
  - Bio-retention filter comprising of filter media (coarse sand and organic material), planting (grass and sedge species to remove pollutants), sub-soil drainage and flow collection.
  - Outlet and discharge location to creek.
  - Maintenance access path for vehicles.

5. Conclusions and recommendations

The Forbes View Subdivision prepared by Hatch (shown on drawing H371649_MasterPlan230922) shown as part of the precinct planning process has been prepared to accommodate the input from planning and specialist studies, including this flooding and drainage assessment. The Indicative Layout Plan is provided on Figure 2.

Key issues to note on the Indicative Layout Plan, as they relate to this flooding and water cycle management are:

– The location of developed land, above the 1% AEP flood level (discussed in Section 3).
– The location of stormwater treatment basins and central median swales within roads (discussed in Section 4).
– The road layout, incorporating roads to allow flood evacuation (discussed in Section 3.4.2).

Flooding

The planning constraints resulting from the outcomes of the flood modelling investigations carried out as part of the precinct planning process have been incorporated in the development of the Indicative Layout Plan. These flood constraints include:

– Restriction of residential and commercial development to areas not inundated during the 1% AEP flood event.
– Layout of the road network to allow flood evacuation during extreme flood events.

The developed scenario flood modelling will be required at later design stages to ensure that the precinct layout does not result in inundation of areas that are not flooded in existing conditions.

Water Cycle Management

The planning outcomes resulting from the water cycle management study and design carried out as part of the precinct planning process have been incorporated in the development of the Indicative Layout Plan. These measures include:

– Incorporation of source control features including rainwater tanks. street trees and permeable landscape features.
– Layout of roads to facilitate a traditional pit, pipe, and the central median swale overland flow network.
– A total of three water quality (bio-retention) basins incorporating gross pollutant traps, filter media and vegetation, including open water bodies for the potential re-use of harvested stormwater for irrigation.

The developed scenario water quality modelling indicates that the precinct layout shown on the Indicative Layout Plan will incorporate water cycle management features able to meet pollutant removal targets.

Recommendation

The Indicative Layout Plan for Forbes View Subdivision prepared by Hatch incorporates measures to address the flooding, drainage, and water quality requirements for approval by the Forbes Shire Council and other stakeholders. The results of technical investigations developed as part of the precinct planning process, and the modelling of the measures outlined in this report demonstrate that the Forbes View Subdivision is suitable for consideration and approval by relevant determining authorities.

Appendix A

Model summary sheet

ghd.com

The Power of Commitment

Appendix 7 - Servicing and Infrastructure Review

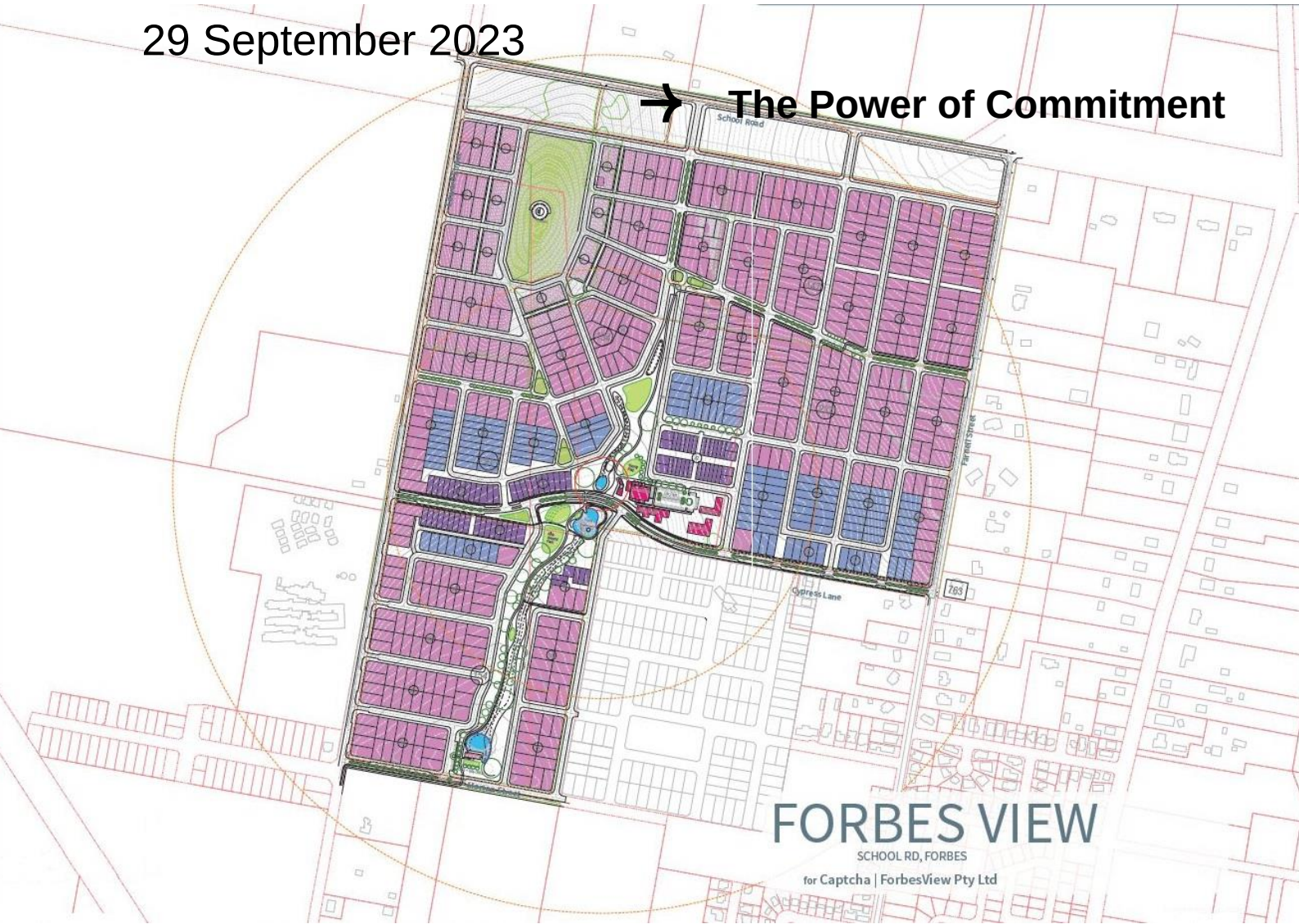
ForbesView Planning Proposal - School Road, Forbes, NSW

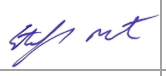
Infrastructure and Servicing Review

ForbesView Property

29 September 2023

→ **The Power of Commitment**



Project name		ForbesView - Planning proposal for School Rd, Forbes						
Document title		ForbesView Planning Proposal - School Road, Forbes, NSW | Infrastructure and Servicing Review						
Project number		12613388						
File name		12613388-REP-Forbes View Subdivision-Infrastructure Review.docx						
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**			
			Name	**Signature**	**Name**	**Signature**	**Date**	
S4	0	Greg Biernat / Luke Sharpe	Andres Munoz Senda		Steve Martin		29/09/23	
.								

GHD Pty Ltd | ABN 39 008 488 373
Contact: Greg Biernat, Senior Electrical Engineer | GHD
270 Summer Street,
Orange, New South Wales 2800, Australia
T +61 2 6393 6400 | **F** +61 2 9475 0725 | **E** oagmail@ghd.com | **ghd.com**

© GHD 2023
This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Executive Summary

Allera, on behalf of ForbesView, are preparing a Planning Proposal to rezone a 92 hectare parcel of land within the Forbes Shire Council, referred to as School Road, Forbes.

This report summarises the engineering investigations related to the infrastructure delivery strategies, including electrical, telecommunications, water, and sewer services for the development site at School Road, Forbes. Based on the assessment in this report, the proposed development can be adequately serviced by current and future reasonable infrastructure upgrades. It is expected that this servicing infrastructure can be delivered to align with the planned development timeline.

Electricity

Forbes is currently supplied by a single 66 kV / 11 kV Zone Substation known as “Forbes Town”, which is owned by Essential Energy, the Local Network Service Provider.

The load data outlined in the Essential Energy Distribution Annual Planning Report (DAPR) 2021 indicates that the Forbes Town Zone Substation has adequate electrical capacity to supply the new subdivision.

The proposed subdivision is likely to require one (1) additional 11 kV feeder which would typically follow the existing 11 kV aerial cable route through the Forbes township.

It is envisaged that approximately six (6) pad-mount (kiosk) substations (11 kV / 400 V) would be required around the subdivision to supply low voltage power to each subdivision lot and street lighting. Low voltage cables would typically be reticulated below the pedestrian pathways and nature strips within the public road reserves.

Telecommunication

Wholesale telecommunications in the Forbes region are provided by NBN Co. The urban areas of the Forbes township generally include fixed-line copper services, known as “fibre-to-the-node” technology, while the rural areas around the township are serviced by NBN’s fixed wireless technology.

NBN have advised that all lots within ForbesView subdivision will be eligible to receive NBN’s “fibre-to-the premises” (FTTP) telecommunications services, which will require a new underground pit and duct system.

Fibre optic trunk cables will need to be reticulated from an existing NBN telecom exchange (within the Forbes CBD) typically within the existing road reserves.

Water

Initial development of the lots south of Cypress Lane are serviced by Council’s existing water network via extension of the DN225 pipe laid along Morton Street. This will service the first 150 lots approximately and is expected to take the development through to around 2026.

Subsequent future development north of Cypress Lane will require new infrastructure. Through consultation with Forbes Shire Council, GHD understands that Council are currently updating the water system model, which will determine the ultimate needs and required upgrades to ensure that the future growth of Forbes can be accommodated, including delivery timing and methodology.

Sewer

Initial development of the lots south of Cypress Lane are serviced by Council’s existing sewer network by extending the SPS18 gravity catchment via a new DN150 pipe attached to the existing DN225 gravity pipe along Morton Street. This will service the first 150 lots approximately.

Subsequent future development north of Cypress Lane will require new infrastructure. Through consultation with Forbes Shire Council, GHD understands that Council are currently updating the sewer system model, which will determine the ultimate needs and required upgrades to ensure that the future growth of Forbes can be accommodated, including delivery timing and methodology.

Contents

1. Introduction **1**
- 1.1 Overview and purpose of the report 1
- 1.2 Scope and limitations 2
- 1.3 Assumptions 2
- 1.4 Sources of Information 2

2. Electricity supply **3**
- 2.1 Maximum demand 3
- 2.2 Electricity source 3
- 2.3 11kV distribution to the subdivision 5
- 2.4 Transmission easement adjacent to subdivision 6
- 2.5 Power distribution network within the subdivision 6

3. Telecommunications services **8**
- 3.1 Existing network 8
- 3.2 Subdivision network 9

4. Water and sewer services **11**
- 4.1 Introduction 11
- 4.2 Water and sewer services assumptions 11
- 4.3 Water demand and sewer load assessment 12
  - 4.3.1 Water demand 13
  - 4.3.2 Sewer load 13
- 4.4 Water and sewer – First phase servicing 14
  - 4.4.1 Water 14
  - 4.4.2 Sewer 15

5. Conclusion **16**

Table index

Table 2.1 Electricity Maximum Demand Assessment 3
Table 4.1 Cumulative lots, EP, and population summary 12
Table 4.2 Residential water demand 13
Table 4.3 Residential sewer loads 13

Figure index

Figure 1.1	Proposed location of development	1
Figure 2.1	Forbes Town Substation – Essential Energy	3
Figure 2.2	Transgrid and Essential Energy HV distribution network – Parkes and Forbes (Source: EE DAPR 2021 Report)	4
Figure 2.3	Essential Energy Forbes Town Zone Substation forecast loads and capacity (Source: EE DAPR 2021 Report)	4
Figure 2.4	Essential Energy Network Map – Subdivision Area, Essential Energy and TransGrid Substations	5
Figure 2.5	TransGrid 66kV lines inside the Plot and Essential Energy's 11kV lines along School Road	6
Figure 2.6	Installing an Essential Energy kiosk substation	7
Figure 3.1	Existing NBN network	8
Figure 3.2	Typical NBN Pit and Duct Installation	9
Figure 3.3	Indicative Route of NBN connection at existing Forbes CBD	10
Figure 4.1	First Phase, south of Cypress Lane	11
Figure 4.2	Initial development water and sewer servicing	14

Appendices

Appendix A	Water network layout
Appendix B	Sewer network layout

1. Introduction

This report has been prepared as part of the precinct planning process for the ForbesView Subdivision, within the town of Forbes, NSW. This report summarises the investigations, outlines findings and proposes measures to service the subdivision including electricity, telecommunications, water, and sewer.

Stormwater management is addressed in a separate report by GHD.

1.1 Overview and purpose of the report

The ForbesView Planning Proposal is a proposed residential development located South of School Road in the Forbes Local Council Area, in the central west region of NSW.

The development includes 750 residential lots and a neighbourhood centre, likely to comprise a small-size supermarket and small food and beverage outlets, a cafe, convenience retail and childcare. Note the number of residential lots is indicative only.

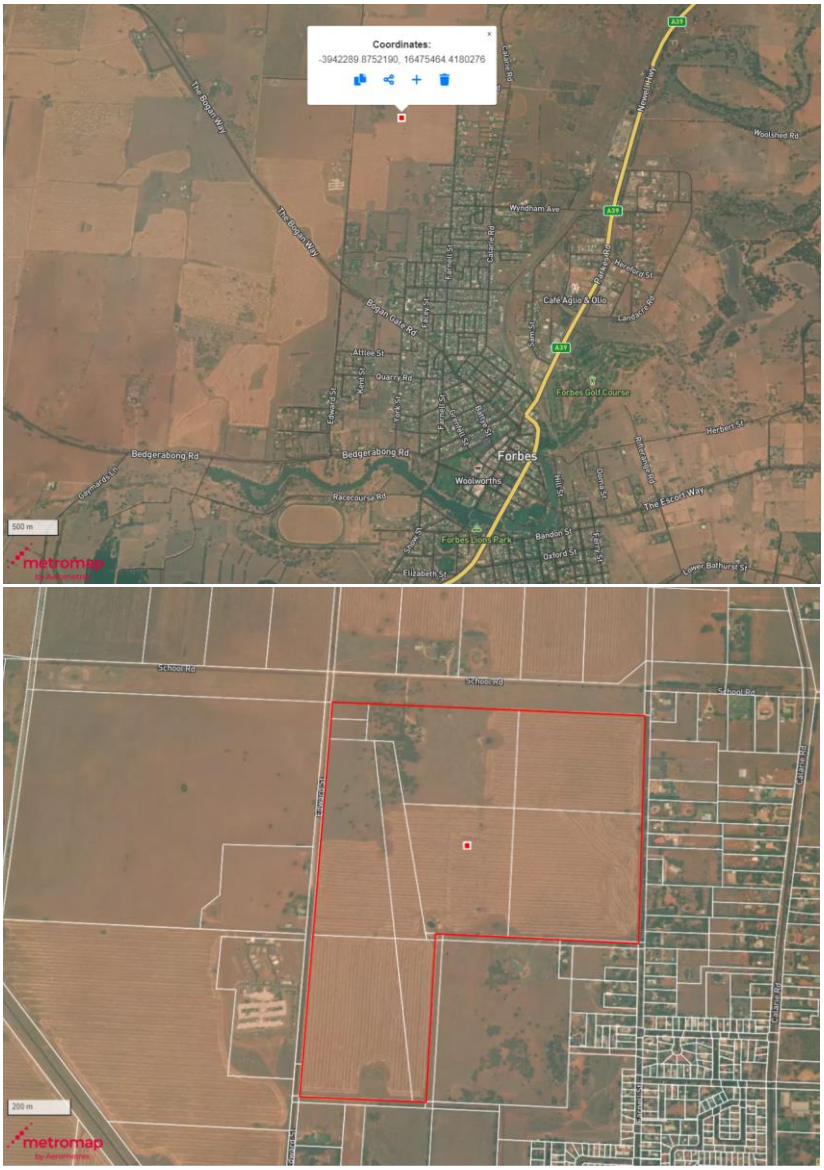


Figure 1.1 Proposed location of development

The land is currently zoned as a mixture of RU1, RE1 and R5 within the Forbes Shire Council (Council or FSC) and Forbes Local Environment Plan (LEP) and will therefore require rezoning.

1.2 Scope and limitations

This report: has been prepared by GHD for ForbesView Property and may only be used and relied on by ForbesView Property for the purpose agreed between GHD and ForbesView Property as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than ForbesView Property arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

Assumptions made for the servicing strategy are contained in each service's section.

1.4 Sources of Information

This report has been prepared with information obtained from the following documents:

- Essential Energy, Asset Management Distribution Annual Planning Report 2021, December 2021
- Essential Energy Network Maps website - https://www.essentialenergy.com.au/our-network/overhead-network-maps
- Essential Energy Underground Design Manual (CEOM-7098).
- NBN rollout mapping website - https://www.nbnco.com.au/learn/rollout-map
- WSAA-02 – Sewerage Code of Australia
- WSAA-03 – Water Supply Code of Australia
- Masterplan area for development area.

2. Electricity supply

2.1 Maximum demand

The maximum demand of the subdivision is outlined below and has been assessed in accordance with load allowances for standard residential properties and commercial areas, as outlined in the Essential Energy Underground Design Manual (CEOM-7098).

Table 2.1 Electricity Maximum Demand Assessment

LOAD GROUP	No. UNITS	UNIT LOAD (kVA)	LOAD (MVA)
Residential Lots	750	6 kVA/Lot	4.50 MVA
Neighbourhood centre (NLA)	4,000 m^2	100 VA/m^2	0.40 MVA
TOTAL			4.90 MVA

These loads are based on the subdivision having no reticulated gas to the plots.

2.2 Electricity source

The Local Network Service Provider for the Forbes region is Essential Energy.

Forbes is currently supplied by a single 66 kV / 11 kV Zone Substation known as “Forbes Town”, which is owned by Essential Energy and located along Patterson Street – see Figure 2.1 below.



Figure 2.1 Forbes Town Substation – Essential Energy

A Preliminary Enquiry was submitted to Essential Energy in early August 2023 (Application ID: 00101479) outlining the proposed subdivision and the anticipated electrical loads stated above.

While Essential Energy have not provided an official response to the enquiry, the load data outlined in the Essential Energy Distribution Annual Planning Report (DAPR) 2021 indicates that the Forbes Town Zone Substation has adequate electrical capacity to supply the new subdivision.

As outlined in Figure 2.3, the Substation has a firm rating of 33 MVA in Summer and 36 MVA in winter.

The substation demand load is currently around 14 MVA in Summer and 12 MVA in Winter, and apart from the proposed subdivision, this load has been forecast to grow very marginally over the next few years.

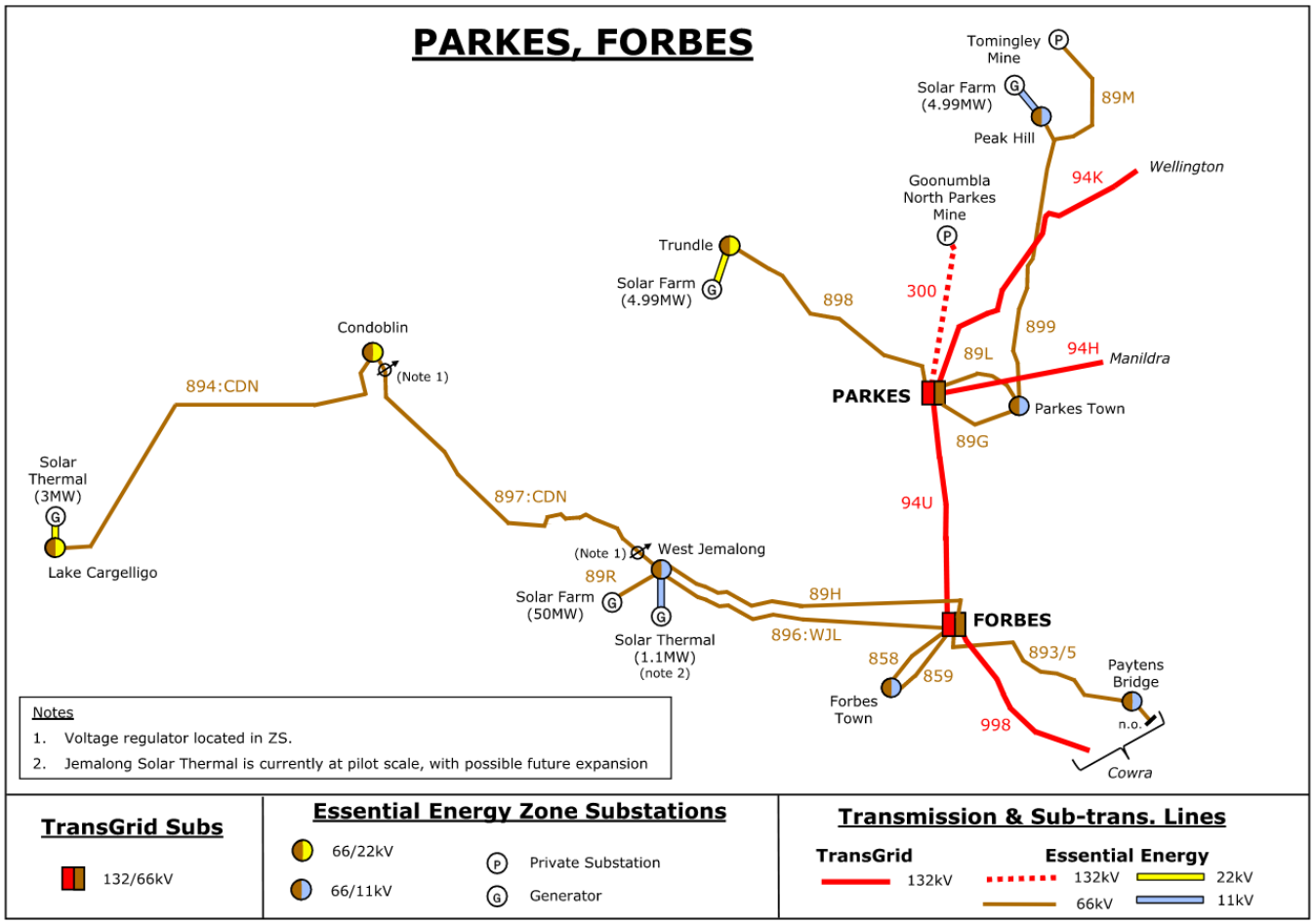


Figure 2.2 Transgrid and Essential Energy HV distribution network – Parkes and Forbes (Source: EE DAPR 2021 Report)

SUMMER	Forbes Supply Area POE50 Indicative Demand Forecast												
Substation	kV	Transformer Rating (MVA)			Firm Normal Cyclic Rating (MVA)	Forecast PF	Forecast (MVA)					Embedded Generation (MW)	95% Peak Load Exceeded (Hrs)
		Tx.1	Tx.2	Tx.3			21/22	22/23	23/24	24/25	25/26		
Condobolin	66/22	16	10		11	1.00	7.6	7.6	7.6	7.6	7.6	3.56	8.5
Forbes Town	66/11	18/30	15/30		33	1.00	13.7	13.7	13.7	13.8	13.8	5.85	5
Lake Cargelligo	66/22	8	5		5.5	0.99	3.8	3.8	3.8	3.8	3.8	2.33	4.5
Paytens Bridge	66/11	5	5/6.25		5.5	0.95	5.5	5.5	5.5	5.5	5.5	0.90	2
West Jemalong	66/11	3/4	3/4		4.4	0.95	2.3	2.3	2.3	2.4	2.4	0.37	12

WINTER	Forbes Supply Area POE50 Indicative Demand Forecast												
Substation	kV	Transformer Rating (MVA)			Firm Normal Cyclic Rating (MVA)	Forecast PF	Forecast (MVA)					Embedded Generation (MW)	95% Peak Load Exceeded (Hrs)
		Tx.1	Tx.2	Tx.3			2022	2023	2024	2025	2026		
Condobolin	66/22	16	10		12	1.00	6.8	6.8	6.8	6.8	6.8	3.56	3
Forbes Town	66/11	18/30	15/30		36	1.00	11.6	11.7	11.8	11.9	12.0	5.85	3.5
Lake Cargelligo	66/22	8	5		6	1.00	3.2	3.3	3.3	3.4	3.4	2.33	4.5
Paytens Bridge	66/11	5	5/6.25		6	0.99	3.1	3.1	3.1	3.1	3.1	0.90	1
West Jemalong	66/11	3/4	3/4		4.8	0.99	1.6	1.6	1.6	1.6	1.7	0.37	4

Figure 2.3 Essential Energy Forbes Town Zone Substation forecast loads and capacity (Source: EE DAPR 2021 Report)

2.3 11kV distribution to the subdivision

The subject land is adjacent to two existing Essential Energy 11 kV aerial feeders, designated FSB-52 and FSB-72. The feeders originate from the Forbes Town Zone Substation (Essential Energy) and are reticulated overhead within the main public road reserves.

Preliminary advice from Essential Energy indicates that the proposed subdivision is likely to require one (1) additional 11 kV feeder which would typically follow the existing 11 kV aerial cable route through the Forbes township. The 11 kV feeder design would need to be undertaken by the Level 3 Accredited Service Provider (ASP3) and certified by Essential Energy.

Essential Energy will verify the routes for any additional 11 kV feeders as part of the Connection Application process. While a new cable route may be required, this should be able to occur with relative ease and with minimal impact to the existing 11kV distribution network.

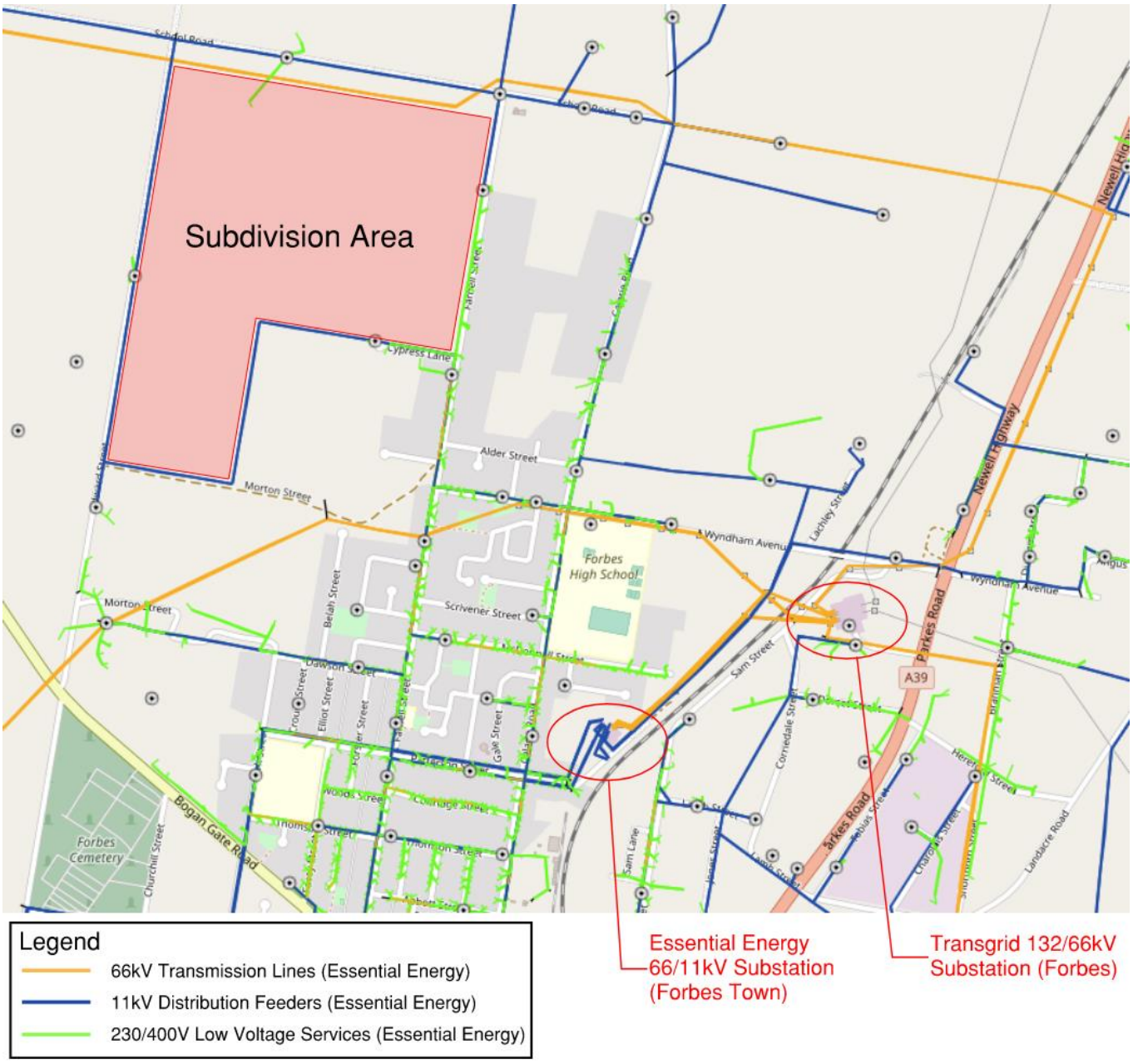


Figure 2.4 ***Essential Energy Network Map – Subdivision Area, Essential Energy and TransGrid Substations***

2.4 Transmission easement adjacent to subdivision

The Essential Energy Network Map (see Figure 2.4 above) indicates a 66kV transmission line running adjacent to the subdivision and parallel to School Road.

This Essential Energy asset is indicated in the Google Maps image below and appears to be supplying power to Essential Energy's 66/11kV West Jemalong zone substation from TransGrid's 132/66kV Forbes Substation.

However, we understand that the transmission line is located outside the boundaries of the proposed subdivision.



Figure 2.5 TransGrid 66kV lines inside the Plot and Essential Energy's 11kV lines along School Road

2.5 Power distribution network within the subdivision

The proposed subdivision will require underground low voltage (230 / 400 V) power reticulation to the residential lots, designed as part of the ASP3 design in accordance with the Essential Energy Underground Design Manual (CEOM-7098).

It is envisaged that approximately six (6) pad-mount (kiosk) substations (11 kV / 400 V) would be required around the subdivision to supply low voltage power to each subdivision lot and street lighting.

Low voltage cables would typically be reticulated below the pedestrian pathways and nature strips within the public road reserves. A pillar box would typically be provided at every second property boundary to provide a point of supply for adjacent residential lots.

The 11kV distribution within the subdivision boundaries would be a combination of underground and overhead, depending on the preferred route selection by the Level 3 ASP.



Figure 2.6 Installing an Essential Energy kiosk substation

The low voltage distribution network, kiosk substations and 11kV feeders would be installed by a Level 1 Accredited Service Provider (ASP1), under the supervision of Essential Energy compliance inspectors. The commissioned infrastructure would be handed over to Essential Energy to operate and maintain upon completion.

3. Telecommunications services

3.1 Existing network

Wholesale telecommunications in the Forbes region are provided by NBN Co, the Government-owned corporation tasked to design, build, and operate Australia's National Broadband Network.

The urban areas of the Forbes township generally include fixed-line copper services, known as "fibre-to-the-node" technology, which utilizes the old legacy Telstra voice cables to connect homes to various node boxes installed along public streets. The rural areas around the township are serviced by NBN's fixed wireless technology.

As indicated in the following image, NBN Co. are currently expanding their rollout of fixed-line services in a nearby subdivision, which is likely to comprise "fibre-to-the-premises" (FTTP) technology.

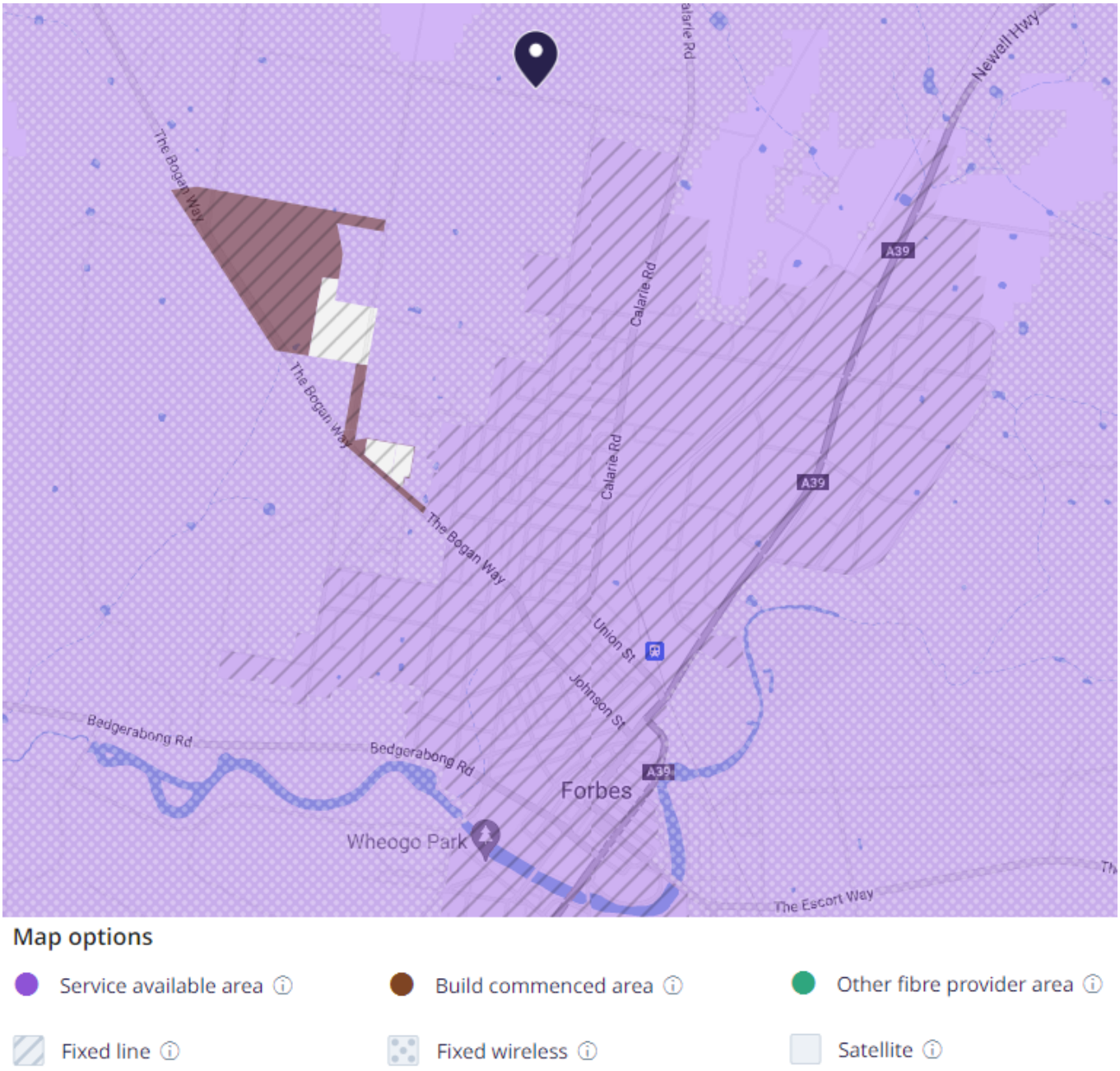


Figure 3.1 Existing NBN network

3.2 Subdivision network

Due to the scale of the ForbesView Planning Proposal, all properties will be eligible to receive NBN's fixed-line telecommunications services via "fibre-to-the premises" (FTTP) technology.

The subdivision developer would be responsible for designing and installing an underground pit and duct system, as outlined in the following image.

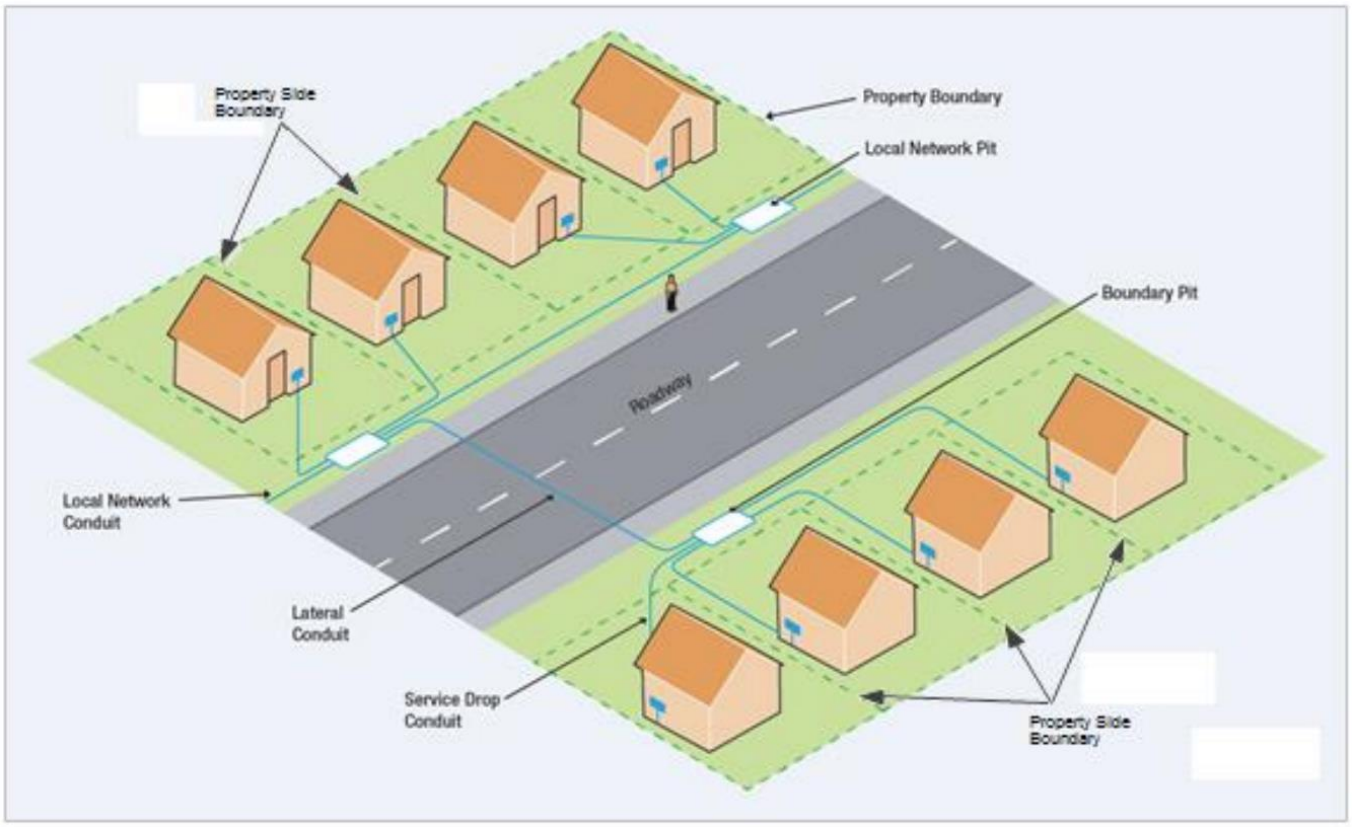


Figure 3.2 Typical NBN Pit and Duct Installation

The individual property owners would be responsible for lodging applications to NBN Co. to obtain incoming fibre optic connections from the neatest fibre optic splitter, typically located in the underground pits.

The network will include a main incoming fibre optic trunk installed from an existing NBN telecom exchange located in the Forbes CBD, typically within the existing road reserves.

The main fibre optic distribution point and cable route would be established by NBN's Planning Team as part of the network design review process. An indicative cable route is indicated in the following image.



Figure 3.3 Indicative Route of NBN connection at existing Forbes CBD

4. Water and sewer services

4.1 Introduction

Council is currently in the process of updating their sewer and water models, in anticipation of residential growth and subsequent demand/infrastructure needs. Therefore, a detailed review of the existing Forbes water and sewer networks has not been performed by GHD at this stage.

The ultimate infrastructure to service the water and sewer requirements of the new development area will most likely be independent from the existing networks, as indicated by Council in a meeting held on 4 August 2023. This will be confirmed by Council in due course. It is understood the Forbes Water Treatment Plant (WTP) can supply the water demands and the Forbes Sewage Treatment Plant (STP) has capacity to accept sewage loads from the new developed area.

As advised by Allera, developments south of Cypress Lane is likely to be developed in the first phase. See area illustrated in Figure 4.1 below.

This area should be able to be serviced via the existing gravity main, through existing infrastructure. Internal reticulation will be required. As the development continues, this will require additional infrastructure (at minimum a sewer pump station). Based on discussions with Council, the existing water and sewer networks are assumed to have capacity to serve the initial demands and loads of the area south of Cypress Lane.



Figure 4.1 First Phase, south of Cypress Lane

4.2 Water and sewer services assumptions

– Developed lots within south of Cypress Lane can be supplied by the existing township's water supply network. The capacity of the existing supply to be confirmed by Council once the hydraulic modellings are complete.

4.3 Water demand and sewer load assessment

Water demands and sewer loads were determined using the following Regional WSAA methodologies in the following two codes:

– WSAA-02 – Sewerage Code of Australia
– WSAA-03 – Water Supply Code of Australia

Specific values if not provided within the Regional WSAA were sourced from Hunter Water or Sydney WSAA variation of the as mentioned codes.

From GHD's current understanding of the masterplan information provided by Allera, the new development area is approximately 92.4 ha, consisting of 80.8 ha of which is dedicated for the new residential lots and road development, 1.6 ha for a neighbourhood centre and 10.0 ha for open space and conservation. The proposed residential development encompasses approximately 745 lots. Each lot will vary in size per 'type' of lot (350 to 800 m^2) with an average size of 700 m^2 across the project.

Flows were calculated using staging projections of 30 lot increments as advised by Allera. At this stage, it is estimated 2-3 stages will be developed per year for a total of 25 stages over fifteen years. The staging projections and estimated developments per year are subject to change based on demand. Residential lots in the first phase of development south of Cypress Lane covers the initial five stages of the whole development. The development of this initial area is estimated to take 2-3 years i.e. to be completed in 2025-2026.

A population factor of 2.5 per lot and an equivalent population (EP) factor of 3.5 per lot was applied to the number of developed lots to determine populations for water and sewer projections respectively as seen in Figure 4.1. EP was the basis for sewer loads, while population was for water demands. The cumulative development EP and population of the residential area are 2,770 and 1,855, respectively. The EP for the parklands and commercial area were calculated based on a 5 EP/Ha and 75 EP/Ha respectively as sourced from Sydney WSAA-03. Therefore, parklands have an estimated EP of 183 and commercial with 127. To note the Sydney WSAA-03 states a 20 EP/Ha for parklands. This has been modified to 5 EP/Ha for appropriateness for regional townships as potable water conservation is typically a focus.

The cumulative EP and population estimations are presented in the table below.

Table 4.1 Cumulative lots, EP, and population summary

	Small lots (350 m^2)	Medium lots (500 m^2)	Large lots (800 m^2)	Cumulative development lots	Cumulative development population	Cumulative development EP
First Phase, South of Cypress Lane	24	9	121	154	385	539
Commercial	-	-	-	-	-	120
Parklands	-	-	-	-	-	50
Ultimate development[1]	80	132	533	745	1,855	2,778

1. Includes all residential lots (including those within the first phase), parkland and commercial.
2. Note the number of lot sizes are specified in this table to be categorised in accordance with WSAA-02 – Sewerage Code of Australia. The numbers and sizes of the lots will vary in size per 'type' of lot (350 to 800 m^2) with an average size of 700 m^2.

4.3.1 Water demand

To determine a standard lot water demand, a residential average day demand of 0.96 kL/lot/day and commercial demand of 11.5 kL/ha/day were sourced from the Hunter Water WSAA-03 code. A 1 kL/day demand was assumed for the parklands within the development for allowances such as park maintenance and watering, drinking fountains etc. See tabulated water demands in Table 4.2 below.

Table 4.2 Residential water demand

	Average Day Demand (ADD)			Peak Day Demand (PDD)		Peak Hour Demand (PHD)
	L/s	ML/d	ML/y	L/s	ML/d	L/s
First Phase, South of Cypress Lane	1.70	0.10	54.0	3.70	0.30	11.0
Commercial only	0.22	0.02	6.9	0.35	0.03	0.69
Parklands only	0.01	0.001	0.4	0.02	0.002	0.03
Ultimate development[1]	8.48	0.73	268.1	17.5	1.5	42.3
1. Includes all residential lots (including those within the first phase), parkland and commercial.						

An ultimate development PDD of 17.5 L/s was estimated for the new ForbesView development. This will be used to determine the infrastructure required for the water services for the entire development.

PDD of first phase has an estimated water demand of 3.7 L/s as determined above.

4.3.2 Sewer load

The calculated sewer loads using the methodology outlined in the Regional WSAA for the staged ForbesView development as well as for the residential lots within the first phase are shown in Table 4.3.

Table 4.3 Residential sewer loads

	Average Dry Weather Flow (ADWF)		Peak Dry Weather Flow (PDWF)		Peak Wet Weather Flow (PWWF)	
	L/s	ML/y	L/s	ML/d	L/s	ML/d
First Phase, South of Cypress Lane	1.13	35.7	4.64	0.40	9.5	0.8
Commercial	0.25	7.9	1.53	0.13	2.2	0.2
Parklands	0.11	3.3	0.75	0.07	8.0	0.7
Ultimate development	5.83	183.9	17.94	1.55	45.0	3.9

A total PWWF of 45.8 L/s was estimated for the entire ForbesView development. This will be used to establish the required infrastructure to provide sewer services for the whole of ForbesView.

The estimated PWWF sewer load for the residential lots within the first phase is 9.5 L/s.

4.4 Water and sewer – First phase servicing

4.4.1 Water

FSC indicated the developed areas south of Cypress Lane, known as the first phase, can be serviced by the existing township's water supply network. The proposed connection point will be to the existing DN225 pipe laid along Morton St. Following the WSAA-03 criteria on minimum pipe diameters. A DN150 pipe is proposed to supply the initial development. Figure 4.2 below illustrates two proposed water network augmentations. Council have confirmed option two to be the preferred method, to connect to the existing DN225 water main along Morton St.

A detailed review of the existing Forbes water and sewer networks is not part of the scope. Council is currently undertaking this update in anticipation of residential growth and subsequent demand/infrastructure needs.

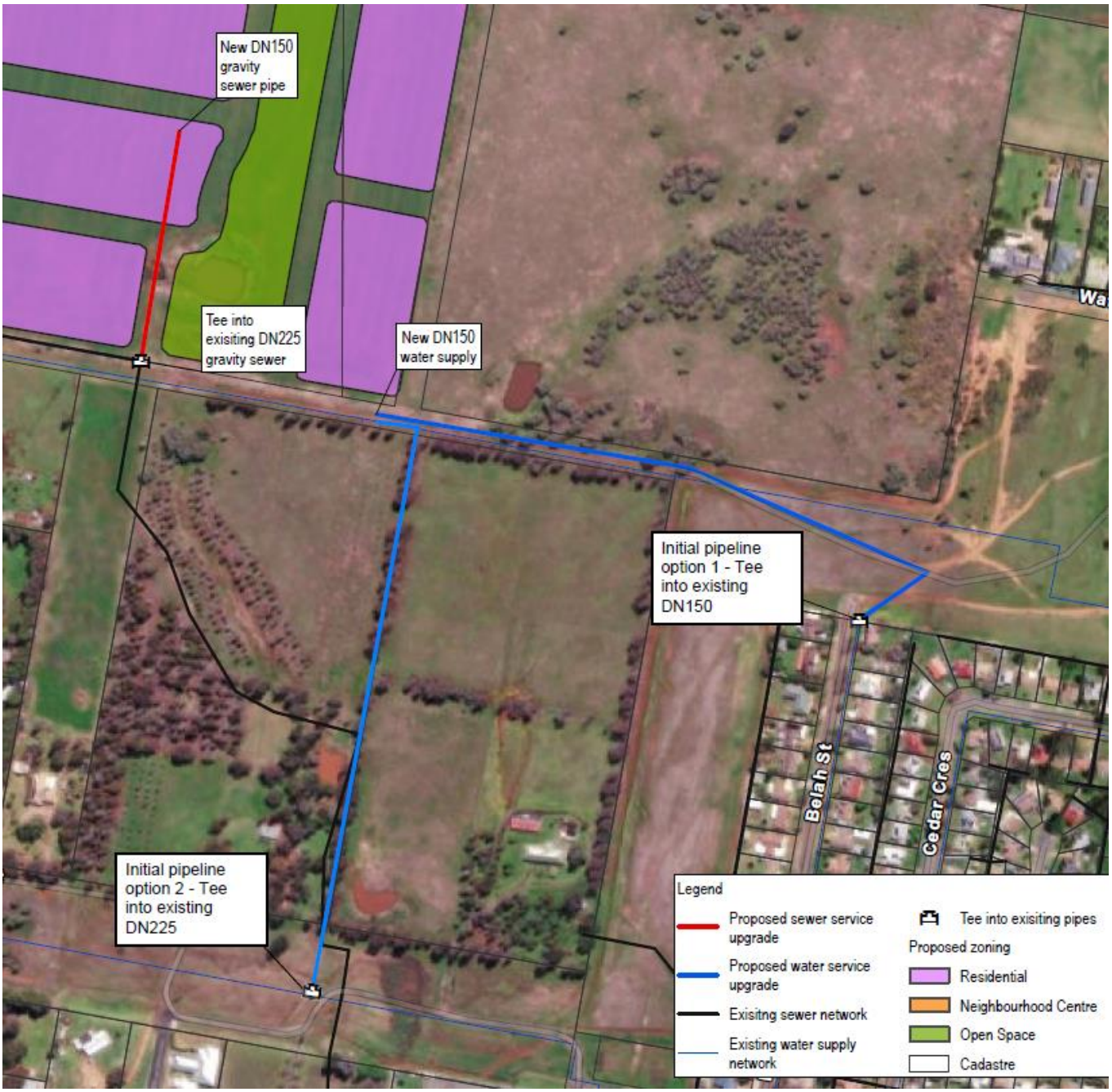


Figure 4.2 Initial development water and sewer servicing

According to Council, the lots south of Cypress Lane will continue to be serviced by the existing main along Morton Street, unless further design indicates otherwise. There will be further development (e.g. the reservoir) but at this stage, the intention would be to retain the connection for these lots from Morton street. A concept design layout for the water network is presented in Appendix A.

4.4.2 Sewer

Similar to the approach outlined above, the existing sewer network can service the initially developed area south of Cypress Lane. A new DN150 sewer main is proposed to connect to the existing DN225 gravity pipe in Morton St that currently services the Catholic Healthcare Jemalong Residential Village as well as Council's own “Goldridge Estate” residential development. Figure 4.2 presents the proposed sewer network augmentation. Flow from this area will discharge into the catchment of SPS 18 located along Bogan Gate Road, opposite Forbes Cemetery. Assuming pipeline will tee off to the existing sewer main with a depth of 2 m, the typical depths of the proposed pipelines in the first phase will range from 0.75 m to 2.1 m approximately.

Council intends to upgrade the existing sewer system such that SPS 18 can handle flows from the first phase and Goldridge Estate. Future infrastructures will be required to service the remainder of the development. This required infrastructure will be defined by Council once the sewer network model is updated. A concept design layout for the sewer network is presented in Appendix B

5. Conclusion

This report summarises the investigations related to the infrastructure delivery strategies for the development site at the Forbes School Road Proposal. Based on the assessments in this report, the proposed development can be.

Water

Initial development of the lots south of Cypress Lane are serviced by Council's existing water network via extension of the DN225 pipe laid along Morton Street. This will service the first 150 lots approximately and is expected to take the development through to around 2026.

Subsequent future development north of Cypress Lane will require new infrastructure. Through consultation with Forbes Shire Council, GHD understands that Council are currently updating the water system model, which will determine the ultimate needs and required upgrades to ensure that the future growth of Forbes can be accommodated, including delivery timing and methodology.

Sewer

Initial development of the lots south of Cypress Lane are serviced by Council's existing sewer network by extending the SPS18 gravity catchment via a new DN150 pipe attached to the existing DN225 gravity pipe along Morton Street. This will service the first 150 lots approximately.

Subsequent future development north of Cypress Lane will require new infrastructure. Through consultation with Forbes Shire Council, GHD understands that Council are currently updating the sewer system model, which will determine the ultimate needs and required upgrades to ensure that the future growth of Forbes can be accommodated, including delivery timing and methodology.

Appendix A

Water network layout

LEGEND

Water Trunk Main

Water Mains/Reticulation

Elevated Reservoir

Initial water connection for area south of Cypress Lane

School Road

Water Tower (Option)

Hospital Reservation

Bowls club

Detention Basin

Kick around park

Playground and BBQ area

Neighbourhood Park

Shared Pathway

Ornamental Lake

Jemalong Residential Village

Jemalong Wilderness School

Future Residential Area

Stage 1 Town Centre

Aged Care

New housing subdivision

0 100 200 300m

SCALE 1:10,000 AT ORIGINAL SIZE

Rev	Description	Checked	Approved	Date
Author	Drafting Check			
Designer	Design Check			

GHD Tower, Level 3 24 Honeysuckle Drive
Newcastle NSW 2300 Australia
PO Box 5403 Hunter Rgn Mail Cent. NSW 2310
T 61 2 4979 9999 F 61 2 4979 9988
E ntlmail@ghd.com W www.ghd.com
www.ghd.com

Conditions of Use. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Project No. 12613388

Client: Forbes Shire Council

Project: Planning proposal for School Rd, Forbe

Status: For Discussion

Drawing Title: Forbes View Concept Water Network Master Plan

Size: A3

Drawing No.:

Rev

Plot Date: 25 September 2023 - 4:53 PM Plotted by: Yasser Khaleghian

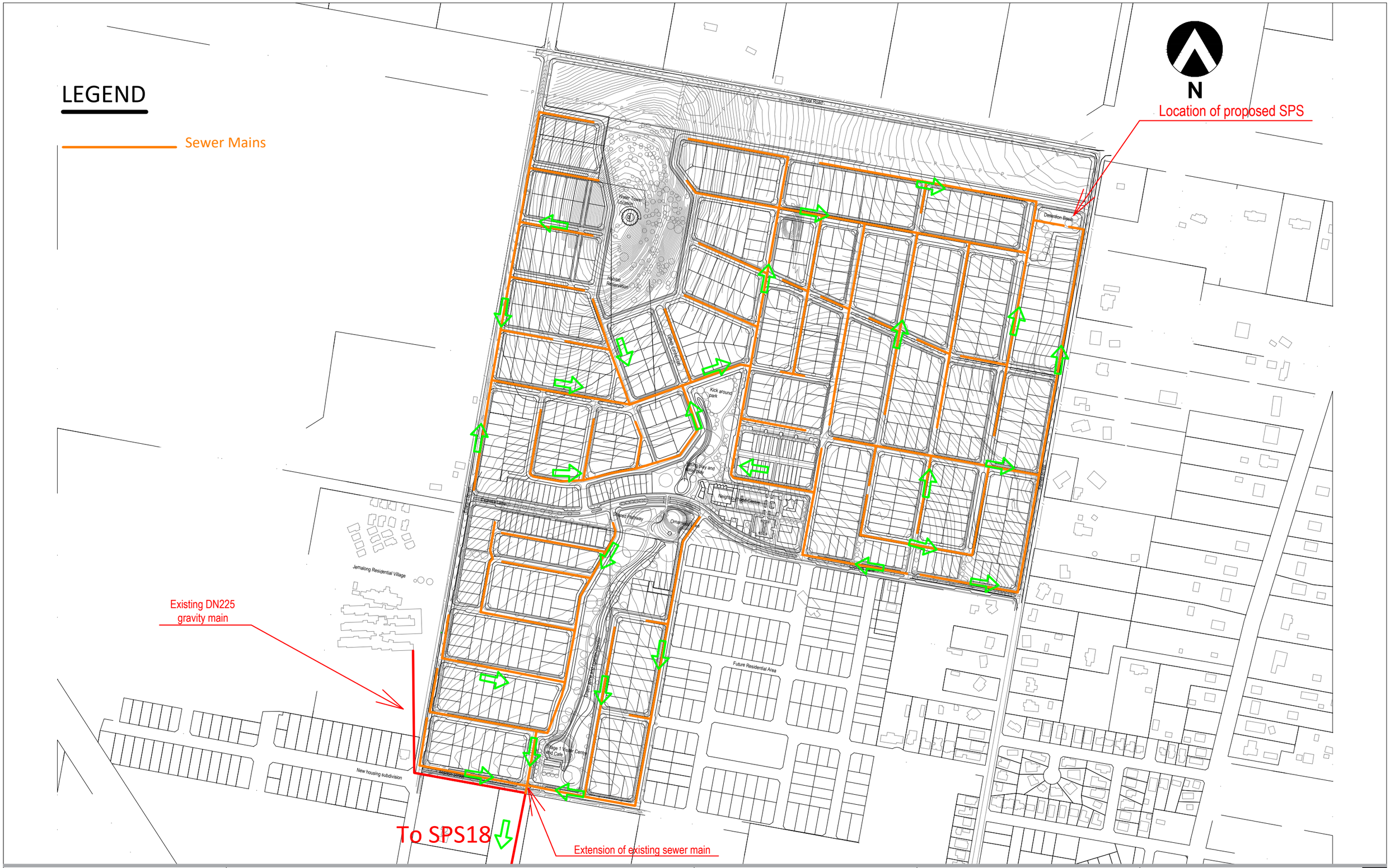
File Name: \\ghdnet\ghd\AU\Newcastle\Projects\22\12613388\Tech\Design\Water and Sewer\Water\CAD\2023-09-25\H371649_MasterPlan_230925_Watermains_Layout.dwg

Appendix B

Sewer network layout

LEGEND

Sewer Mains



Rev	Description	Checked	Approved	Date
Author	Drafting Check	Reg No.		
Designer	Design Check	Date		

0 100 200 300m

SCALE 1:10,000 AT ORIGINAL SIZE

GHD Tower, Level 3 24 Honeysuckle Drive
Newcastle NSW 2300 Australia
PO Box 5403 Hunter Rgn Mail Cent. NSW 2310
T 61 2 4979 9999 F 61 2 4979 9988
E ntlmail@ghd.com W www.ghd.com
www.ghd.com

Conditions of Use. This document may only be used by GHD's client (and any other person who GHD has agreed can use this document) for the purpose for which it was prepared and must not be used by any other person or for any other purpose.

Project No. 12613388

Client: Forbes Shire Council

Project: Planning proposal for School Rd, Forbes

Status: For Discussion

Drawing Title: Forbes View Concept Sewer Master Plan

Size: A3

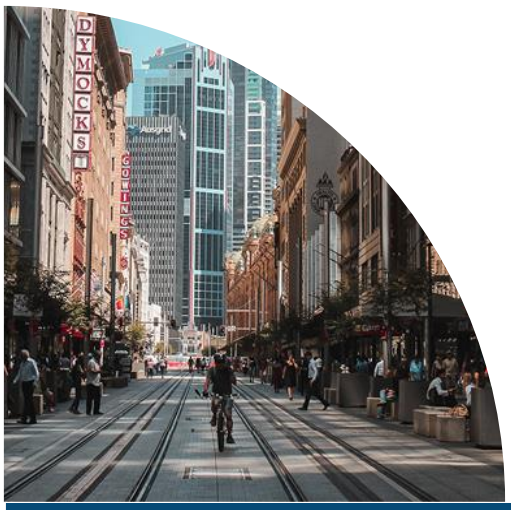
Drawing No.: Rev

Plot Date: 22 September 2023 - 5:57 PM Plotted by: Yasser Khaleghian File Name: \\ghdnet\ghd\AU\Newcastle\Projects\22\12613388\Tech\Design\Water and Sewer\Sewer\CAD\2023-09-22\H371649_MasterPlan_230922_Sewermains_Layout.dwg

ghd.com

The Power of Commitment

Appendix 8 - Transport Impact Assessment



CROSSLEY

Stephanie Crossley
executive director
m +61 498 641 687
e stephanie@crossleytp.com.au
crossleytp.com.au

School Road, Forbes Transport Impact Assessment

Rev B





Quality Assurance

Project Details

Project	School Road, Forbes – Transport Impact Assessment		
Project Reference	P2231	Contract Number	
Client	Allera	ABN	
Prepared by	Crossley Transport Planning	ABN	18 632 881 602

Document Revision Register

Revision	Status	Prepared By	Checked By	Approved By
A	Final	Kevin Nathaniel	Kirk Martinez	Kirk Martinez
		25/09/2023	25/09/2023	25/09/2023
B	Final (update traffic impacts)	Kerry Tran	Kirk Martinez	Kirk Martinez
		27/09/2023	27/09/2023	27/09/2023

Disclaimer

This report (including any enclosures and attachments) has been prepared by Crossley Transport Planning Pty Ltd on the request of Allera. The report is for the exclusive use and benefit of Allera and solely for the purpose set out in the engagement documentation. Unless we provide express prior written consent, no part of this report should be reproduced, distributed or communicated to any third party. We do not accept any liability if this report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report.

The information, statements, statistics and commentary (together the 'Information') contained in this Report have been prepared by Crossley Transport Planning from publicly available material, from discussions with Stakeholders and data provided by the client. Crossley Transport Planning does not express an opinion on the accuracy or completeness of the information provided, the assumptions made by the parties that provided the information or any conclusions reached by those parties.

Crossley have based this Report on information received or obtained on the basis that such information is accurate and complete. The information contained in this Report has not been subject to an audit.

Table of Contents

Quality Assurance 2
1 Introduction 4
1.1 Project background 4
1.2 Scope 4
1.3 Study Area 4
1.4 Literature Review 5
1.5 Purpose of the report 7
2 Existing Site Condition 8
2.1 Road Network 8
2.2 Public Transport 9
2.3 Cycling and Walking 10
2.4 Crash Analysis 11
2.5 Traffic Counts 13
2.6 SIDRA Outputs Criteria 15
2.7 Intersection Analysis and Results (Current Condition, 2023) 17
3 Development Scheme 18
3.1 Vehicular Access 19
3.2 Proposed Internal Road Network 19
3.3 Phasing of Development 20
3.4 Servicing 20
4 Traffic Impacts 21
4.1 Traffic Generation Rates 21
4.2 Traffic Distribution and Assumptions 22
4.3 Phase 1 Intersection Analysis (year 2025) 23
4.4 Phase 2 (50% complete) Intersection Analysis (year 2030) 25
4.5 Phase 3 (100% completion) Intersection Analysis (year 2035) 27
5 Conclusion 30
Appendix A Concept Plans 31
Appendix B Traffic Surveys 32
Appendix C SIDRA Outputs 33

1 Introduction

1.1 Project background

Allera is proposing a rezoning of 92 hectares of land within the Forbes Shire Council to construct 742 residential dwellings and other mixed use developments to support the housing needs in Forbes.

1.2 Scope

Crossley Transport Planning (CTP) has been commissioned by Allera to carry out a Transport Impact Assessment (TIA) to determine the potential impacts of the proposed development on the operation and safety of the surrounding road network. The outcomes of the TIA will be used in support of a planning proposal for the site, which will be assessed by Forbes Shire Council (Council).

The study addresses the key topics related to traffic and transport impacts typically associated with the proposed development to include:

- Existing transport conditions surrounding the site
- Strategic planning context
- Traffic generating characteristics of the proposed development
- Transport impact of the planning proposal on the surrounding road network.

1.3 Study Area

The proposed development (subject site) has a total area of approximately 920,000 sqm and is located on Lots 375, 376, 386, 387, 388, 389, 830, 831, and 1273 in DP 750158. The subject site has been zoned as RU1 (Primary Production), R5 (Large Lot Residential), and RE1 (Public Recreation).

Figure 1-1 and **Figure 1-2** illustrates the location of the site in aerial view.



Figure 1-1: Aerial View of the Subject Site (Source: Nearmap, dated 19th March 2023)

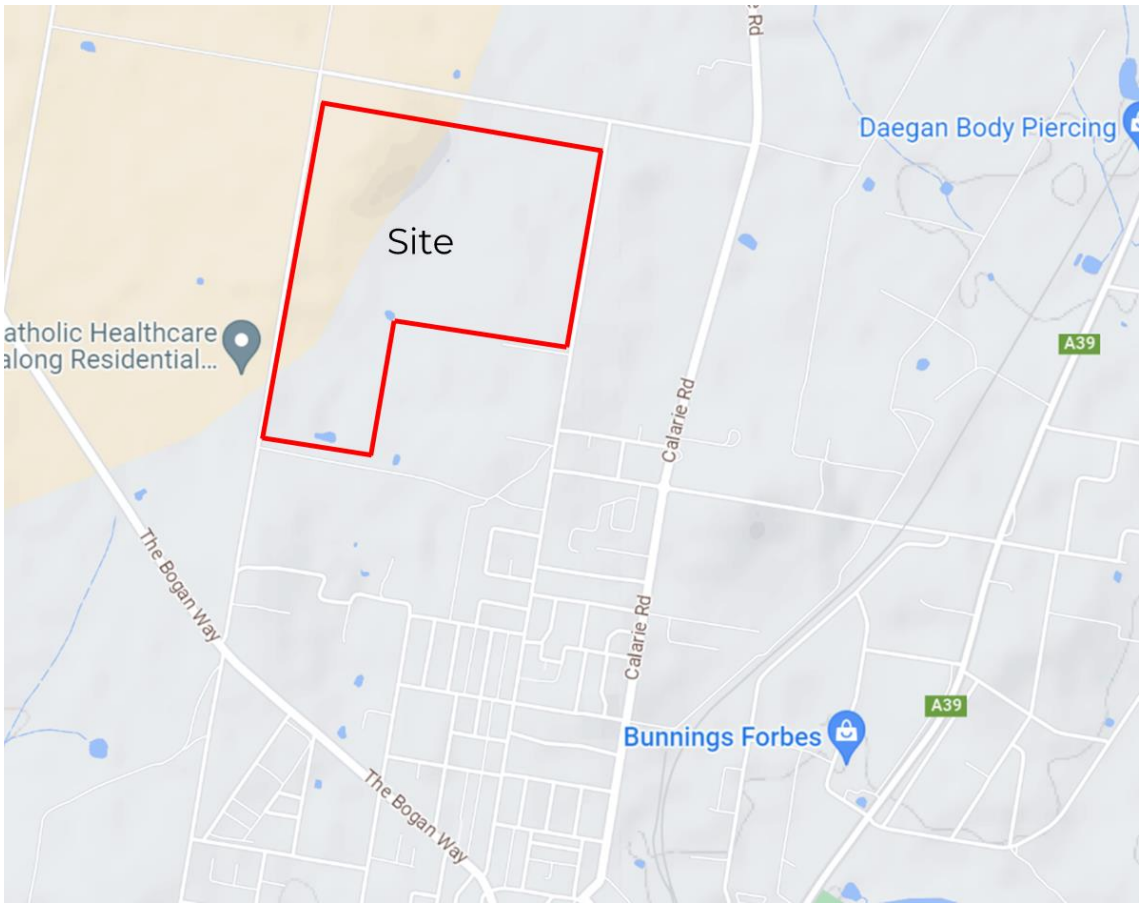


Figure 1-2 Road network surrounding the subject site (Source: Google Map)

1.4 Literature Review

Local policies, strategies and plans frame the planning intent and the aspired outcome for the region. A review of policies has been undertaken to help frame and align opportunity generation from this project with the vision for the region.

1.4.1 Forbes Housing Strategy 2021-2041

This strategy outlined the trend, opportunity, and issues of Forbes Shire to grow and provide the supply for the future housing demand in the existing residential area and the proposed urban expansion area.

Currently, there are 10,023 people living in Forbes Shire with 80% of the population residing in the city center. It is projected that the population will rise to 13,231 in 2041 with 1,819 new housing needs.

To address future housing supply, Council has outlined a priority for the development of serviced residential land estates. They have estimated that a reserve of serviced residential zoned land of approximately 238 hectares needs to be made available in response to any potential housing demands.

Furthermore, it is approximated that more than 75% of the residents travel by private motor vehicle. To accommodate the increase in traffic as a result of the increase In population, it is necessary to assess the capacity of the local road network such that adequate accessibility to the residents is maintained/provided.

Council have noted that an integrated planning approach should be adopted to assess the urban road network to properly manage urban growth and traffic-related

issues. This report will aim to assess the performance of the roads and intersections around the proposed residential development in response to the urban release program.

1.4.2 The Forbes Local Strategic Planning Statement (LSPS) 2040

This strategic planning provides the information of planning priorities of Forbes Shire area for the future. Based on the Department of Planning, Infrastructure and Environment, it is estimated that the area will experience a growth of 5% in 20 years.

The key objectives of The Forbes Local Strategic Planning Statement (LSPS) 2040 is as follows:

- Accommodating future growth and community needs of the area.
- Conservation of environment, heritage and local character of the area.
- Providing support to boost the diverse economy and industry of the area.
- Linking the local's strategic vision with the region and state vision to achieve the best outcomes for the area.
- Ensuring land zonings will accommodate the investment and growth in the Shire expected from infrastructure upgrades

This assessment will aim to assess the traffic impacts of the rezoning of 92 hectares of land within the Forbes Shire Council to construct 742 residential dwellings and other land use developments, as well as providing recommendations to support these key objectives for the desired growth of the northern Forbes township.

1.4.3 Forbes Community Strategic Plan (CSP) 2018-2028

The Forbes Community Strategic Plan is a document that outlines the collective vision, goals, and the community priorities for a ten-year period. This document is prepared in accordance with the principles of social justice and sustainability.

The Forbes Community Strategic Plan is built upon six key directions:

- Community and Culture
- Local Economy
- Natural Environment
- Rural and Urban Land use
- Infrastructure and Services
- Government and Representation

The findings of the document outlined that there is a need to identify new residential subdivisions and industrial precincts to accommodate future population growth while maintaining local agricultural land.

1.5 Purpose of the report

The purpose of this report is to present the likely traffic and transport impacts of the proposed development, and if any traffic mitigation strategies are required. The report has the following structure:

- Section 1: Introduction and a brief description of the proposal
- Section 2: Description of the existing conditions surrounding the site
- Section 3: Description of the proposed development
- Section 4: Determination of the traffic activity associated with the proposed development and assessment of the surrounding road network
- Section 5: Conclusion

2 Existing Site Condition

2.1 Road Network

The existing road network surrounding the subject site is comprised of the following roads (refer to **Figure 2-1**):

- **School Road** – serves as a local road which provides access to the surrounding residential areas. The road runs east-west along the northern boundary of the site and is governed by a speed limit of 50 km/hr.
- **Edward Street** – serves as the main road which connects the site and the surrounding area and offers a direct connection to the school's vicinity. The road runs north-south and is also governed by a speed limit of 50 km/hr.
- **The Bogan Way** - serves as a significant connector road, intersecting with other key roads in the area. It serves as a vital link to the local centre. The road runs northwest-southeast and is governed by a speed limit of 80 km/hr.
- **Farnell Street** – serves as a vital road that provides access to the surrounding residential areas. The road runs north-south and is governed by a speed limit of 50 km/hr.



Figure 2-1: Aerial View of the Surrounding Roads Subject to the Site (Source: Nearmap)

2.2 Public Transport

The nearest bus stop is located at the southern boundary of the subject site, along Farnell Street. **Table 2-1** summarises the bus routes and frequencies of each bus routes within the area. **Figure 2-2** shows the existing bus stop locations near the subject site.

Table 2-1 Bus Routes and Frequencies

Route	Type	Destinations	Frequency During Weekday (AM)	Frequency During Weekday (PM)
586	Public Bus	Forbes Town Centre to Forbes Dawson Street via Edward Street	Every 2 hours	Every 2 hours
587	Public Bus	Forbes Town Centre to Forbes Alder Street via Calarie Road	Every 1 hour	Every 1 hour



Figure 2-2 Existing Bus Stop Locations

2.3 Cycling and Walking

There are currently no pedestrian footpaths provided near the subject site. A bicycle lane is provided along Calarie Street, but no bicycle lane is provided to the site or along the boundary of the site. The walking and cycling infrastructure available around the site are shown in **Figure 2-3**.

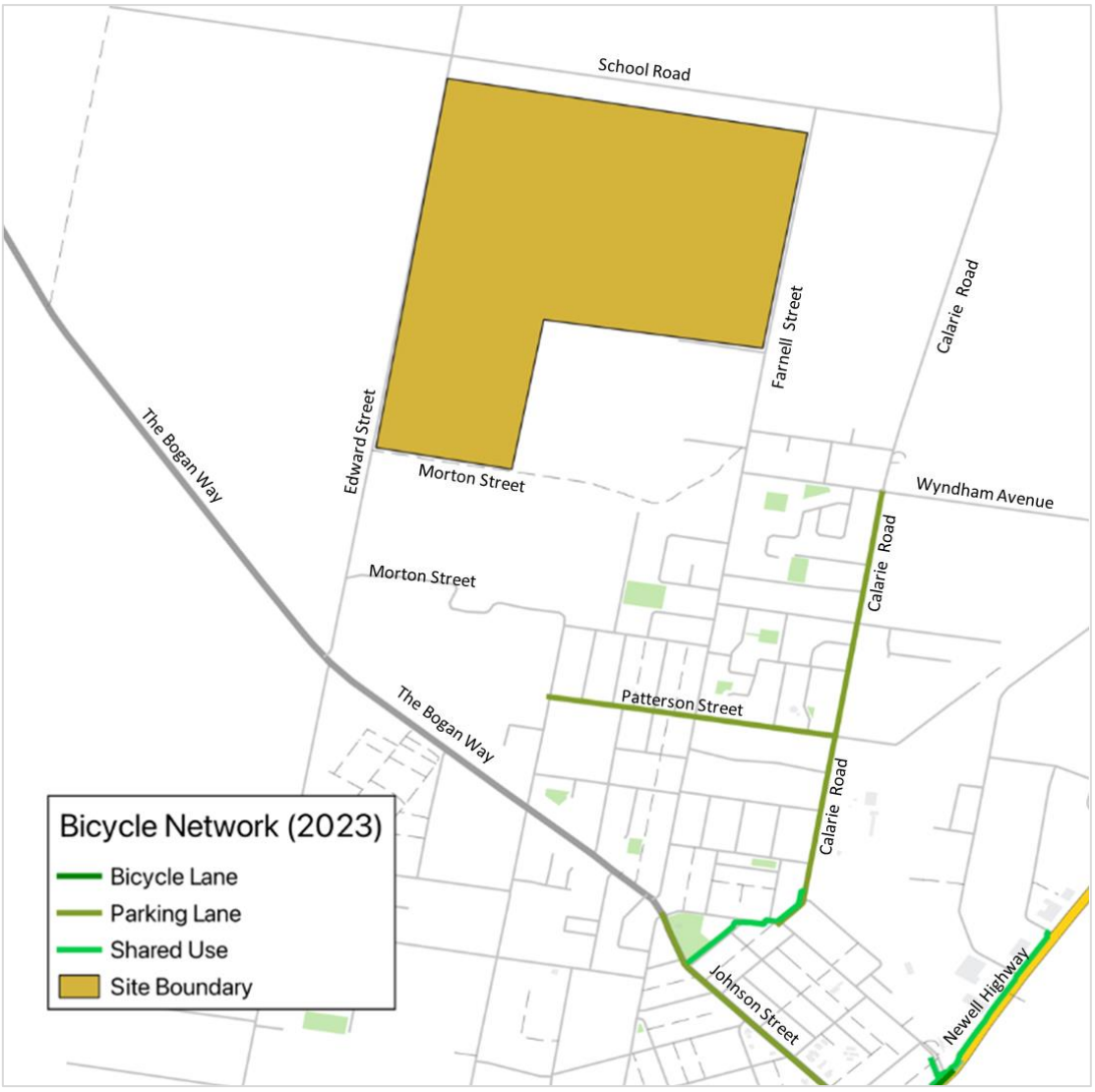


Figure 2-3 Bicycle network around the proposed residential development (TfNSW Open Data)

Following that, Forbes Shire Council is currently installing a wide shared footpath on Bogan Street and Edward Street, connecting the town centre and the residential area. The shared footpath design is shown in **Figure 2-4**

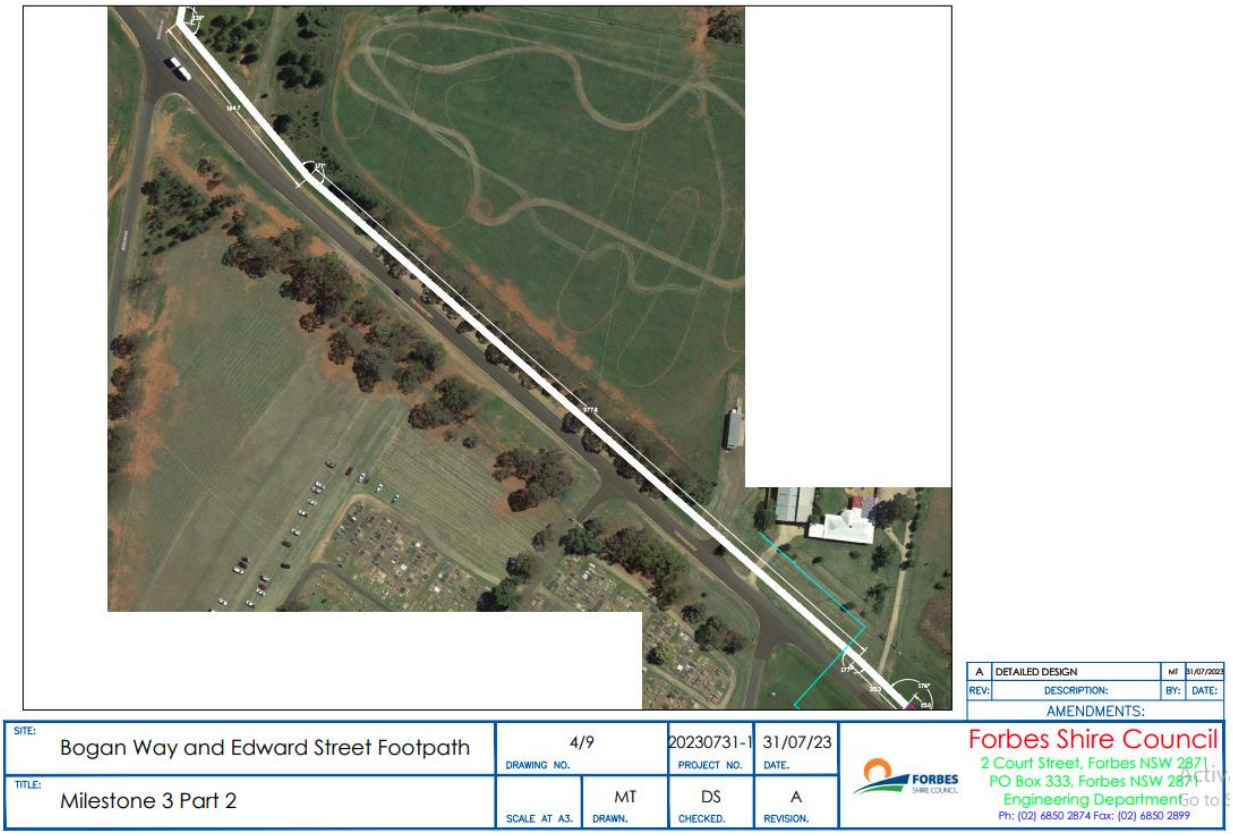


Figure 2-4 Shared Footpath Design at the Bogan Way and Edward Street (Source: Forbes Shire Council)

2.4 Crash Analysis

The crash history data within a 2 kilometres radius of the subject site was sourced from Transport for NSW (TfNSW) for the period 2017 to 2021. A total of 20 crashes were reported around the subject site during the 5-year period and are shown in **Figure 2-5**. Majority of the crashes involved are mainly moderate injury crashes which occurred at intersections located in the residential areas.

Two crashes occurred at the site boundary with no casualty. One of the crashes resulted in a moderate injury crash which occurred in 2019 along Edward Street within an 80km/hr speed limit. It was during daytime with dry conditions, and involved a light truck.
The other crash was a non-casualty crash that took place in 2020 along Farnell Street within an 50km/hr speed limit. It occurred at night with dry conditions involving a light truck going off the carriageway.

These crashes are not indicative of any inherent safety issue associated with the subject site.



Figure 2-5 Crash history around proposed residential development

2.5 Traffic Counts

Traffic counts of 3 intersections within proximity of the subject site (refer to Figure 2-6) were undertaken on Tuesday, 23 June 2023 to assess the traffic impacts and form inputs into the traffic modelling assessment.

These three survey intersections include:

- Johnson Street / Barton Street / Farnell Street
- The Bogan Way / Edward Street
- Farnell Street / Wyndham Avenue

The three intersection locations were consulted and confirmed with the Forbes Shire Council prior to conducting the traffic count.



Figure 2-6 Traffic survey locations

The morning and evening peak hours for each of the respective intersections are summarised in **Table 2-2.** The raw traffic survey data are provided in **Appendix B**.

Table 2-2 Traffic peak hour for AM and PM period

Intersection	AM Peak Hour	PM Peak Hour
Johnson Street / Barton Street	8:15 – 9:15	15:30 – 16:30
The Bogan Way / Edward Street	8:15 – 9:15	16:00 – 17:00
Farnell Street / Wyndham Avenue	8:15 – 9:15	15:00 – 16:00

Note: To conduct the traffic modeling assessment during the evening peak periods, we have designated the timeframe from 16:00 to 17:00 for analysis at the three intersections.

Figure 2-7, **Figure 2-8**, and **Figure 2-9** present the total vehicle movements at each of the surveyed intersections for the AM and PM peak hours respectively.

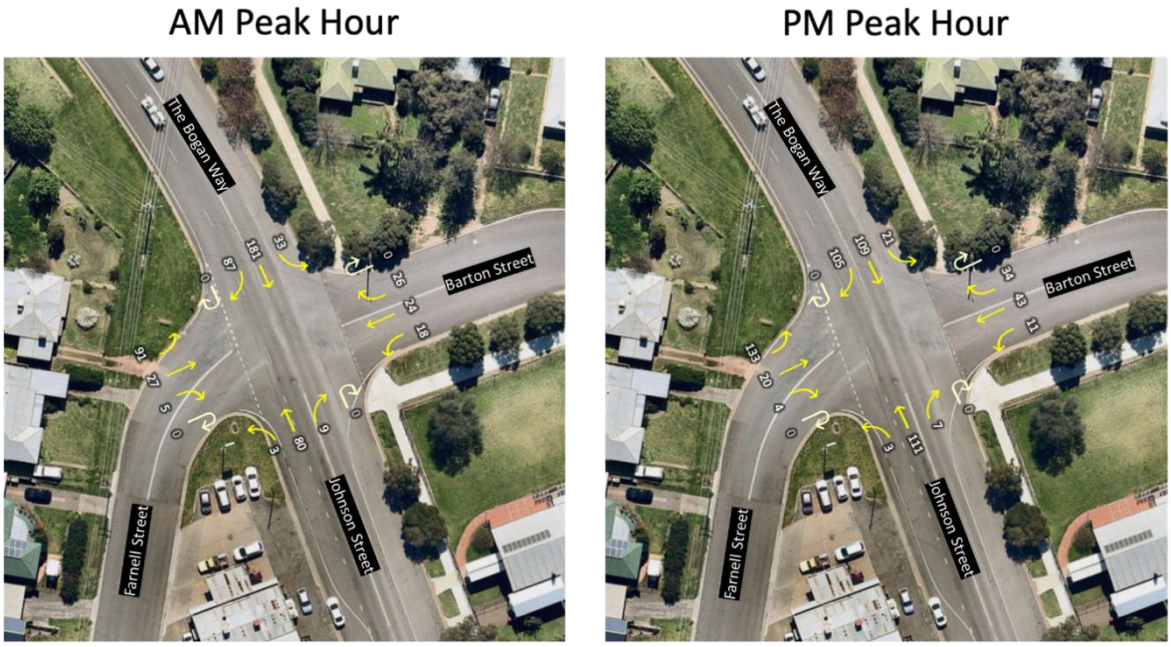


Figure 2-7 Intersection movement counts at Johnson Street and Barton Street

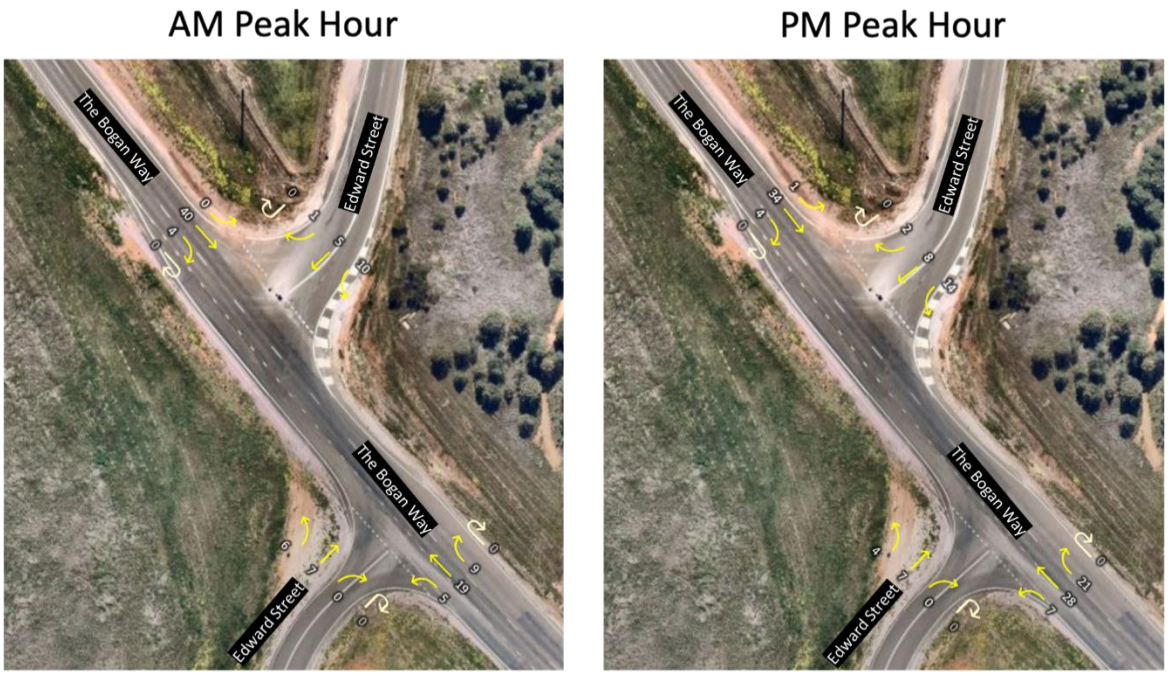
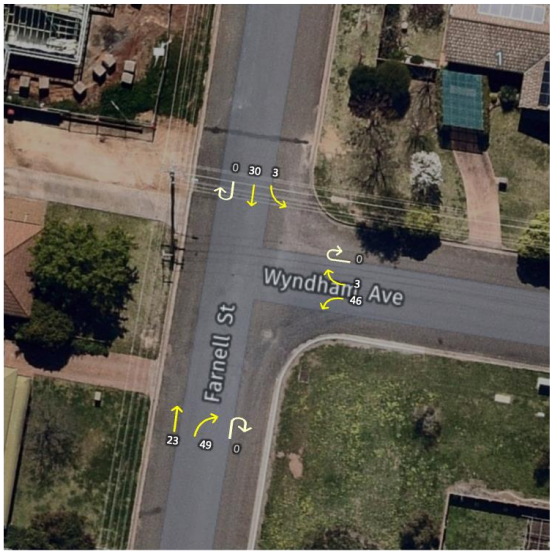


Figure 2-8 Intersection movement counts at The Bogan Way and Edward Street

AM Peak Hour



PM Peak Hour

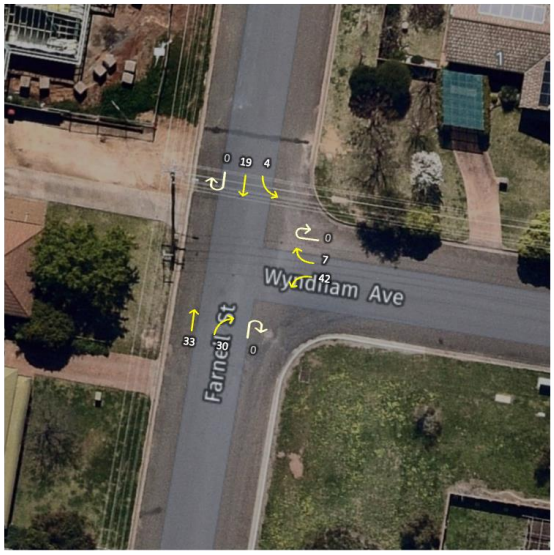


Figure 2-9 Intersection movement counts at Farnell Street and Wyndham Avenue

2.6 SIDRA Outputs Criteria

The assessment of the intersection was undertaken for the morning and afternoon peak periods using SIDRA INTERSECTION 9.1 (SIDRA), developed by SIDRA Solutions. SIDRA was the selected tool, as it is the most suitable software package for undertaking micro-analytical modelling. It provides information about the capacity of the intersection in terms of a range of parameters. A definition of these parameters are as follows:

- Level of Service (LOS): is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. **Table 2-3** shows the level of service criteria for a various intersection treatments, extracted from the Guide to Traffic Generating Developments.
- Average Delay: is the average of all travel time delays for vehicles through the intersection.
- Degree of saturation: The ratio of arrival (demand) flow rate to capacity during a given flow period.

Table 2-3 Level of Service (LoS) for all types of intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 15 seconds	Good operation	Good operation
B	15 to 28 seconds	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 43 seconds	Satisfactory	Satisfactory, but accident study required
D	43 to 56 seconds	Operating Near Capacity	Near capacity and accident study required
E	57 to 70 seconds	At capacity; at signals incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70 seconds	The amount of traffic approaching the point under consideration exceeds that which can pass it.	The amount of traffic approaching the point under consideration exceeds that which can pass it.

Source: Traffic Modelling Guidelines 2013 (RTA)

The following provides a description of each level of service category:

Level of Service A (LoS A):
LoS A represents the best operating conditions at an intersection. It indicates minimal delays, short queues, and efficient traffic flow. In terms of SIDRA modelling, intersections assigned to LoS A typically exhibit high capacities, low control delay, and short queue lengths. Vehicles can move through the intersection smoothly with minimal disruptions.

Level of Service B (LoS B):
LoS B indicates a high level of operational efficiency, but with slightly more congestion compared to LoS A. The delays and queues at the intersection are still relatively low, but there may be a slight decrease in traffic flow compared to LoS A. Intersections assigned to LoS B in SIDRA modelling generally maintain good capacities and reasonably low delays, ensuring acceptable levels of service for motorists.

Level of Service C (LoS C):
LoS C represents an intermediate level of service, where traffic congestion and delays begin to increase. Intersections assigned to LoS C may experience moderate queues and slightly longer delays compared to LoS A and B. Traffic flow is still relatively smooth, but there might be occasional interruptions and minor disruptions. The capacity of the intersection is typically lower than LoS A and B, indicating a moderately congested condition.

Level of Service D (LoS D):
LoS D indicates a moderate level of congestion and delays at an intersection. Intersections assigned to LoS D experience significant queues and delays during peak hours. Traffic flow is slower, and vehicles may have to wait for multiple signal cycles before being able to proceed through the intersection. Capacity is noticeably reduced, leading to longer delays and increased travel times.

Level of Service E (LoS E):
LoS E represents a high level of congestion and delays. Intersections assigned to LoS E face severe queues, lengthy delays, and significantly reduced traffic flow. Vehicles may experience multiple cycles of waiting before getting a chance to proceed, leading to frustration and longer travel times. The capacity of the intersection is considerably compromised, resulting in poor service quality.

Level of Service F (LoS F):
LoS F represents the worst operating conditions at an intersection. It indicates extreme congestion, long queues, and extensive delays. Intersections assigned to LoS F suffer from severe traffic congestion, where traffic may come to a standstill or move at an extremely slow pace. Vehicles experience extensive waiting times, resulting in significantly increased travel durations. The capacity of the intersection is overwhelmed, leading to extremely poor service quality.

2.7 Intersection Analysis and Results (Current Condition, 2023)

The key intersections has been assessed using SIDRA intersection modelling, focusing on the existing conditions. A summary of the intersections current operation is presented in **Table 2-4** and **Table 2-5**, while detailed results can be found in **Appendix C**.

Table 2-4 Existing Year 2023 AM Peak Results

Intersection	Average Delay (sec)	Level of Service (LoS)
The Bogan Way / Edward Street	7.1	A
Johnson Street / Barton Street / Farnell Street	11.9	A
Farnell Street / Wyndham Avenue	5.7	A

Table 2-5 Existing Year 2023 PM Peak Results

Intersection	Average Delay (sec)	Level of Service (LoS)
The Bogan Way / Edward Street	7.8	A
Johnson Street / Barton Street / Farnell Street	13.5	A
Farnell Street / Wyndham Avenue	5.7	A

Based on the SIDRA intersection results shown in **Table 2-4** and **Table 2-5**, the intersections surrounding the proposed subject site performs at a Level of Service A with ample capacity to accommodate for future traffic volumes.

3 Development Scheme

Allera is planning to rezone a 92-hectare land to facilitate the construction of 742 residential dwellings and other land use developments on the subject site. **Figure 3-1** presents the proposed masterplan for the subject site.



Figure 3-1 Proposed development of the subject site (Source: Hatch)

The proposed land use breakdown of the subject site is shown in **Table 3-1**. The land use details are intended for planning purposes only. It may subject to change.

Table 3-1 Proposed land use breakdown for the subject site

Land Use	Details
Residential	742 residential dwellings
Small Supermarket	850m^2
Specialty Shops	600m^2
Allied Health	850m^2
Childcare	100 place (700m^2)
Gym	950m^2

3.1 Vehicular Access

Proposed vehicular access to the subject site will be provided by key road Edwards Street and Farnell Street. At the early Phase, the main access will be via Morton Street.

3.2 Proposed Internal Road Network

The internal road network of the subject site will be provided via local and collector roads. The collector road will be serviced by a number of local roads which will distribute traffic to the local street network for residential access and other developments within the subject site.

The road network within the subject site would be developed as part of a site-specific Development Control Plan. This road network would be consistent with the relevant standards.

Table 3-2 Council road carriageway requirements

Traffic Volume (AADT)	Servicing No. of Lots	Hierarchy	Road Reserve Widths (min)	Vehicle Pavement Width (m)	Footpath Width (m)	Design Speed (Km/hr)
0-80	0 - 8	Minor Cul-de-sac	17	8	4.5	40
80-300	8 - 30	Cul-de-sac	18	9	4.5	60
300-800	30 - 80	Local Road	18	9	4.5	60
800-1500	80 - 150	Minor collector	20	1 1.0	4.5	60
1500-5000	> 150	Major Collector	22	13	4.5	70
5000+	>5,000	Distributor	22	13	4.5	70

3.3 Phasing of Development

Given the size of the proposed development, the construction of the subject site are likely to occur in the following three phases (subject to market demand):

- Phase 1 (2025): 30 residential dwellings.
- Phase 2, 50% complete (2030): 350 residential dwellings.
- Phase 3, 100% complete (2035): development of the full site to include 742 dwellings, small supermarket, specialty shops, allied health, childcare centre, and gym.

3.4 Servicing

Refuse collection will occur from the street by Council's collection service, which is typically a 9.9m rigid truck.

The design of the local roadways in this area will be suitable for on-street parking of service and delivery vehicles. The internal road system will be planned to accommodate the circulation of a 9.9m truck, and adhering to the Council's road width standards.

4 Traffic Impacts

The traffic impacts are assessed for four different scenarios:

- **Base case**: Assessment of the existing traffic volumes, based on the survey data (refer to **Section 2.7**).
- **Phase 1**: The future case scenario (2025) assesses the future traffic for the subject site with consideration of 30 residential dwellings. In addition, a background traffic growth rate is assumed to be 1.8 percent per annum.
- **Phase 2**: The future and development case scenario projects the overall traffic volumes in 2030, accounting for the additional traffic generated by the residential dwellings and other mixed use developments, which is expected to be approximately 50% completed.
- **Phase 3**: The future and development case scenario projects the total traffic for the year 2035, considering the additional traffic generated by the fully developed site.

4.1 Traffic Generation Rates

The 'Guide to Traffic Generating Development Version 2.2 (2002)' and 'Technical Direction Updated traffic surveys (TDT 2013/04a)' by RTA (RMS) outlines traffic generation rates for various development types.
In this assessment, CrossleyTP have applied the traffic generation rates as specified in these guidelines. The anticipated traffic generation for the development can be found in **Table 4-1**.

Table 4-1: Weekday peak (traffic generation rates)

Land use	Area / Dwellings / Place	Traffic generation rate Morning	Evening	Source
Residential	742 dwellings	0.85 trip per dwelling		TDT 2013/04a
Small Supermarket	850m²	12.3 trips per 100m² GLFA*		Guide to Traffic Generating Developments (2002)
Specialty Shops	600m²	This traffic generation will be included as part of the small supermarket rates. As noted in the 'Guide to Traffic Generating Developments 2022' these stores are grouped as they tend to not be primary attractors to the centre.		Guide to Traffic Generating Developments (2002)
Allied Health	850m²	10 trips per 100m² GFA	10 trips per 100m² GFA	Guide to Traffic Generating Developments (2002)

Land use	Area / Dwellings / Place	Traffic generation rate		Source
		Morning	Evening	
Childcare Centre	700m² / 100 place	0.8 trip per child	0.7 trip per child	Guide to Traffic Generating Developments (2002)
Gym	950m²	3 trips per 100m²	3 trips per 100m²	Guide to Traffic Generating Developments (2002)

Note: *Small supermarkets rates have not been identified in the Guide to Traffic Generating Developments (2002) or TDT 2013/04a. For this assessment the retail (shopping centres) traffic generation rate will be taken into consideration.

4.2 Traffic Distribution and Assumptions

Considering the characteristic trip types for the numerous land uses proposed for the subject site, the following assumptions have been considered for the trip distribution and assignment:

- Assumptions made for the residential dwellings:
  - 80/20 ratio for inbound and outbound morning trip distribution.
  - 20/80 ratio for inbound and outbound afternoon trip distribution.
  - 30 dwellings will be constructed at the starting year.
  - 60 new dwellings will be constructed annually until 2030 (50% completion).
  - 80 new dwellings will be constructed annually from 2030 to final completion.
- Retail uses (small supermarket and specialty shops) within the neighbourhood centre is assumed to generate 50/50 ratio of external and internal trips.
- Community and recreational uses (i.e. gym, childcare, and allied health) are assumed to generate 50/50 ratio of external and internal trips.
- Based on Journey to Work and Traffic Count data, the trip distribution are assumed as below:
  - AM Peak: 60% of the traffic will come from the north, 16% from the south, 22% from the east, and 2% from the west.
  - PM Peak: 58% of the traffic will head north, 17% to the south, 19% to the east, and 6% to the west.
- The projected annual background traffic growth rate of 1.8% is calculated using a pro rata method with data from the Travel Volume Viewer.

4.3 Phase 1 Intersection Analysis (year 2025)

Phase 1 is assessed based on the existing traffic, forecasting the background traffic up to the year 2025 and 30 residentials dwellings. It is assumed that the annual growth of traffic is 1.8 percent.

4.3.1 Traffic Generation (scenario 1)

Based on the assumptions specified, a summary of the traffic generated by the proposed development for Phase 1 is outlined in **Table 4-1**.

Table 4-2: Weekday peak (traffic generation)

Land use	Area / Dwellings / Place	Traffic generation	
		Morning	Evening
Residential	30 dwellings	25 vehicles	25 vehicles
Small Supermarket	Not applicable (developments has not entered the construction phase)		
Specialty Shops			
Allied Health			
Childcare Centre			
Gym			

Figure 4-1 and **Figure 4-2** provides the morning and evening peak hour total vehicle movements for Phase 1 (includes proposed development, forecast background growth etc).

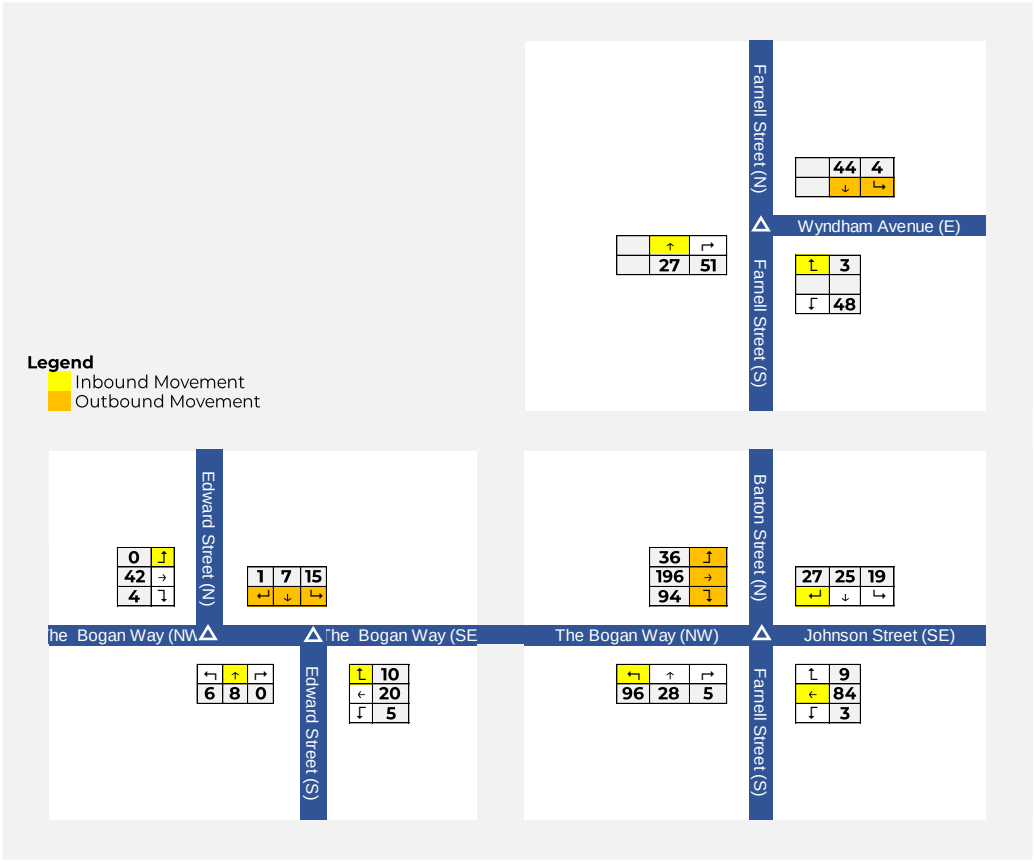


Figure 4-1 Phase 1 – Vehicle movements (morning peak) from the proposed development

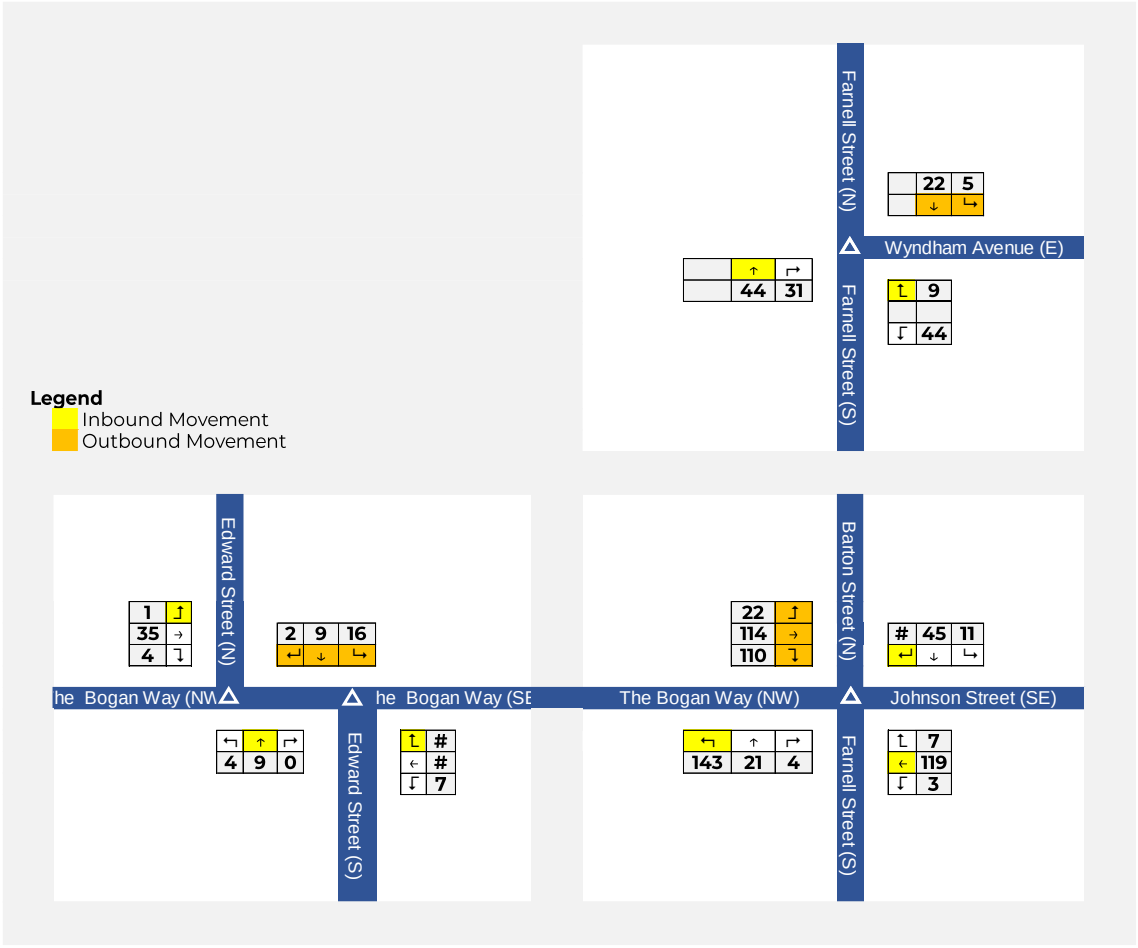


Figure 4-2 Phase 1 – Vehicle movements (evening) from the proposed development

4.3.2 Intersection analysis results (Phase 1)

Table 4-3 summarises the results of the Phase 1 scenario.

Table 4-3 SIDRA output results – Phase 1 (morning and evening peak periods)

Intersection	Morning		Evening	
	Average Delay (sec)	Level of Service (LoS)	Average Delay (sec)	Level of Service (LoS)
The Bogan Way / Edward Street	8.0	A	7.9	A
Johnson Street / Barton Street / Farnell Street	11.4	A	13.7	A
Farnell Street / Wyndham Avenue	5.7	A	5.7	A

Based on the SIDRA intersection modelling results (refer to **Table 4-3**), the intersections of The Bogan Way/Edward Street, Johnson Street/Barton Street/Farnell Street and Farnell Street/Wyndham Avenue performs at a Level of Service A with ample capacity to accommodate for future traffic volumes.

4.4 Phase 2 (50% complete) Intersection Analysis (year 2030)

Phase 2 is assessed based on the existing traffic, forecasting the background traffic up to the year 2030, 350 residentials dwellings and other developments. It is assumed that the annual growth of traffic is 1.8 percent.

4.4.1 Traffic Generation (scenario 2)

Based on the assumptions specified, a summary of the traffic generated by the proposed development for Phase 2 is outlined in **Table 4-4**.

Table 4-4 Weekday peak (traffic generation)

Land use	Area / Dwellings / Place	Vehicle traffic generation	
		Morning	Evening
Residential	350 dwellings	298 vehicles	298 vehicles
Small Supermarket	850 m²	Not applicable (development has not enter construction phase)	
Specialty Shops	600 m²		
Allied Health	850 m²		
Childcare Centre	700 m² / 100 children		
Gym	950 m²		

Figure 4-3 and **Figure 4-4** provides the morning and evening peak hour total vehicle movements for Phase 2 (includes proposed development, forecast background growth etc).



Figure 4-3 Phase 2 – Vehicle movements (morning peak) from the proposed development

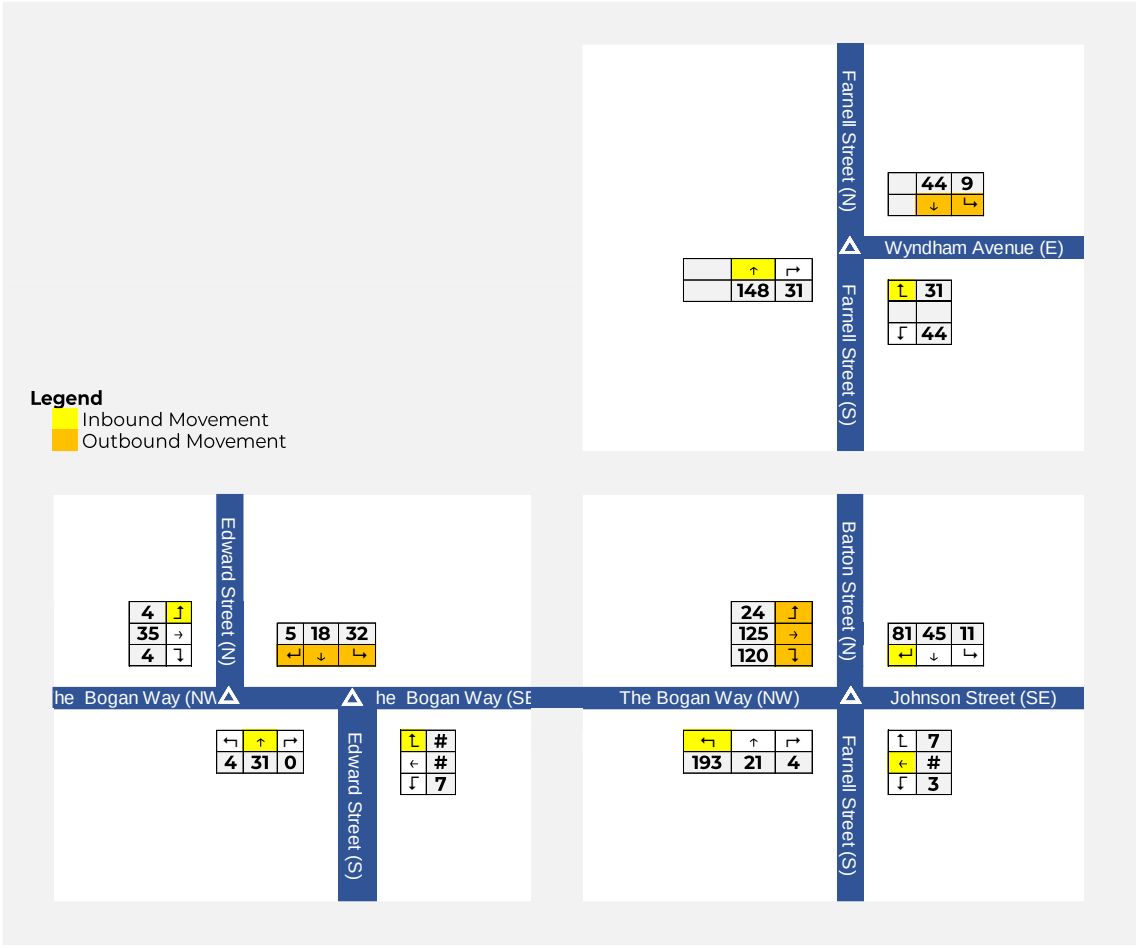


Figure 4-4 Phase 2 – Vehicle movements (evening) from the proposed development

4.4.2 Intersection analysis results (Phase 2)

Table 4-5 summarises the intersection performance results of Phase 2.

Table 4-5 SIDRA output results – Phase 2 (morning and evening peak periods)

Intersection	Morning		Evening	
	Average Delay (sec)	Level of Service (LoS)	Average Delay (sec)	Level of Service (LoS)
The Bogan Way / Edward Street	8.0	A	8.1	A
Johnson Street / Barton Street / Farnell Street	17.7	B	19.8	B
Farnell Street / Wyndham Avenue	6.4	A	5.9	A

The priority-controlled intersection (give-way sign control) of The Bogan Way and Edward Street has a maximum average delay of 8.0 seconds for the worst performing movement, and the intersection operating at a LoS A.
Johnson Street, Barton Street, and Farnell Street which is also a priority-controlled intersection (give-way sign control) which has increased to a LoS B for both morning and evening peak periods.

Farnell Street and Wyndham Avenue is also a priority-controlled intersection, which has a maximum average delay of 6.4 seconds and continues to perform at LoS A. Based on the SIDRA intersection modelling results (refer to Section **Table 4-5**), these intersections performs at a LoS A or B, with ample capacity to accommodate for future traffic volumes.

4.5 Phase 3 (100% completion) Intersection Analysis (year 2035)

Phase 3 is assessed based on the existing traffic, forecasting the background traffic up to the year 2035 with the site fully completed. It is assumed that the annual growth of traffic is 1.8 percent.

4.5.1 Traffic Generation (scenario 3)

Based on the assumptions specified in **Section 4.2**, a summary of the traffic generated by the proposed development for Phase 3 is outlined in **Table 4-6**.

Table 4-6 Weekday peak (traffic generation rates)

Land use	Area / Dwellings / Place	Traffic generation	
		Morning	Evening
Residential	742 dwellings	631	631
Small Supermarket	850m²	53	53
Specialty Shops	600m²		
Allied Health	850m²	43	43
Childcare Centre	700m² / 100 children	40	35
Gym	950m²	15	15
TOTAL		**782 vehicles**	**777 vehicles**

Figure 4-5 and **Figure 4-6** provides the morning and evening peak hour total vehicle movements for phase 3 (includes the proposed site being full developed, forecast background growth etc).



Figure 4-5 Phase 3 – Vehicle movements (morning peak) from the proposed development

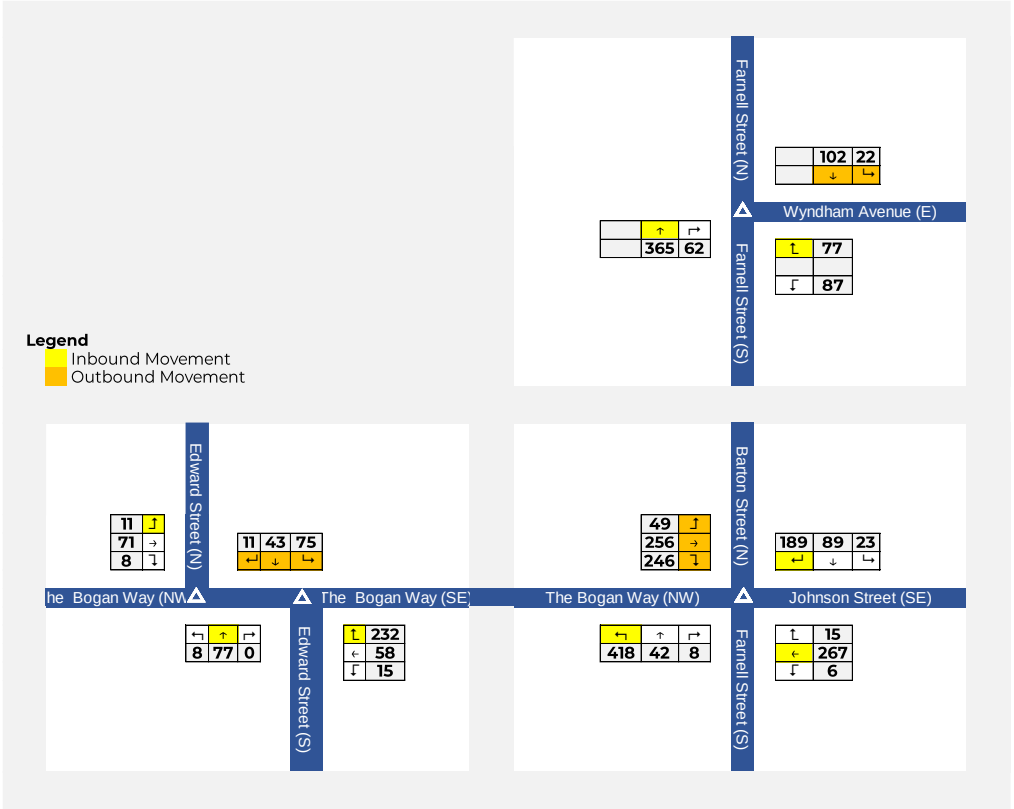


Figure 4-6 Phase 3 – Vehicle movements (evening) from the proposed development

4.5.2 Intersection analysis results (Phase 3)

Table 4-7 summarises the intersection performance results of Phase 3.

Table 4-7 SIDRA output results – Phase 3 (morning and evening peak periods)

Intersection	Morning		Evening	
	Average Delay (sec)	Level of Service (LoS)	Average Delay (sec)	Level of Service (LoS)
The Bogan Way / Edward Street	9.2	A	9.8	A
Johnson Street / Barton Street / Farnell Street	46.2	D	30.3	C
Farnell Street / Wyndham Avenue	8.5	A	6.3	A

Based on the SIDRA intersection modelling results (refer to **Table 4-7**), the intersection of The Bogan Way/Edward Street and Farnell Street/Wyndham Avenue performs at a LoS A during the morning and evening peak periods, with the site being fully developed.

The intersection of Johnson Street, Barton Street, and Farnell Street operates at a LoS D in the morning peak period and a LoS C during the evening peak period. These Levels of Service are deemed acceptable, indicating that ample capacity remains available for accommodating potential increases in traffic volume. It is worth noting that a Level of Service F signifies that the intersection is operating at maximum capacity.

5 Conclusion

Crossley Transport Planning has reviewed the traffic and transport matters for the proposed development at subject site located at School Road Forbes.
Based on the findings of this assessment the following can be concluded:

- The proposal would seek to provide approximately 742 new residential dwellings and other land use developments within Forbes.
- The proposed road network would be subject to further design work. A site-specific Development Control Plan will be developed in consultation with Council prior to any future Development Application and will accord with all relevant standards.
- The provisions for vehicle access and servicing will be satisfactory.
- There will be no adverse traffic implications.
- Based on the SIDRA traffic modelling assessment the key intersections within vicinity of the subject site indicate that the additional traffic generated for the proposed development would have a negligible impact on the road network and intersections.

Taking into account the information presented in this report and the conclusions outlined above, we believe that the planning proposal for the site is justifiable from a traffic and transport planning perspective.

Appendix A
Concept Plans

School Road

Water Tower Location

Habitat Reservation

Detention Basin

Green connection

Kick around park

Young play and water play

Neighbourhood Centre

Edward Street

Cypress Lane

Shared Pathway

Ornamental Lake

Farnell Street

Jemalong Residential Village

Future Residential Area

Green open and riparian corridor

Stage 1 Visitor Centre and Cafe

New housing subdivision

Morton Street

N

CADASTRAL INFORMATION
SOURCE: Client Survey
PROJECTION: GDA2020

AERIAL PHOTOGRAPHY
SOURCE: NearMap

0 metres 2 4 6

SIZE A0 1:2000

HATCH

FOR DISCUSSION

Forbes View Concept Master Plan
Forbes Shire Council

DATE - YYMMDD	DRAWN	APPRD	JOBE CODE	SERVICE	DOC.TYPE	DRAW NO.	REV.
230922	MD	MD	H-377649	Concept Design	DWG	001	A

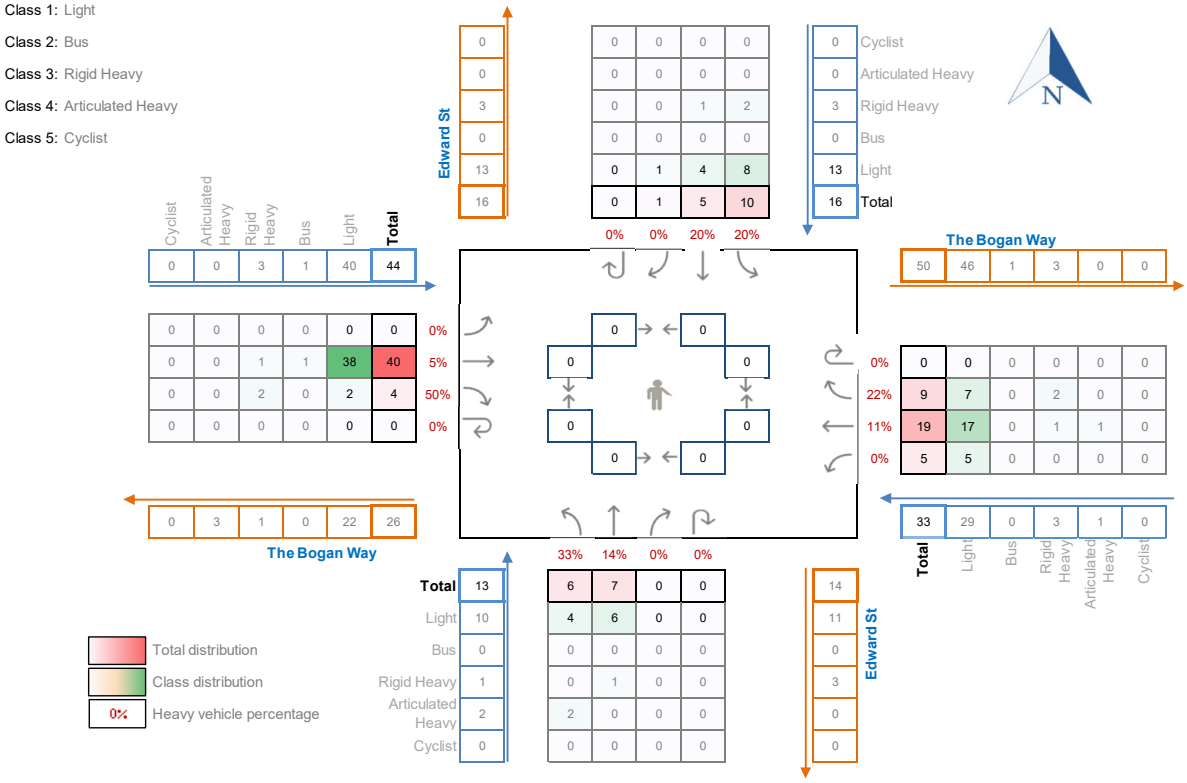
DISCLAIMER: ISSUED FOR DESIGN INTENT ONLY. ALL AREAS AND DIMENSIONS ARE SUBJECT TO DETAIL DESIGN AND SURVEY

Appendix B
Traffic Surveys

Location: The Bogan Way & Edward St
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: AM Peak to 17:00
Notes: 0

AM Peak: 08:15-09:15
PM Peak: 15:30-16:30

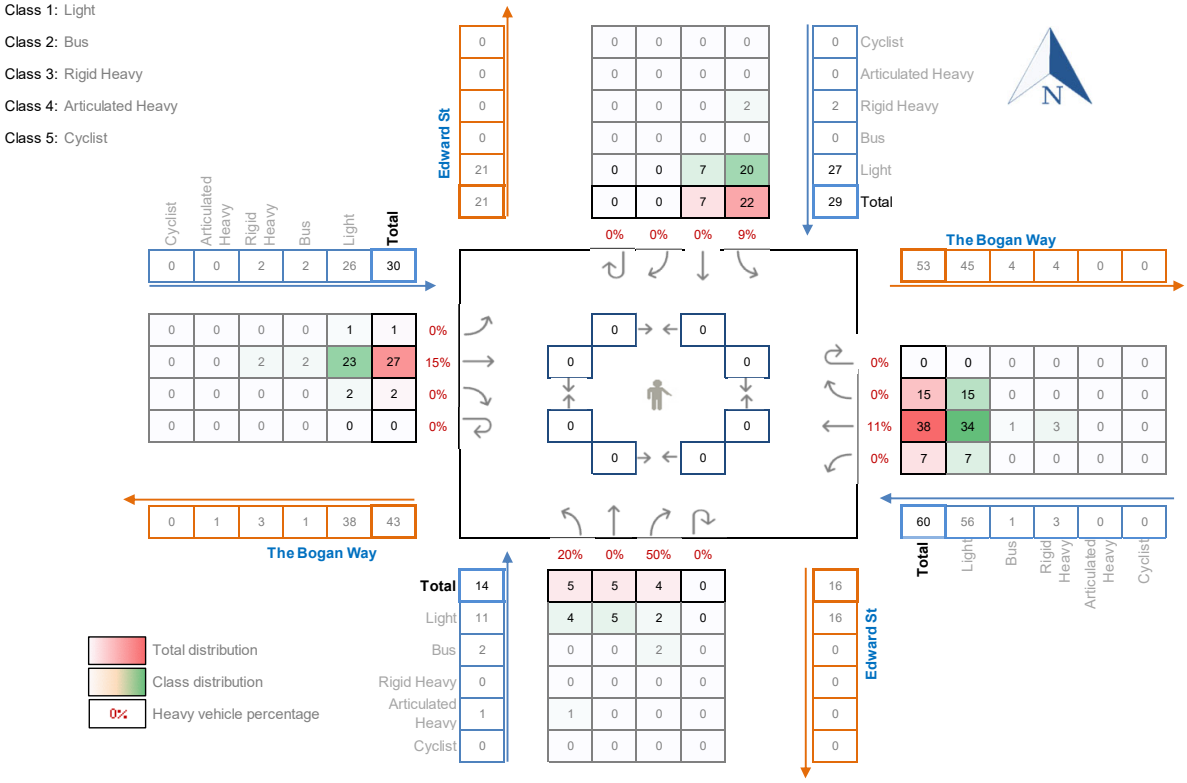
Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist



Location: The Bogan Way & Edward St
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: PM Peak to 17:00
Notes: 0

AM Peak: 08:15-09:15
PM Peak: 15:30-16:30

Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist

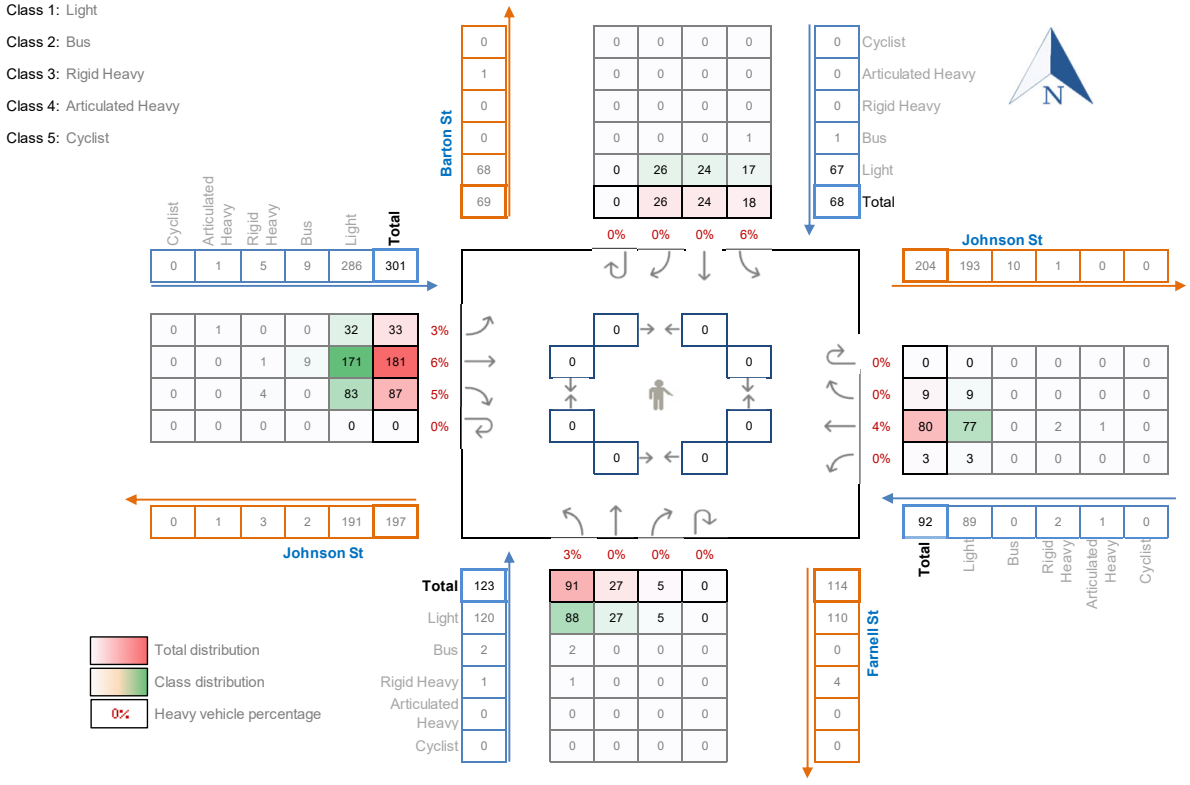


Total distribution
Class distribution
0% Heavy vehicle percentage

Location: Johnson St & Barton St
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: AM Peak to 17:00
Notes: 0

AM Peak: 08:15-09:15
PM Peak: 16:00-17:00

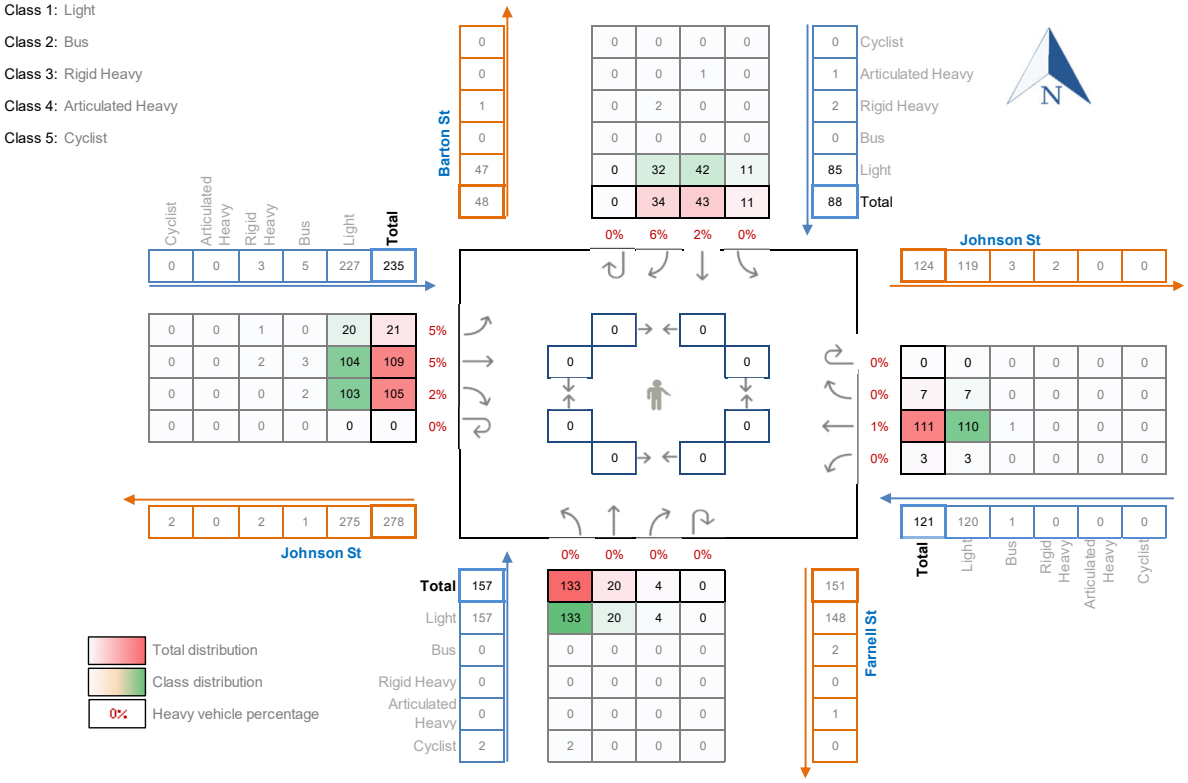
Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist



Location: Johnson St & Barton St
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: PM Peak to 17:00
Notes: 0

AM Peak: 08:15-09:15
PM Peak: 16:00-17:00

Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist

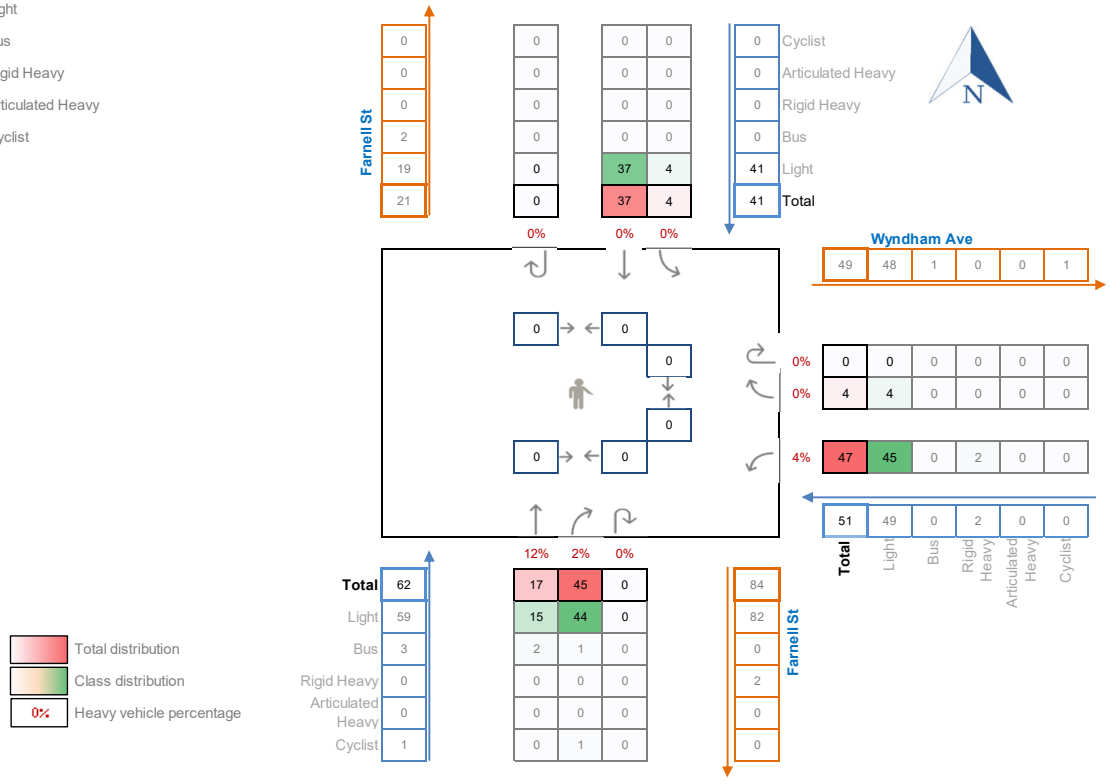


Total distribution
Class distribution
0% Heavy vehicle percentage

Location: Farnell St & Wyndham Ave
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: AM Peak to 17:00
Notes: 0

AM Peak: 08:00-09:00
PM Peak: 15:00-16:00

Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist

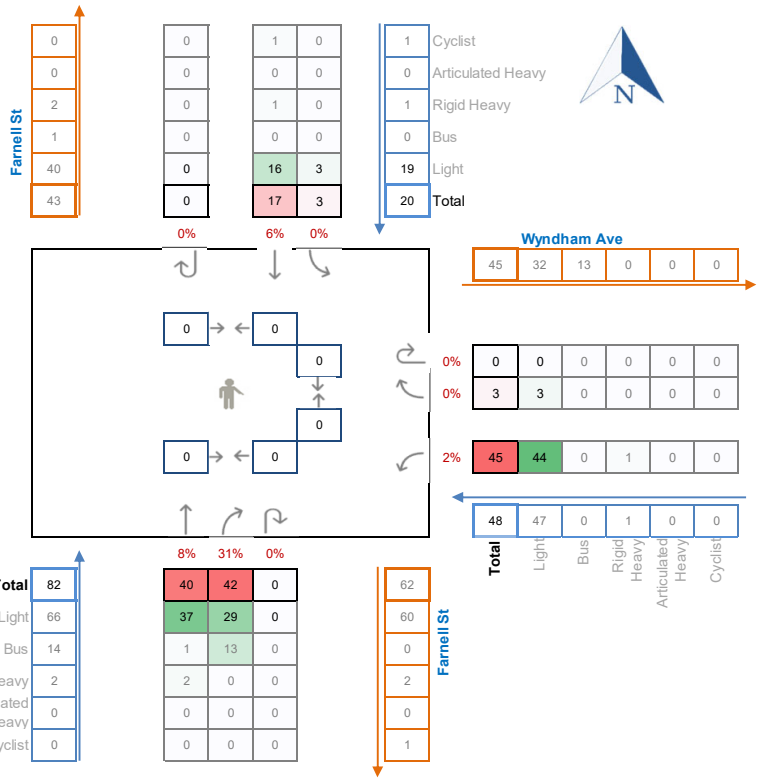


Total distribution
Class distribution
0% Heavy vehicle percentage

Location: Farnell St & Wyndham Ave
Date: Tuesday, 27 June 2023
Survey Duration: 0700-1000 & 1500-1800
Survey Period: PM Peak to 17:00
Notes: 0

AM Peak: 08:00-09:00
PM Peak: 15:00-16:00

Class 1: Light
Class 2: Bus
Class 3: Rigid Heavy
Class 4: Articulated Heavy
Class 5: Cyclist



Total distribution
Class distribution
0% Heavy vehicle percentage

Appendix C
SIDRA Outputs

MOVEMENT SUMMARY

Site: 01 [01 (AM BASE) 8:15-9:15AM - BOG_EDW (Site Folder: AM Peak - (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (AM BASE) 8:15-9:15AM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	40	16.0	40	16.0	0.037	0.2	LOS A	0.1	1.1	0.12	0.21	0.12	59.4
23a	R1	All MCs	28	18.8	28	18.8	0.037	2.4	LOS A	0.1	1.1	0.14	0.25	0.14	42.0
Approach			68	17.1	68	17.1	0.037	1.1	NA	0.1	1.1	0.13	0.23	0.13	57.3
North: Edward St_NE															
7a	L1	All MCs	28	20.0	28	20.0	0.025	5.4	LOS A	0.1	0.8	0.16	0.55	0.16	35.2
9b	R3	All MCs	4	0.0	4	0.0	0.025	7.1	LOS A	0.1	0.8	0.16	0.55	0.16	54.4
Approach			32	17.5	32	17.5	0.025	5.6	LOS A	0.1	0.8	0.16	0.55	0.16	43.2
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	4	0.0	4	0.0	0.036	8.0	LOS A	0.0	0.0	0.00	0.33	0.00	72.7
28	T1	All MCs	60	9.1	60	9.1	0.036	2.1	LOS A	0.0	0.0	0.00	0.33	0.00	76.4
Approach			64	8.5	64	8.5	0.036	2.4	NA	0.0	0.0	0.00	0.33	0.00	76.2
All Vehicles			164	13.8	164	13.8	0.037	2.5	NA	0.1	1.1	0.08	0.33	0.08	64.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (AM BASE) 8:15-9:15AM - JOH_BAR (Site Folder: AM Peak - (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (AM BASE) 8:15-9:15AM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	140	3.3	140	3.3	0.194	5.7	LOS A	0.8	5.5	0.29	0.56	0.29	30.2
3a	R1	All MCs	36	0.0	36	0.0	0.194	10.9	LOS A	0.8	5.5	0.29	0.56	0.29	36.3
3b	R3	All MCs	6	0.0	6	0.0	0.194	11.9	LOS A	0.8	5.5	0.29	0.56	0.29	38.1
Approach			182	2.5	182	2.5	0.194	6.9	LOS A	0.8	5.5	0.29	0.56	0.29	31.9
SouthEast: Johnson Street_SE															
21b	L3	All MCs	4	0.0	4	0.0	0.071	9.8	LOS A	0.3	1.9	0.21	0.19	0.21	46.6
22	T1	All MCs	92	3.8	92	3.8	0.071	0.9	LOS A	0.3	1.9	0.21	0.19	0.21	50.9
23	R2	All MCs	10	0.0	10	0.0	0.071	9.2	LOS A	0.3	1.9	0.21	0.19	0.21	41.6
Approach			106	3.3	106	3.3	0.071	2.1	NA	0.3	1.9	0.21	0.19	0.21	49.4
NorthEast: Barton Street_NE															
24	L2	All MCs	28	5.6	28	5.6	0.091	6.3	LOS A	0.3	2.3	0.39	0.63	0.39	34.9
24a	L1	All MCs	32	0.0	32	0.0	0.091	6.3	LOS A	0.3	2.3	0.39	0.63	0.39	36.7
26	R2	All MCs	44	0.0	44	0.0	0.091	6.8	LOS A	0.3	2.3	0.39	0.63	0.39	27.5
Approach			104	1.5	104	1.5	0.091	6.5	LOS A	0.3	2.3	0.39	0.63	0.39	32.6
NorthWest: The Bogan Way_NW															
27	L2	All MCs	52	3.0	52	3.0	0.216	3.8	LOS A	0.8	6.2	0.16	0.27	0.16	26.8
28	T1	All MCs	220	5.5	220	5.5	0.216	0.2	LOS A	0.8	6.2	0.16	0.27	0.16	67.1
29a	R1	All MCs	112	4.6	112	4.6	0.216	3.0	LOS A	0.8	6.2	0.16	0.27	0.16	46.2
Approach			384	4.9	384	4.9	0.216	1.5	NA	0.8	6.2	0.16	0.27	0.16	51.7
All Vehicles			776	3.7	776	3.7	0.216	3.5	NA	0.8	6.2	0.23	0.38	0.23	41.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 03 [03 (AM BASE) 8:15-9:15AM - FAR_WYN (Site Folder: AM Peak - (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (AM BASE) 8:15-9:15AM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	44	8.7	44	8.7	0.061	0.1	LOS A	0.2	1.7	0.11	0.35	0.11	49.1
3	R2	All MCs	68	2.0	68	2.0	0.061	5.7	LOS A	0.2	1.7	0.11	0.35	0.11	48.1
Approach			112	4.7	112	4.7	0.061	3.5	NA	0.2	1.7	0.11	0.35	0.11	48.4
East: Wyndham Avenue															
4	L2	All MCs	72	0.0	72	0.0	0.050	5.7	LOS A	0.2	1.4	0.12	0.54	0.12	45.6
6	R2	All MCs	8	0.0	8	0.0	0.050	5.6	LOS A	0.2	1.4	0.12	0.54	0.12	30.9
Approach			80	0.0	80	0.0	0.050	5.7	LOS A	0.2	1.4	0.12	0.54	0.12	44.2
North: Farnell Street															
7	L2	All MCs	8	0.0	8	0.0	0.026	4.7	LOS A	0.0	0.0	0.00	0.09	0.00	50.4
8	T1	All MCs	44	6.7	44	6.7	0.026	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	57.6
Approach			52	5.6	52	5.6	0.026	0.7	NA	0.0	0.0	0.00	0.09	0.00	56.4
All Vehicles			244	3.3	244	3.3	0.061	3.6	NA	0.2	1.7	0.09	0.36	0.09	47.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (PM BASE) 4:00-5:00PM - BOG_EDW (Site Folder: PM Peak - Scenario (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (PM BASE) 8:15-9:15AM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	34	6.3	34	6.3	0.026	0.1	LOS A	0.1	0.7	0.08	0.18	0.08	78.8
23a	R1	All MCs	22	0.0	22	0.0	0.026	2.3	LOS A	0.1	0.7	0.11	0.25	0.11	47.2
Approach			56	3.8	56	3.8	0.026	1.0	NA	0.1	0.7	0.09	0.21	0.09	74.6
North: Edward St_NE															
7a	L1	All MCs	23	4.5	23	4.5	0.018	5.1	LOS A	0.1	0.5	0.12	0.54	0.12	35.9
9b	R3	All MCs	2	0.0	2	0.0	0.018	6.7	LOS A	0.1	0.5	0.12	0.54	0.12	54.5
Approach			25	4.2	25	4.2	0.018	5.3	LOS A	0.1	0.5	0.12	0.54	0.12	41.8
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	1	0.0	1	0.0	0.024	7.8	LOS A	0.0	0.0	0.00	0.06	0.00	71.3
28	T1	All MCs	40	13.2	40	13.2	0.024	0.2	LOS A	0.0	0.0	0.00	0.06	0.00	76.8
Approach			41	12.8	41	12.8	0.024	0.4	NA	0.0	0.0	0.00	0.06	0.00	76.6
All Vehicles			122	6.9	122	6.9	0.026	1.7	NA	0.1	0.7	0.06	0.23	0.06	71.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (PM BASE) 4:00-5:00PM - JOH_BAR (Site Folder: PM Peak - Scenario (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (PM BASE) 8:15-9:15AM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	177	0.0	177	0.0	0.210	6.1	LOS A	0.9	6.0	0.39	0.61	0.39	30.0
3a	R1	All MCs	24	0.0	24	0.0	0.210	12.8	LOS A	0.9	6.0	0.39	0.61	0.39	36.0
3b	R3	All MCs	6	0.0	6	0.0	0.210	13.5	LOS A	0.9	6.0	0.39	0.61	0.39	37.8
Approach			207	0.0	207	0.0	0.210	7.0	LOS A	0.9	6.0	0.39	0.61	0.39	31.1
SouthEast: Johnson Street_SE															
21b	L3	All MCs	3	0.0	3	0.0	0.141	8.9	LOS A	0.4	3.1	0.16	0.15	0.16	48.1
22	T1	All MCs	200	0.9	200	0.9	0.141	0.6	LOS A	0.4	3.1	0.16	0.15	0.16	53.6
23	R2	All MCs	21	0.0	21	0.0	0.141	8.1	LOS A	0.4	3.1	0.16	0.15	0.16	42.9
Approach			224	0.8	224	0.8	0.141	1.4	NA	0.4	3.1	0.16	0.15	0.16	51.9
NorthEast: Barton Street_NE															
24	L2	All MCs	15	0.0	15	0.0	0.138	6.0	LOS A	0.5	3.5	0.45	0.67	0.45	34.4
24a	L1	All MCs	59	2.3	59	2.3	0.138	7.3	LOS A	0.5	3.5	0.45	0.67	0.45	35.7
26	R2	All MCs	58	5.9	58	5.9	0.138	7.4	LOS A	0.5	3.5	0.45	0.67	0.45	26.7
Approach			132	3.6	132	3.6	0.138	7.2	LOS A	0.5	3.5	0.45	0.67	0.45	31.9
NorthWest: The Bogan Way_NW															
27	L2	All MCs	61	4.8	61	4.8	0.220	4.2	LOS A	1.1	8.2	0.32	0.42	0.32	26.3
28	T1	All MCs	132	4.6	132	4.6	0.220	0.6	LOS A	1.1	8.2	0.32	0.42	0.32	61.5
29a	R1	All MCs	173	1.9	173	1.9	0.220	3.4	LOS A	1.1	8.2	0.32	0.42	0.32	43.3
Approach			366	3.3	366	3.3	0.220	2.6	NA	1.1	8.2	0.32	0.42	0.32	44.3
All Vehicles			928	2.0	928	2.0	0.220	3.9	NA	1.1	8.2	0.32	0.43	0.32	39.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 03 [03 (PM BASE) 4:00-5:00PM - FAR_WYN (Site Folder: PM Peak - Scenario (Base case))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (PM BASE) 8:15-9:15AM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	48	6.1	48	6.1	0.048	0.1	LOS A	0.2	1.2	0.10	0.27	0.10	51.8
3	R2	All MCs	40	3.3	40	3.3	0.048	5.7	LOS A	0.2	1.2	0.10	0.27	0.10	49.0
Approach			88	4.8	88	4.8	0.048	2.6	NA	0.2	1.2	0.10	0.27	0.10	50.2
East: Wyndham Avenue															
4	L2	All MCs	52	4.8	52	4.8	0.042	5.7	LOS A	0.2	1.1	0.11	0.55	0.11	45.5
6	R2	All MCs	16	0.0	16	0.0	0.042	5.6	LOS A	0.2	1.1	0.11	0.55	0.11	37.3
Approach			68	3.6	68	3.6	0.042	5.7	LOS A	0.2	1.1	0.11	0.55	0.11	43.9
North: Farnell Street															
7	L2	All MCs	12	0.0	12	0.0	0.025	4.7	LOS A	0.0	0.0	0.00	0.14	0.00	49.6
8	T1	All MCs	40	0.0	40	0.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	56.7
Approach			52	0.0	52	0.0	0.025	1.1	NA	0.0	0.0	0.00	0.14	0.00	54.9
All Vehicles			208	3.2	208	3.2	0.048	3.2	NA	0.2	1.2	0.08	0.33	0.08	48.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (AM Scenario 1) 8:15-9:15AM - BOG_EDW 1 (Site Folder: AM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (AM Scenario 1) 8:15-9:15AM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	42	15.4	42	15.4	0.039	0.2	LOS A	0.2	1.2	0.12	0.22	0.12	59.4
23a	R1	All MCs	32	16.7	32	16.7	0.039	2.4	LOS A	0.2	1.2	0.15	0.26	0.15	42.3
Approach			73	15.9	73	15.9	0.039	1.2	NA	0.2	1.2	0.13	0.24	0.13	57.2
North: Edward St_NE															
7a	L1	All MCs	41	18.2	41	18.2	0.034	5.4	LOS A	0.1	1.1	0.16	0.54	0.16	35.3
9b	R3	All MCs	4	0.0	4	0.0	0.034	7.1	LOS A	0.1	1.1	0.16	0.54	0.16	54.4
Approach			45	16.6	45	16.6	0.034	5.6	LOS A	0.1	1.1	0.16	0.54	0.16	41.6
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	4	0.0	4	0.0	0.037	8.0	LOS A	0.0	0.0	0.00	0.33	0.00	72.7
28	T1	All MCs	63	8.7	63	8.7	0.037	2.1	LOS A	0.0	0.0	0.00	0.33	0.00	76.5
Approach			67	8.2	67	8.2	0.037	2.4	NA	0.0	0.0	0.00	0.33	0.00	76.2
All Vehicles			185	13.3	185	13.3	0.039	2.7	NA	0.2	1.2	0.09	0.35	0.09	63.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (AM Scenario 1) 8:15-9:15AM - JOH_BAR (Site Folder: AM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (AM Scenario 1) 8:15-9:15AM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	148	3.1	148	3.1	0.198	5.7	LOS A	0.8	5.7	0.29	0.56	0.29	30.4
3a	R1	All MCs	37	0.0	37	0.0	0.198	10.4	LOS A	0.8	5.7	0.29	0.56	0.29	36.5
3b	R3	All MCs	6	0.0	6	0.0	0.198	11.4	LOS A	0.8	5.7	0.29	0.56	0.29	38.3
Approach			191	2.4	191	2.4	0.198	6.8	LOS A	0.8	5.7	0.29	0.56	0.29	32.0
SouthEast: Johnson Street_SE															
21b	L3	All MCs	4	0.0	4	0.0	0.074	10.3	LOS A	0.3	2.0	0.22	0.20	0.22	46.4
22	T1	All MCs	97	3.6	97	3.6	0.074	1.0	LOS A	0.3	2.0	0.22	0.20	0.22	50.6
23	R2	All MCs	10	0.0	10	0.0	0.074	9.7	LOS A	0.3	2.0	0.22	0.20	0.22	41.4
Approach			111	3.1	111	3.1	0.074	2.2	NA	0.3	2.0	0.22	0.20	0.22	49.1
NorthEast: Barton Street_NE															
24	L2	All MCs	30	5.3	30	5.3	0.094	6.4	LOS A	0.3	2.3	0.38	0.63	0.38	34.9
24a	L1	All MCs	33	0.0	33	0.0	0.094	6.2	LOS A	0.3	2.3	0.38	0.63	0.38	36.7
26	R2	All MCs	46	0.0	46	0.0	0.094	6.7	LOS A	0.3	2.3	0.38	0.63	0.38	27.5
Approach			109	1.4	109	1.4	0.094	6.5	LOS A	0.3	2.3	0.38	0.63	0.38	32.7
NorthWest: The Bogan Way_NW															
27	L2	All MCs	57	2.8	57	2.8	0.199	3.8	LOS A	0.5	4.1	0.11	0.22	0.11	27.2
28	T1	All MCs	238	5.6	238	5.6	0.199	0.2	LOS A	0.5	4.1	0.11	0.22	0.11	69.4
29a	R1	All MCs	51	10.0	51	10.0	0.199	3.2	LOS A	0.5	4.1	0.11	0.22	0.11	46.4
Approach			346	5.8	346	5.8	0.199	1.2	NA	0.5	4.1	0.11	0.22	0.11	54.1
All Vehicles			757	3.9	757	3.9	0.199	3.5	NA	0.8	5.7	0.21	0.36	0.21	42.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 03 [03 (AM Scenario 1) 8:15-9:15AM - FAR_WYN (Site Folder: AM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (AM Scenario 1) 8:15-9:15AM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	52	7.4	52	7.4	0.068	0.1	LOS A	0.3	1.9	0.13	0.34	0.13	49.8
3	R2	All MCs	71	2.0	71	2.0	0.068	5.7	LOS A	0.3	1.9	0.13	0.34	0.13	48.4
Approach			122	4.3	122	4.3	0.068	3.4	NA	0.3	1.9	0.13	0.34	0.13	48.8
East: Wyndham Avenue															
4	L2	All MCs	75	0.0	75	0.0	0.053	5.7	LOS A	0.2	1.4	0.14	0.54	0.14	45.5
6	R2	All MCs	8	0.0	8	0.0	0.053	5.7	LOS A	0.2	1.4	0.14	0.54	0.14	30.8
Approach			83	0.0	83	0.0	0.053	5.7	LOS A	0.2	1.4	0.14	0.54	0.14	44.1
North: Farnell Street															
7	L2	All MCs	11	0.0	11	0.0	0.035	4.7	LOS A	0.0	0.0	0.00	0.09	0.00	50.4
8	T1	All MCs	60	4.9	60	4.9	0.035	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	57.7
Approach			71	4.1	71	4.1	0.035	0.7	NA	0.0	0.0	0.00	0.09	0.00	56.5
All Vehicles			277	2.9	277	2.9	0.068	3.4	NA	0.3	1.9	0.10	0.34	0.10	48.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (PM Scenario 1) 4:00-5:00PM - BOG_EDW 1 (Site Folder: PM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (PM Scenario 1) 4:00-5:00PM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	35	6.1	35	6.1	0.035	0.1	LOS A	0.2	1.1	0.08	0.22	0.08	77.0
23a	R1	All MCs	39	0.0	39	0.0	0.035	2.3	LOS A	0.2	1.1	0.12	0.33	0.12	45.9
Approach			74	2.9	74	2.9	0.035	1.3	NA	0.2	1.1	0.10	0.28	0.10	70.6
North: Edward St_NE															
7a	L1	All MCs	26	4.0	26	4.0	0.020	5.1	LOS A	0.1	0.6	0.12	0.54	0.12	35.9
9b	R3	All MCs	2	0.0	2	0.0	0.020	6.9	LOS A	0.1	0.6	0.12	0.54	0.12	54.5
Approach			28	3.7	28	3.7	0.020	5.3	LOS A	0.1	0.6	0.12	0.54	0.12	41.3
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	1	0.0	1	0.0	0.024	7.9	LOS A	0.0	0.0	0.00	0.06	0.00	71.4
28	T1	All MCs	41	12.8	41	12.8	0.024	0.2	LOS A	0.0	0.0	0.00	0.06	0.00	76.9
Approach			42	12.5	42	12.5	0.024	0.4	NA	0.0	0.0	0.00	0.06	0.00	76.7
All Vehicles			144	5.8	144	5.8	0.035	1.8	NA	0.2	1.1	0.08	0.27	0.08	69.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (PM Scenario 1) 4:00-5:00PM - JOH_BAR (Site Folder: PM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (PM Scenario 1) 4:00-5:00PM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	191	0.0	191	0.0	0.230	6.1	LOS A	0.9	6.6	0.41	0.62	0.41	29.8
3a	R1	All MCs	25	0.0	25	0.0	0.230	13.7	LOS A	0.9	6.6	0.41	0.62	0.41	35.8
3b	R3	All MCs	6	0.0	6	0.0	0.230	14.2	LOS A	0.9	6.6	0.41	0.62	0.41	37.6
Approach			221	0.0	221	0.0	0.230	7.2	LOS A	0.9	6.6	0.41	0.62	0.41	30.8
SouthEast: Johnson Street_SE															
21b	L3	All MCs	3	0.0	3	0.0	0.149	9.1	LOS A	0.5	3.2	0.16	0.14	0.16	48.2
22	T1	All MCs	214	0.8	214	0.8	0.149	0.6	LOS A	0.5	3.2	0.16	0.14	0.16	53.7
23	R2	All MCs	21	0.0	21	0.0	0.149	8.2	LOS A	0.5	3.2	0.16	0.14	0.16	43.0
Approach			238	0.8	238	0.8	0.149	1.4	NA	0.5	3.2	0.16	0.14	0.16	52.1
NorthEast: Barton Street_NE															
24	L2	All MCs	15	0.0	15	0.0	0.144	6.0	LOS A	0.5	3.7	0.46	0.68	0.46	34.1
24a	L1	All MCs	60	2.3	60	2.3	0.144	7.6	LOS A	0.5	3.7	0.46	0.68	0.46	35.4
26	R2	All MCs	58	5.9	58	5.9	0.144	7.5	LOS A	0.5	3.7	0.46	0.68	0.46	26.5
Approach			133	3.6	133	3.6	0.144	7.4	LOS A	0.5	3.7	0.46	0.68	0.46	31.7
NorthWest: The Bogan Way_NW															
27	L2	All MCs	64	4.5	64	4.5	0.232	4.2	LOS A	1.2	8.7	0.34	0.43	0.34	26.3
28	T1	All MCs	138	4.4	138	4.4	0.232	0.7	LOS A	1.2	8.7	0.34	0.43	0.34	61.2
29a	R1	All MCs	181	1.8	181	1.8	0.232	3.5	LOS A	1.2	8.7	0.34	0.43	0.34	43.2
Approach			383	3.2	383	3.2	0.232	2.6	NA	1.2	8.7	0.34	0.43	0.34	44.2
All Vehicles			976	1.9	976	1.9	0.232	4.0	NA	1.2	8.7	0.33	0.44	0.33	39.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 03 [03 (PM Scenario 1) 4:00-5:00PM - FAR_WYN (Site Folder: PM Peak - Scenario 1 (Opening Year 2025))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (PM Scenario 1) 4:00-5:00PM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	64	2.3	64	2.3	0.056	0.1	LOS A	0.2	1.3	0.10	0.24	0.10	52.7
3	R2	All MCs	41	3.2	41	3.2	0.056	5.7	LOS A	0.2	1.3	0.10	0.24	0.10	50.1
Approach			105	2.6	105	2.6	0.056	2.3	NA	0.2	1.3	0.10	0.24	0.10	51.4
East: Wyndham Avenue															
4	L2	All MCs	55	4.5	55	4.5	0.050	5.7	LOS A	0.2	1.2	0.12	0.55	0.12	45.5
6	R2	All MCs	27	0.0	27	0.0	0.050	5.6	LOS A	0.2	1.2	0.12	0.55	0.12	37.2
Approach			82	3.0	82	3.0	0.050	5.7	LOS A	0.2	1.2	0.12	0.55	0.12	43.1
North: Farnell Street															
7	L2	All MCs	15	0.0	15	0.0	0.029	4.7	LOS A	0.0	0.0	0.00	0.14	0.00	49.5
8	T1	All MCs	46	0.0	46	0.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	56.5
Approach			61	0.0	61	0.0	0.029	1.2	NA	0.0	0.0	0.00	0.14	0.00	54.6
All Vehicles			249	2.1	249	2.1	0.056	3.1	NA	0.2	1.3	0.08	0.32	0.08	48.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (AM Scenario 2) 8:15-9:15AM - BOG_EDW 1 (Site Folder: AM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (AM Scenario 2) 8:15-9:15AM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	42	15.4	42	15.4	0.059	0.2	LOS A	0.3	2.1	0.11	0.24	0.11	59.3
23a	R1	All MCs	68	12.8	68	12.8	0.059	2.5	LOS A	0.3	2.1	0.18	0.37	0.18	41.9
Approach			110	13.8	110	13.8	0.059	1.6	NA	0.3	2.1	0.15	0.32	0.15	55.0
North: Edward St_NE															
7a	L1	All MCs	164	20.5	164	20.5	0.152	5.5	LOS A	0.6	5.2	0.19	0.55	0.19	35.0
9b	R3	All MCs	24	0.0	24	0.0	0.152	7.7	LOS A	0.6	5.2	0.19	0.55	0.19	54.4
Approach			188	17.8	188	17.8	0.152	5.8	LOS A	0.6	5.2	0.19	0.55	0.19	43.2
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	8	0.0	8	0.0	0.040	8.0	LOS A	0.0	0.0	0.00	0.35	0.00	72.3
28	T1	All MCs	63	8.7	63	8.7	0.040	2.1	LOS A	0.0	0.0	0.00	0.35	0.00	76.1
Approach			71	7.7	71	7.7	0.040	2.7	NA	0.0	0.0	0.00	0.35	0.00	75.6
All Vehicles			369	14.7	369	14.7	0.152	3.9	NA	0.6	5.2	0.14	0.45	0.14	57.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (AM Scenario 2) 8:15-9:15AM - JOH_BAR (Site Folder: AM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (AM Scenario 2) 8:15-9:15AM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	168	2.8	168	2.8	0.268	5.8	LOS A	1.1	7.9	0.38	0.57	0.38	28.5
3a	R1	All MCs	37	0.0	37	0.0	0.268	17.7	LOS B	1.1	7.9	0.38	0.57	0.38	34.4
3b	R3	All MCs	6	0.0	6	0.0	0.268	17.0	LOS B	1.1	7.9	0.38	0.57	0.38	36.2
Approach			211	2.2	211	2.2	0.268	8.2	LOS A	1.1	7.9	0.38	0.57	0.38	29.8
SouthEast: Johnson Street_SE															
21b	L3	All MCs	4	0.0	4	0.0	0.088	13.0	LOS A	0.4	2.9	0.26	0.24	0.26	44.5
22	T1	All MCs	110	3.1	110	3.1	0.088	1.9	LOS A	0.4	2.9	0.26	0.24	0.26	47.5
23	R2	All MCs	10	0.0	10	0.0	0.088	12.6	LOS A	0.4	2.9	0.26	0.24	0.26	39.7
Approach			125	2.8	125	2.8	0.088	3.1	NA	0.4	2.9	0.26	0.24	0.26	46.4
NorthEast: Barton Street_NE															
24	L2	All MCs	30	5.3	30	5.3	0.124	6.9	LOS A	0.4	3.0	0.48	0.72	0.48	33.9
24a	L1	All MCs	33	0.0	33	0.0	0.124	7.7	LOS A	0.4	3.0	0.48	0.72	0.48	35.5
26	R2	All MCs	53	0.0	53	0.0	0.124	7.6	LOS A	0.4	3.0	0.48	0.72	0.48	26.5
Approach			115	1.3	115	1.3	0.124	7.5	LOS A	0.4	3.0	0.48	0.72	0.48	31.4
NorthWest: The Bogan Way_NW															
27	L2	All MCs	79	4.0	79	4.0	0.332	3.9	LOS A	1.5	10.8	0.20	0.29	0.20	26.7
28	T1	All MCs	335	5.8	335	5.8	0.332	0.3	LOS A	1.5	10.8	0.20	0.29	0.20	66.6
29a	R1	All MCs	171	4.5	171	4.5	0.332	3.2	LOS A	1.5	10.8	0.20	0.29	0.20	45.9
Approach			585	5.2	585	5.2	0.332	1.6	NA	1.5	10.8	0.20	0.29	0.20	51.4
All Vehicles			1036	3.9	1036	3.9	0.332	3.8	NA	1.5	10.8	0.27	0.39	0.27	41.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 03 [03 (AM Scenario 2) 8:15-9:15AM - FAR_WYN (Site Folder: AM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (AM Scenario 2) 8:15-9:15AM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	107	8.9	107	8.9	0.105	0.5	LOS A	0.4	2.7	0.27	0.33	0.27	50.6
3	R2	All MCs	71	2.0	71	2.0	0.105	6.4	LOS A	0.4	2.7	0.27	0.33	0.27	48.9
Approach			178	6.2	178	6.2	0.105	2.9	NA	0.4	2.7	0.27	0.33	0.27	49.8
East: Wyndham Avenue															
4	L2	All MCs	75	0.0	75	0.0	0.070	6.4	LOS A	0.3	1.8	0.33	0.60	0.33	44.6
6	R2	All MCs	19	0.0	19	0.0	0.070	5.9	LOS A	0.3	1.8	0.33	0.60	0.33	30.2
Approach			94	0.0	94	0.0	0.070	6.3	LOS A	0.3	1.8	0.33	0.60	0.33	41.8
North: Farnell Street															
7	L2	All MCs	48	0.0	48	0.0	0.153	4.7	LOS A	0.0	0.0	0.00	0.09	0.00	50.3
8	T1	All MCs	260	7.9	260	7.9	0.153	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	57.5
Approach			308	6.7	308	6.7	0.153	0.7	NA	0.0	0.0	0.00	0.09	0.00	56.3
All Vehicles			580	5.4	580	5.4	0.153	2.3	NA	0.4	2.7	0.14	0.25	0.14	50.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (PM Scenario 2) 4:00-5:00PM - BOG_EDW 1 (Site Folder: PM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (PM Scenario 2) 4:00-5:00PM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	35	6.1	35	6.1	0.019	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
23a	R1	All MCs	164	0.0	164	0.0	0.095	2.4	LOS A	0.5	3.2	0.14	0.49	0.14	43.4
Approach			199	1.1	199	1.1	0.095	2.0	NA	0.5	3.2	0.12	0.41	0.12	59.9
North: Edward St_NE															
7a	L1	All MCs	63	5.0	63	5.0	0.049	5.2	LOS A	0.2	1.4	0.13	0.54	0.13	35.8
9b	R3	All MCs	5	0.0	5	0.0	0.049	8.1	LOS A	0.2	1.4	0.13	0.54	0.13	54.5
Approach			68	4.6	68	4.6	0.049	5.4	LOS A	0.2	1.4	0.13	0.54	0.13	41.4
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	6	0.0	6	0.0	0.028	7.9	LOS A	0.0	0.0	0.00	0.13	0.00	70.7
28	T1	All MCs	41	12.8	41	12.8	0.028	0.2	LOS A	0.0	0.0	0.00	0.13	0.00	76.0
Approach			47	11.1	47	11.1	0.028	1.3	NA	0.0	0.0	0.00	0.13	0.00	75.2
All Vehicles			315	3.3	315	3.3	0.095	2.6	NA	0.5	3.2	0.10	0.40	0.10	61.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (PM Scenario 2) 4:00-5:00PM - JOH_BAR (Site Folder: PM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (PM Scenario 2) 4:00-5:00PM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	280	0.0	280	0.0	0.327	6.3	LOS A	1.5	10.2	0.47	0.64	0.47	29.2
3a	R1	All MCs	25	0.0	25	0.0	0.327	19.8	LOS B	1.5	10.2	0.47	0.64	0.47	35.2
3b	R3	All MCs	6	0.0	6	0.0	0.327	16.7	LOS B	1.5	10.2	0.47	0.64	0.47	37.0
Approach			311	0.0	311	0.0	0.327	7.6	LOS A	1.5	10.2	0.47	0.64	0.47	29.9
SouthEast: Johnson Street_SE															
21b	L3	All MCs	3	0.0	3	0.0	0.165	9.6	LOS A	0.5	3.5	0.16	0.14	0.16	48.2
22	T1	All MCs	241	0.7	241	0.7	0.165	0.6	LOS A	0.5	3.5	0.16	0.14	0.16	53.6
23	R2	All MCs	21	0.0	21	0.0	0.165	8.7	LOS A	0.5	3.5	0.16	0.14	0.16	42.9
Approach			265	0.7	265	0.7	0.165	1.4	NA	0.5	3.5	0.16	0.14	0.16	52.2
NorthEast: Barton Street_NE															
24	L2	All MCs	15	0.0	15	0.0	0.288	6.3	LOS A	1.1	8.0	0.54	0.79	0.61	32.7
24a	L1	All MCs	62	2.2	62	2.2	0.288	8.8	LOS A	1.1	8.0	0.54	0.79	0.61	33.8
26	R2	All MCs	163	6.3	163	6.3	0.288	8.7	LOS A	1.1	8.0	0.54	0.79	0.61	25.1
Approach			239	4.9	239	4.9	0.288	8.6	LOS A	1.1	8.0	0.54	0.79	0.61	28.0
NorthWest: The Bogan Way_NW															
27	L2	All MCs	73	4.0	73	4.0	0.264	4.4	LOS A	1.4	10.2	0.37	0.45	0.37	26.0
28	T1	All MCs	155	4.7	155	4.7	0.264	0.8	LOS A	1.4	10.2	0.37	0.45	0.37	60.5
29a	R1	All MCs	203	1.6	203	1.6	0.264	3.7	LOS A	1.4	10.2	0.37	0.45	0.37	42.8
Approach			430	3.1	430	3.1	0.264	2.8	NA	1.4	10.2	0.37	0.45	0.37	43.7
All Vehicles			1245	2.2	1245	2.2	0.327	4.8	NA	1.5	10.2	0.38	0.50	0.39	37.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 03 [03 (PM Scenario 2) 4:00-5:00PM - FAR_WYN (Site Folder: PM Peak - Scenario 2 (50% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (PM Scenario 2) 4:00-5:00PM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	266	3.3	266	3.3	0.155	0.1	LOS A	0.2	1.7	0.07	0.10	0.07	56.8
3	R2	All MCs	41	3.2	41	3.2	0.155	5.9	LOS A	0.2	1.7	0.07	0.10	0.07	52.6
Approach			308	3.3	308	3.3	0.155	0.9	NA	0.2	1.7	0.07	0.10	0.07	55.9
East: Wyndham Avenue															
4	L2	All MCs	55	4.5	55	4.5	0.089	5.9	LOS A	0.3	1.9	0.20	0.57	0.20	45.0
6	R2	All MCs	89	0.0	89	0.0	0.089	5.9	LOS A	0.3	1.9	0.20	0.57	0.20	36.8
Approach			144	1.7	144	1.7	0.089	5.9	LOS A	0.3	1.9	0.20	0.57	0.20	40.4
North: Farnell Street															
7	L2	All MCs	33	0.0	33	0.0	0.067	4.7	LOS A	0.0	0.0	0.00	0.14	0.00	49.6
8	T1	All MCs	107	0.0	107	0.0	0.067	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	56.6
Approach			140	0.0	140	0.0	0.067	1.1	NA	0.0	0.0	0.00	0.14	0.00	54.8
All Vehicles			592	2.1	592	2.1	0.155	2.1	NA	0.3	1.9	0.09	0.22	0.09	50.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (AM Scenario 3) 8:15-9:15AM - BOG_EDW 1 (Site Folder: AM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (AM Scenario 3) 8:15-9:15AM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	42	15.4	42	15.4	0.094	0.2	LOS A	0.4	3.6	0.06	0.15	0.06	59.6
23a	R1	All MCs	132	17.3	132	17.3	0.094	2.5	LOS A	0.4	3.6	0.19	0.46	0.19	40.2
Approach			173	16.9	173	16.9	0.094	1.9	NA	0.4	3.6	0.16	0.38	0.16	51.9
North: Edward St_NE															
7a	L1	All MCs	362	6.7	362	6.7	0.329	5.3	LOS A	1.7	12.5	0.23	0.55	0.23	35.0
9b	R3	All MCs	56	0.0	56	0.0	0.329	9.2	LOS A	1.7	12.5	0.23	0.55	0.23	54.3
Approach			418	5.8	418	5.8	0.329	5.9	LOS A	1.7	12.5	0.23	0.55	0.23	43.4
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	12	0.0	12	0.0	0.042	8.0	LOS A	0.0	0.0	0.00	0.37	0.00	72.0
28	T1	All MCs	63	8.7	63	8.7	0.042	2.1	LOS A	0.0	0.0	0.00	0.37	0.00	75.7
Approach			75	7.3	75	7.3	0.042	3.0	NA	0.0	0.0	0.00	0.37	0.00	75.0
All Vehicles			666	8.8	666	8.8	0.329	4.5	NA	1.7	12.5	0.18	0.49	0.18	52.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (AM Scenario 3) 8:15-9:15AM - JOH_BAR (Site Folder: AM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (AM Scenario 3) 8:15-9:15AM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	205	3.8	205	3.8	0.466	8.1	LOS A	3.5	25.2	0.63	0.67	0.88	22.1
3a	R1	All MCs	37	0.0	37	0.0	0.466	46.2	LOS D	3.5	25.2	0.63	0.67	0.88	27.2
3b	R3	All MCs	6	0.0	6	0.0	0.466	36.4	LOS C	3.5	25.2	0.63	0.67	0.88	29.4
Approach			248	3.1	248	3.1	0.466	14.5	LOS B	3.5	25.2	0.63	0.67	0.88	23.1
SouthEast: Johnson Street_SE															
21b	L3	All MCs	4	0.0	4	0.0	0.121	21.4	LOS B	0.9	6.2	0.34	0.33	0.34	38.5
22	T1	All MCs	135	3.4	135	3.4	0.121	5.0	LOS A	0.9	6.2	0.34	0.33	0.34	38.5
23	R2	All MCs	10	0.0	10	0.0	0.121	21.2	LOS B	0.9	6.2	0.34	0.33	0.34	34.6
Approach			149	3.1	149	3.1	0.121	6.5	NA	0.9	6.2	0.34	0.33	0.34	38.2
NorthEast: Barton Street_NE															
24	L2	All MCs	30	5.3	30	5.3	0.195	8.0	LOS A	0.6	4.6	0.63	0.84	0.63	31.5
24a	L1	All MCs	33	0.0	33	0.0	0.195	11.1	LOS A	0.6	4.6	0.63	0.84	0.63	32.6
26	R2	All MCs	64	0.0	64	0.0	0.195	9.5	LOS A	0.6	4.6	0.63	0.84	0.63	24.1
Approach			127	1.2	127	1.2	0.195	9.6	LOS A	0.6	4.6	0.63	0.84	0.63	28.4
NorthWest: The Bogan Way_NW															
27	L2	All MCs	120	2.6	120	2.6	0.504	4.1	LOS A	2.7	19.8	0.26	0.32	0.26	26.4
28	T1	All MCs	508	5.5	508	5.5	0.504	0.4	LOS A	2.7	19.8	0.26	0.32	0.26	65.4
29a	R1	All MCs	259	4.5	259	4.5	0.504	3.5	LOS A	2.7	19.8	0.26	0.32	0.26	45.3
Approach			886	4.8	886	4.8	0.504	1.8	NA	2.7	19.8	0.26	0.32	0.26	50.6
All Vehicles			1411	4.0	1411	4.0	0.504	5.2	NA	3.5	25.2	0.37	0.43	0.41	38.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 03 [03 (PM Scenario 3) 4:00-5:00PM - FAR_WYN (Site Folder: PM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (PM Scenario 3) 4:00-5:00PM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	481	3.0	481	3.0	0.260	0.1	LOS A	0.3	2.0	0.06	0.07	0.06	57.8
3	R2	All MCs	41	3.2	41	3.2	0.260	6.3	LOS A	0.3	2.0	0.06	0.07	0.06	53.2
Approach			523	3.0	523	3.0	0.260	0.6	NA	0.3	2.0	0.06	0.07	0.06	57.2
East: Wyndham Avenue															
4	L2	All MCs	55	4.5	55	4.5	0.145	6.2	LOS A	0.4	2.8	0.28	0.62	0.28	44.6
6	R2	All MCs	160	0.0	160	0.0	0.145	6.2	LOS A	0.4	2.8	0.28	0.62	0.28	36.4
Approach			215	1.2	215	1.2	0.145	6.2	LOS A	0.4	2.8	0.28	0.62	0.28	38.8
North: Farnell Street															
7	L2	All MCs	51	0.0	51	0.0	0.107	4.7	LOS A	0.0	0.0	0.00	0.13	0.00	49.6
8	T1	All MCs	173	0.0	173	0.0	0.107	0.0	LOS A	0.0	0.0	0.00	0.13	0.00	56.7
Approach			224	0.0	224	0.0	0.107	1.1	NA	0.0	0.0	0.00	0.13	0.00	54.9
All Vehicles			961	1.9	961	1.9	0.260	2.0	NA	0.4	2.8	0.10	0.21	0.10	51.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 01 [01 (PM Scenario 3) 4:00-5:00PM - BOG_EDW 1 (Site Folder: PM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

01 (PM Scenario 3) 4:00-5:00PM - The Bogan Way, Edward Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
SouthEast: The Bogan Way_SE															
22	T1	All MCs	35	6.1	35	6.1	0.019	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
23a	R1	All MCs	295	0.0	295	0.0	0.172	2.4	LOS A	0.9	6.2	0.16	0.49	0.16	43.3
Approach			329	0.6	329	0.6	0.172	2.1	NA	0.9	6.2	0.14	0.44	0.14	54.8
North: Edward St_NE															
7a	L1	All MCs	100	4.2	100	4.2	0.082	5.2	LOS A	0.3	2.4	0.14	0.54	0.14	35.7
9b	R3	All MCs	9	0.0	9	0.0	0.082	9.8	LOS A	0.3	2.4	0.14	0.54	0.14	54.5
Approach			109	3.8	109	3.8	0.082	5.6	LOS A	0.3	2.4	0.14	0.54	0.14	41.8
NorthWest: The Bogan Way_NW															
27b	L3	All MCs	11	0.0	11	0.0	0.030	7.9	LOS A	0.0	0.0	0.00	0.18	0.00	70.3
28	T1	All MCs	41	12.8	41	12.8	0.030	0.2	LOS A	0.0	0.0	0.00	0.18	0.00	75.4
Approach			52	10.2	52	10.2	0.030	1.8	NA	0.0	0.0	0.00	0.18	0.00	74.2
All Vehicles			491	2.4	491	2.4	0.172	2.9	NA	0.9	6.2	0.13	0.44	0.13	57.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SIDRA INTERSECTION 9.1 | Copyright © 2000-2023 Akcelik and Associates Pty Ltd | sidrasolutions.com

MOVEMENT SUMMARY

Site: 02 [02 (PM Scenario 3) 4:00-5:00PM - JOH_BAR (Site Folder: PM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

02 (PM Scenario 3) 4:00-5:00PM - The Bogan Way, Johnson Street, Farnell Street, Barton Street Intersection
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street_S															
1a	L1	All MCs	373	0.0	373	0.0	0.443	7.4	LOS A	2.9	20.6	0.55	0.72	0.70	27.4
3a	R1	All MCs	25	0.0	25	0.0	0.443	30.3	LOS C	2.9	20.6	0.55	0.72	0.70	33.2
3b	R3	All MCs	6	0.0	6	0.0	0.443	21.1	LOS B	2.9	20.6	0.55	0.72	0.70	35.1
Approach			404	0.0	404	0.0	0.443	9.0	LOS A	2.9	20.6	0.55	0.72	0.70	27.9
SouthEast: Johnson Street_SE															
21b	L3	All MCs	3	0.0	3	0.0	0.183	10.0	LOS A	0.5	3.7	0.15	0.14	0.15	48.2
22	T1	All MCs	273	0.7	273	0.7	0.183	0.7	LOS A	0.5	3.7	0.15	0.14	0.15	53.8
23	R2	All MCs	21	0.0	21	0.0	0.183	9.1	LOS A	0.5	3.7	0.15	0.14	0.15	43.0
Approach			298	0.6	298	0.6	0.183	1.4	NA	0.5	3.7	0.15	0.14	0.15	52.5
NorthEast: Barton Street_NE															
24	L2	All MCs	15	0.0	15	0.0	0.466	7.2	LOS A	2.2	15.9	0.64	0.95	0.96	30.5
24a	L1	All MCs	62	2.2	62	2.2	0.466	10.9	LOS A	2.2	15.9	0.64	0.95	0.96	31.3
26	R2	All MCs	264	5.8	264	5.8	0.466	10.7	LOS A	2.2	15.9	0.64	0.95	0.96	23.0
Approach			340	4.9	340	4.9	0.466	10.6	LOS A	2.2	15.9	0.64	0.95	0.96	25.0
NorthWest: The Bogan Way_NW															
27	L2	All MCs	76	3.8	76	3.8	0.297	4.6	LOS A	1.6	11.9	0.40	0.48	0.40	26.0
28	T1	All MCs	172	4.9	172	4.9	0.297	1.0	LOS A	1.6	11.9	0.40	0.48	0.40	59.6
29a	R1	All MCs	226	2.2	226	2.2	0.297	3.9	LOS A	1.6	11.9	0.40	0.48	0.40	42.2
Approach			473	3.4	473	3.4	0.297	2.9	NA	1.6	11.9	0.40	0.48	0.40	43.5
All Vehicles			1515	2.3	1515	2.3	0.466	6.0	NA	2.9	20.6	0.45	0.58	0.56	34.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 03 [03 (AM Scenario 3) 8:15-9:15AM - FAR_WYN (Site Folder: AM Peak - Scenario 3 (100% completion))]

Output produced by SIDRA INTERSECTION Version: 9.1.4.221

03 (AM Scenario 3) 8:15-9:15AM - Farnell Street, Wyndham Street
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Farnell Street															
2	T1	All MCs	205	8.4	205	8.4	0.183	1.4	LOS A	0.7	5.0	0.34	0.43	0.34	51.0
3	R2	All MCs	71	2.0	71	2.0	0.183	8.5	LOS A	0.7	5.0	0.34	0.43	0.34	49.1
Approach			275	6.8	275	6.8	0.183	3.2	NA	0.7	5.0	0.34	0.43	0.34	50.3
East: Wyndham Avenue															
4	L2	All MCs	75	0.0	75	0.0	0.117	8.4	LOS A	0.4	2.7	0.50	0.76	0.50	43.5
6	R2	All MCs	37	0.0	37	0.0	0.117	6.5	LOS A	0.4	2.7	0.50	0.76	0.50	29.4
Approach			113	0.0	113	0.0	0.117	7.8	LOS A	0.4	2.7	0.50	0.76	0.50	38.9
North: Farnell Street															
7	L2	All MCs	109	0.0	109	0.0	0.352	4.8	LOS A	0.0	0.0	0.00	0.09	0.00	50.3
8	T1	All MCs	607	6.3	607	6.3	0.352	0.0	LOS A	0.0	0.0	0.00	0.09	0.00	57.4
Approach			717	5.3	717	5.3	0.352	0.7	NA	0.0	0.0	0.00	0.09	0.00	56.2
All Vehicles			1105	5.1	1105	5.1	0.352	2.1	NA	0.7	5.0	0.14	0.24	0.14	51.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Appendix 9 - Aboriginal Heritage Constraints Assessment

22 August 2023

Matt Hills
Development Director
Allera
Suite 2.01, 65 Hume Street
Crows Nest NSW 2065

Dear Matt

Aboriginal Heritage Constraints Assessment School Road, Forbes

Our Ref: Matter: 39273

Biosis Pty Ltd (Biosis) has been commissioned by Allera to provide Aboriginal due diligence advice for the proposed rezoning at School Road, Forbes, New South Wales (NSW) (Lots 375, 376, 386, 387, 388, 389, 830, 831, 1272 and 1273, DP 750158 (the study area) (Figure 1 and Figure 2). The project involves rezoning the study area to facilitate future residential development(Figure 3). The purpose of this advice is to assist the client in exercising due diligence in determining whether the project will involve activities that may harm Aboriginal objects and to determine whether consent in the form of an Aboriginal Heritage Impact Permit (AHIP) is required. The proposed development will be assessed against Part 3 of the *Environmental Planning and Assessment Act 1979 NSW* (EP&A Act) as a planning proposal.

The *National Parks and Wildlife Act 1974* (NPW Act) provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm. Harm is defined to mean destroying, defacing, damaging or moving an object from the land. There are a number of defences and exemptions to the offence of harming an Aboriginal object or place. The NPW Act states that a person or organisation who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence of unknowingly harming an object without an AHIP.

The NPW Act allowed for a generic code of practice to explain what due diligence means. As a result, the *National Parks and Wildlife Regulation 2009* (NPW Regulation) adopted the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010a) (the Due Diligence Code). The Due Diligence Code sets out the reasonable and practicable steps which individuals and organisations need to take in order to:

- Identify whether or not Aboriginal objects are, or are likely to be, present in an area.
- Determine whether or not their activities are likely to harm Aboriginal objects (if present).
- Determine whether an AHIP application is required.

This advice includes a background review of documents and databases containing information relevant to the site and its surrounds, as well as an archaeological survey in accordance with the code, in order to adequately map areas of high, moderate and low archaeological sensitivity.

Step 1: Will the activity disturb the ground surface or any culturally modified trees?

Under the *Forbes Local Environment Plan 2013*, the study area is currently zoned RU1- Primary Production, R5- Large Lot Residential, and RE1 – Public Recreation. The study area has been identified by Forbes Shire Council (Council) for future residential development and is included within Council's *Draft Local Housing Strategy* (2021-2024) ((Draft LHS)). The Draft LHS indicates that the study area could facilitate the development of approximately 600 dwellings (including the R5 Large Lot Residential portion).

As the intention of rezoning is to allow for residential development, ground disturbance will occur during future development of the study area and therefore consideration of Steps 2a and 2b of the Due Diligence Code is required.

Step 2a. Search the Aboriginal Heritage Information Management System (AHIMS) database and use any other sources of information of which you are already aware

An extensive search of the AHIMS database was conducted on 26 June 2023 (Client service ID: 794639). The search identified 65 Aboriginal archaeological sites within a 10 by 10 kilometre search area, centred on the proposed study area (Table 1). None of these registered sites are located within the study area (Figure 4). The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied upon where notable discrepancies occurred.

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area. Some recorded sites consist of more than one element, for example artefacts and a modified tree, however for the purposes of this breakdown and the predictive modelling, all individual site types will be studied and compared. This explains why there are 68 results presented here, compared to the 65 sites identified in AHIMS.

Table 1 AHIMS sites within the vicinity of the study area

Site type	Occurrences	Frequency (%)
Artefact	29	42.65
Modified Tree (Carved or Scarred)	29	42.65
Hearth	5	7.35
Burial	4	5.88
Conflict	1	1.47
Total	68	100.00

A simple analysis of the Aboriginal sites registered within a 10 by 10 kilometre search centred on the study area indicates that the dominant site type is artefact sites and modified trees (carved or scarred), representing 42.65% each (n=29), with hearth sites representing 7.35% (n=5) and burial sites representing 5.88% (n=4). Conflict sites was the least represented site type in the vicinity of the study area at 1.47% (n=1).

A limited number of archaeological studies have been carried out in the Forbes locality in proximity to the study area. Further afield, larger studies have been conducted that provide predictive models relating to site patterning (Pearson, M. 1981, Koettig, M. 1985) in the landscape:

- Pearson (1981) conducted an assessment of the land use patterns and history of the Upper Macquarie River Valley. The assessment area spanned from Bathurst to Dubbo and Wellington to Mudgee and was at a minimum 60 kilometres from study area. The area occupied a total of 160 by 130 kilometres (20,800 sq km)(Pearson, M. 1981, pp. 87), and was divided into eight sub-regions according to terrain, hydrological resources, and climate. The study assembled data based on ethnohistorical records, historical research, and archaeological surveying. A sample of 148 Aboriginal sites were subject to assessment which could be divided into two main categories: occupation sites (artefact scatters and rock shelters) and non-occupation sites (inclusive of grinding grooves, scarred or carved trees, and ceremonial and burial sites). The following conclusions and observations were made:
  - Occupation sites varied from 10 to 500 metres distance to water, with larger sites occurring closer to water and lower elevations. Over half of the sites located at least 100 metres from water.
  - The preferential conditions for occupation sites included hilly areas situated upon dry, well-drained grounds, sheltered from prevailing winds with views over water resources.
  - Most sites were located in contexts which would originally have supported open woodlands.
  - Burial sites and grinding grooves were situated as close to habitation areas as geologically possible.
  - Ceremonial sites were located away from occupation sites.
  - Stone arrangements were located away from campsites in isolated places and were associated with small hills or knolls or on flat land.
  - Quarry sites were located where stone outcrops with desirable working qualities were recognised and accessible.
  - Rock shelter sites were on average182 metres from water sources and contained evidence of small group occupation.
  - Based on ethnohistoric information, it is suggested that Aboriginal campsites were seldom used for longer than three nights and that large archaeological sites probably represent accumulations of material over a series of short visits.
  - Sub-regions of harsh climate (subject to extreme cold and hot conditions) and containing poor resources, while not entirely unoccupied, were generally avoided in comparison to fertile and mild regions.
- Koettig (1985) undertook a comprehensive study of Aboriginal occupation of the Dubbo area (approximately 150 kilometres north of the study area), which included a desktop assessment followed by a systematic survey to target all topographic landform units and different stream orders. The field survey was divided up into five sample survey areas covering three major physiographic zones in the broader Dubbo area. As a result of the study, Koettig concluded that:
  - Aboriginal sites may be expected throughout all landscape units.
  - The most frequently occurring sites types were open artefact scatters, scarred trees, and grinding grooves.
  - The location of sites and their relative size were determined by a number of factors including environmental and social. Social factors could not be explained through archaeological research, however, environmental factors included:
  - The largest campsites were located close to permanent water and smaller sites were found all over the landscape including hills and ridges away from permanent water.

- Certain sites required specific conditions. For example, burials tend to be found in sandy sediments, grinding grooves were suitable rock outcrops occur, and quarries tend to be found where stone resources as accessible.
- The widest range of potential food resources were found along main watercourses due to the supply of permanent water, while some foods were seasonal and required foraging away from watercourses.

Koettig suggested that larger and more constantly occupied site are likely to occur along permanent water courses, while less intense and sporadic occupation evidence is seen along ridge tops and temporary water sources.

A review of the reports held by AHIMS identified several archaeological studies have been undertaken in the surrounding localities, particularly in the Parkes Shire Council area, the nearest extent of which is approximately 15 kilometres north of the study area. These reports have been summarised below:

- Moore (1977) (as summarised in OzArk Environmental and Heritage Management 2011, p.40) conducted an assessment for a proposed electricity easement from the northern edge of Parkes, 33 kilometres north of the study area, to Peak Hill approximately 81 kilometres further north to the study area. One site near Trewilga was recorded as part of the assessment: a basalt quarry site (AHIMS: 35-6-0002/Trewilga; Ten Mile Creek) which contained bi-facial choppers as well as numerous broken choppers and flakes.
- Witter (1987) conducted an archaeological assessment of the London-Victoria gold project, located approximately 25 kilometres north east of the study area. No artefact sites were located within the 0.5 square kilometre assessment via vehicular surveying and Witter noted that high levels of quartz contamination from the associated mining activities made it difficult to locate camp sites. Witter recommended that the seven scarred trees in the area should be subject to further investigation. Following from this survey, Mary Dallas Consulting Archaeology (1987) conducted a follow up investigation based on Witters recommendation. Ten scarred trees were located (inclusive of those located by Witter) within the London-Victoria gold project study area (AHIMS 43-3-0008-17, LV1-LV9 and LV11). The species of all scarred tree were not recorded though Bimble box *Eucalyptus populnea* was amongst them.
- Brayshaw (1993) undertook an archaeological survey for the proposed water supply pipe line to North Parkes Mine. The pipeline started 50 kilometres north of the study area, along Bogan Road, and finished 15 kilometres west of Forbes. The survey identified two open camps sites and one isolated find. One campsite contained a quartz flaked piece with retouch and use wear that was located within a disturbed context adjacent to an unnamed ephemeral drainage line. The second camp site was located 700 metres south of the first camp site, and contained an isolated find of a mudstone flake, also within a disturbed context.
- Appleton (2003)(as summarised in OzArk Environmental and Heritage Management 2011, pp. 41) located four modified trees along the Newell Highway, approximately 38 kilometres north east of the study area during a survey for the realignment of the Newell Highway (AHIMS 43-3-0065/PST-3 and AHIMS 43-3-0066/PST-4). Both modified tree sites were recorded as apple box *Eucalyptus bridgesiana* and fuzzy box *Eucalyptus conica*.
- Australian Archaeological Survey Consultants Pty Ltd (2006) were commissioned by R.W. Corkery & Co. Pty Limited on behalf of North Mining Limited, to carry out the ACHA component at the North Parkes mine approximately 49 kilometres north of the study area. During the archaeological survey, a total of three newly recorded Aboriginal archaeological sites were identified (Sites AHIMS 35-6-

0153/A1 Alectown, AHIMS 35-6-0154/A2 Alectown and AHIMS 35-6-0155/A3 Alectown). The sites consist of two isolated finds and one small artefact scatter.. It was recommended that the artefacts be recovered as part of a salvage project to be undertaken with the Peak Hill Local Aboriginal Land Council.

- OzArk (2011) was commissioned to determine the presence and distribution of Aboriginal and European sites within areas of potential future disturbance associated with the Tomingley Gold Project. The predictive model of the study area consisted of those outlined in the above Koettig, M. (1985) and Pearson, M. (1981) summaries. The project involved the establishment of mining, gold processing and waste management operations across an area of 776 hectares south of the township of Tomingley, approximately 99 kilometres north of the study area. The following predictive statements were generated based on a synthesis of desktop research((OzArk Environmental and Heritage Management 2011, pp. 47):
  - Second order creeks were likely to be the focus of smaller scale activities, such as transitory tool production or one-off camp sites.
  - Flat plains over 200 metres from water sources are unlikely to contain archaeological material.
  - Modified trees are highly likely to occur where remnant vegetation is present.
  - Open campsites are likely to occur within 150 metres of waterways
  - IsolattedIsolated finds may occurs on any landform though the likelihood of detection increases within disturbed locations in proximity to waterways.

  Over the course of the survey, 60 Aboriginal heritage sites were identified, including 54 modified trees, three artefact sites, two isolated finds and one ceremonial site (OzArk Environmental and Heritage Management 2011, pp. 51). The following conclusions were made with regards to site distribution:

  - 90% of the recorded sites were scarred trees potentially reflecting post-colonial efforts to maintain remnant vegetation as a means of protecting against the elements. The density of scarred trees indicates the assessment area was a heavily populated location in which the practice of cultural scarring was frequently utilised.
  - Modified tree tend to be located in proximity to drainage lines with 60-63% recorded within 100 metres of water sources. The largest site, AHIMS 35-3-0159/TNWP-OS1 with PAD (n=121, 76.5 artefacts per square metre), was located in proximity to the Macquarie River paleochannel. Smaller sites such as TGP-OS1(n=3) and OS2 (n=18) were located in proximity to what has been estimated to be a prehistoric spring (OzArk Environmental and Heritage Management 2011, pp. 80)
  - A notable lack of sites in proximity to water course was observed in the mining portion of the study area, determined to be a result of post-colonial influences on hydrological structures. Higher densities of scarred trees were used to estimate the location of the original channels.
- Biosis (2013) conducted an ACHA of approximately 11.73 hectares of land within Lot 550 DP 750179 and a portion of Lot 7313 DP 1147330 in Parkes approximately 30 kilometres north-west of the study area. The field assessment involved surveying of a flat landform containing erosional soils approximately 1.5 kilometres south of a permanent water source, Goobang Creek (fourth order stream). No Aboriginal sites were identified within the study area. It was concluded that the lack of available freshwater and geological resources, and poor soils contributed to both a reduced likelihood of occupation and poor environmental conditions that would have reduced the likelihood of artefact and site preservation (Biosis 2013, pp. 30).

- Umwelt (2017) prepared an Aboriginal Cultural Heritage and Archaeological Assessment for the Parkes to Narromine inland rail on behalf of Australian Rail Track Corporation (ARTC). During the preliminary archaeological inspection of the existing railway corridor and the proposed connection route, site AHIMS 43-3-0111/P2N IA1 was identified. The site consisted of a single silcrete flake located upon an access track on the northern bank of a tributary of Ridgey Creek, less than 10 meters from the rail line. Site predictions for the proposed area indicated that stone artefacts and scarred trees were the most likely site types. Stone artefacts sites were commonly associated with areas close to reliable sources of water. It was noted that a number of reliable water sources were located close to the proposed corridor, however the reliability of these water sources has been impacted by post-contact land use and artificial modifications. It was concluded that the Ridgey Creek Tributary where site AHIMS 43-3-0111/P2N IA1 was located, possessed low archaeological potential within the corridor and moderate potential outside the rail corridor and level crossing. Various mitigation and management options were provided to ensure no harm would come to any identified site or areas of archaeological potential. It was recommended that prior to commencing construction, site AHIMS 43-3-0111/P2N IA1 be collected and salvaged.
- Biosis (2018) conducted an Aboriginal and non-Aboriginal cultural heritage archaeological survey report for the proposed expansion of an existing hard rock quarry at 1105 Bogan Road, Goonumbla, NSW, approximately 50 kilometres north of the study area. The assessment area was situated within a gently sloping landscape approximately 10 kilometres east of Gooboang Creek (fourth order stream). Though background research indicated the presence of 72 Aboriginal sites within 10 kilometres of the assessment area, no sites were located within it. Biosis determined this to be related to the lack of well drained landforms and limited freshwater supply, and the significant level of vehicular disturbance, ploughing and clearing that had occurred throughout the assessment area (Biosis 2018, pp. 38).

Step 2b. Activities in areas where landscape features indicate the presence of Aboriginal objects

In order to determine whether the activity within landscape features likely to contain Aboriginal objects, a review of information pertaining to ethnohistories, soils, geology, landform, disturbance and potential resources has been undertaken.

Ethnohistory

Early contact between Aboriginal and European cultures occurred sporadically within the Lachlan Valley, approximately 129 kilometres south of the study area, and were documented by Surveyor General John Oxley and explorer Allan Cummingham in 1817 (Whitehead, J. 2003). On the return journey from their explorations of the Lachlan Valley, Oxley and Cunningham moved north of Lake Cargelligo and Condobolin to the west of Parkes (approximately 33 kilometres north of the study area). Relating to their travels Oxley (1817, cited by Whitehead, J. 2003: 298) writes:

> *We have hitherto seen no other signs of this being inhabited country than the marks usually made by the natives in ascending the rees, and none of these were very recent. It is probable that they may see us without discovering themselves…*

While Cunningham (1817, cited by Whitehead, J. 2003: 299) reported that:

> *…we halted and pitched our tent on the stie of an old native encampment. Here we saw quantities of horse-mussel shells with which the creek had furnished them and some stones on which they had been sharpening some weapons or instruments, perhaps hir mogos or stone hatches.*

Further along the journey as they attempted to find passage towards Macquarie River, Oxley and Cunningham made camp north of Gundong Creek near Tomingley Creek (approximately 106 kilometres north of the study area) where Oxley (1817, cited by Whitehead, J. 2003: 303) wrote:

> *On the banks of that burn (Scottishfor creek), many heaps of the pearl muscle-shells were found, and marks of flood about eight feet. We have for several days past seen no signs of any native being recently in this part of the country: the marks on the trees, which were the only marks we saw, being several months old, and never seen except in the vicinity of water. Marks of the natives' tomahawks were to us certain signs of approaching water.*

The expedition led by Surveyor General Sir Thomas Mitchell, set out in 1835 to explore the Bogan river (approximately 168 kilometres north of the study area) (Kass, T. 2003). Following a meeting with a group of local Aboriginal men, Mitchell learned that the area named the Hervey Range by Oxley during their 1817 expedition was known to locals as 'Goobang', which meant 'place of many wattles'. Mitchell's group camped within earshot of an Aboriginal camp and is quoted (Unger, L.A. 1963):

> *The Natives who we met here were fine looking men, enjoying contentment and happiness within the precincts of their native woods. Their enjoyment seemed so derived from nature, that it almost excited a feeling of regret, that civilised men, enervated by luxury and all its concomitant diseases, should ever disturb the haunts of these rude happy beings. The countenance of the first man who came up to me, was a fine specimen of man in an independent state of nature. He had nothing artificial about him, save the badge of mourning for the dead, a white band (his was very white), round his brow. His manner was grave, his eye keen and intelligent, and, as our people were encamping, he seemed to watch the moment when they wanted fire, when he took a burning stick, which one of the natives had brought, and presented it in a manner expressive of welcome and an unaffected wish to contribute to our wants. Sat a distance, their gins sat at fires, and we heard the domestic sounds of squalling children.*

Mitchell's party would leave their camping spot followed by several of the Aboriginal men who reportedly extracted honey from tree branches using tomahawks, while another speared a large kangaroo. This would continue for four days before the group retreated at the sight of another group of Aboriginal people; this was interpreted as a tribal boundary by Mitchell (Unger, L.A. 1963).

Once the Mitchell expedition reached the Bogan headwaters they encountered a group of Aboriginal people who referred to themselves as the 'Bultje' tribe, composed of up to 120 people who were capable of speaking minor amounts of English. The group was described as removing one of two front teeth of males aged over 14 years. Mitchell described this group as relying on possums, kangaroo and emus as well as freshwater mussels for sustenance, while the children ate the root of the 'tao' plant (1835, cited by Unger, L.A. 1963).(Unger, L.A. 1963).

Geology, soils and hydrology

The study area is located within the NSW South Western Slopes bioregion (New South Wales National Parks and Wildlife Service 2003). It is within the Lower Slopes Subregion which consists of undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial fans. The entirety of the study area is encompassed by a gently sloping landform, defined by relatively level surfaces stretching between study area boundaries.

The geological formations associated with the study area are identified within Figure 5 and include the Calarie Sandstone unit occupying the north-western corner of the study area encompassed by colluvial and residual deposits. The Calarie Sandstone contains cross bedded to planar bedded medium grained sandstone, the outcrops of which may have historically been utilised as grinding surfaces in proximity to creek banks, art surfaces, and rock shelters where appropriate overhangs may be present (Pearson, M. 1981, pp. 90, 102). Colluvial and residual deposits comprise a majority of the study area, this geological formation is the result of loose sediments washed towards the base of hillslopes. Thick accumulations of colluvium have been known

to contain well preserved and deeply buried archaeological deposits (Steve Parry 2011). The remaining geological feature, Mixed colluvial, alluvial and aeolian deposits, occupies minimal space towards the southernmost boundary of the study area. It is an amalgamation of the previously mentioned Colluvial deposit, along with alluvial sediments, loose clay, silt, sand or gravel deposited by running water in a stream bed or similar setting (Jackson, Julia, A. 1997), the aeolian deposit is defined as sediment transported by erosional forces, such as the wind.

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. Because they are defined by a combination of soils, topography, vegetation and weathering conditions, soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure. The Bald Hill and Parkes soil landscapes are present within the study area. Bald Hill soil landscape is an erosional soil landscape which covers the north-western, south-western and south-eastern portions of the study area. It consists of narrow, convex elongated crests and ridges and gently inclined side slopes on predominantly sandstones (3-8%). The Parkes soil landscape, covering the north-eastern portion of the study area, is also an erosional soil landscape which consists of narrow crests and gently inclined side slopes on Ordovician metasediments. Erosional soils are generally subject to movement events which lead to poor preservation of archaeological materials, this can be an indication of low probability for the occurrence of Aboriginal sites and objects The soil landscapes associated with the study area are identified within Figure 7.

Stream order is recognised as a factor which helps the development of predictive modelling in Aboriginal archaeology in NSW. The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Photo 1. As stream order increases, so does the likelihood that the stream would be a perennial source of water. Predictive models which have been developed for the region have a tendency to favour permanent water courses as the locations of campsites as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups (Koettig, M. 1985, Pearson, M. 1981).

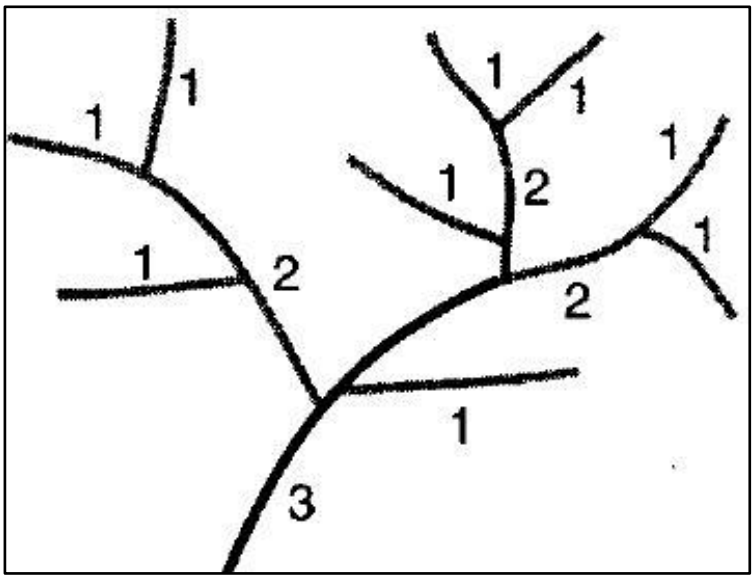


Photo 1 Diagram showing Strahler stream order (Ritter, Kochel, & Miller 1995, pp. 151)

The study area contains the northern extent of one first order stream originating from Lake Forbes and three dams. The first dam is in Lot 386, DP 750158 in proximity to the north-eastern border of the study area, the second is in the central portion of the study area at the southern boundary of Lot 387/DP750158, and the

third is located at the southern boundary of the study area in Lot 375/DP750158 . These dams track north to south of the study area indicating the streams drainge pathway historically followed the lower lying terrain but has since been modified to accommodate for agriculatural activities. Further to this the action of damming this stream indicates it was likely a non-perennial watercourse. Beyond this the surrounding locality contains an ample network of lower order streams stemming from the major sources of the Forbes Lake, Lachlan River and Bocobidgle Creek. The nearest of these is Forbes Lake located approximately 2.1 kilometres souther-west of the study area at its nearest point. When exploring trends between hydrology and occupation, Pearson, M. 1981 and Koettig, M. 1985 each determined that preference was given to permanent water courses in the central west region given their correlation to high resource availiability, this suggests sites are less lilely to occur within the study area due to the lack of permanent water resources. Hydrological features associated with the study area are identified in Figure 5

Resources

The South Western Slopes is the traditional home of the Wiradjuri people, the largest Aboriginal language group in NSW. The Wiradjuri people travelled to the alpine regions of the South Eastern Highlands and Australian Alps bioregions for the annual summer feasts of bogong moths (Heritage Office and Department of Urban Affairs and Planning 1996).

Wiradjuri means "people of the three rivers". the rivers being referred to are the Macquarie, Lachlan and Murrumbidgee (Heritage Office and Department of Urban Affairs and Planning 1996). For the Wiradjuri people, the three rivers were their livelihood and supplied a variety of consistent and abundant food provisions including shellfish and fish such as Murray cod *Maccullochella peelii* (Heritage Office and Department of Urban Affairs and Planning 1996). In dry seasons aquatic resources from the rivers were supplemented with kangaroos and emus, hunted for their meat, as well as flora gathered from the land between the rivers, including fruit, nuts, yam daisies, wattle seeds and orchid tubers (Heritage Office and Department of Urban Affairs and Planning 1996).

Plant resources were used in a variety of ways. Fibres were twisted into string, which was used for many purposes, including the weaving of nets, baskets and fishing lines. String was also used for personal adornment(Attenbrow 2002). Pearson's summary of ethnographic data indicates that bark was utilised in the manufacture of shelters in cold and wet conditions, and bough and leaf wind breakers and shelters, referred to as 'gungah' were constructed for hot, dry weather (Pearson, M. 1981, pp. 373). Eucalyptus bark was also was observed in the manufacture of canoes utilised for long distance travel and crossing bodies of water. Pearson ((1981, pp. 374) notes the level of ingenuity employed by local populations with all manner of resources in the stating:

> *Stone sources were located and utilized, all forms of timber were converted into tools and weapons, bark, animal tendons and fur were converted into string and then into netting, sap was utilized as halting gum, skins were made into cloaks and bags, and all were finished with artistic decoration.*

Further examples of the items manufactured using faunal and floral resources include belts of kangaroo skin, possum hair and grass, kangaroo tendon head pieces with cockatoo feather plumes, woven grass and kurrajong bark string nets, and bone and reed ornaments (Pearson, M. 1981, pp. 367–369).

Native mammalian species most commonly recorded within the Forbes locality include Rakali *Hydromys chrysogaster*, Eastern Grey Kangaroo *Macropus giganteus,* Swamp Wallaby *Wallabia bicolor,* Common Wallaroo *Osphranter robustus* and Little Red Flying-fox *Pteropus scapulatus.* Galah *Eolophus roseicapilla,* Australian Magpie *Gymnorhina tibicen,* Magpie-lark *Grallina cyanoleuca,* Crested Pigeon *Ocyphaps lophotes,* Eastern Rosella *Platycercus (Violania) eximius,* and Australian Wood Duckmaned Goose *Chenonetta jubata* are amongst the most commonly observed avian species.

Disturbances

Land has been disturbed if it has been the subject of a human activity that has changed the land's surfaces, being changes that remain clear and observable. The study area has been subject to varying levels of disturbance, with crop and pastoral and grazing evident across the study area, as well as extensive vegetative clearing. Historic aerials from 1965 (

Photo 2 **1965 aerial photograph, with the study area outlined in orange (Source: NSW Spatial Services accessed 2023)**

), which is the earliest date with aerials available, display the study area widely cleared of vegetation and separated into fields for agricultural purposes. No structures are visible within the study area at this time. Further aerial imagery dating to 1974 (

Photo 3) show a minor change in that a track is now visible extending from the northern boundary of the study area towards what may be a small structure or potentially an access gate to paddocks to the south. The structure which is present in modern aerials of the study area was constructed post-1974 and pre- 1983 as indicated by

Photo 4 indicating that some site work has taken place which would likely cause sub-surface disturbance.



Photo 2 **1965 aerial photograph, with the study area outlined in orange (Source: NSW Spatial Services accessed 2023)**



Photo 3 **1974 aerial photograph, with the study area outlined in orange (Source: NSW Spatial Services accessed 2023)**

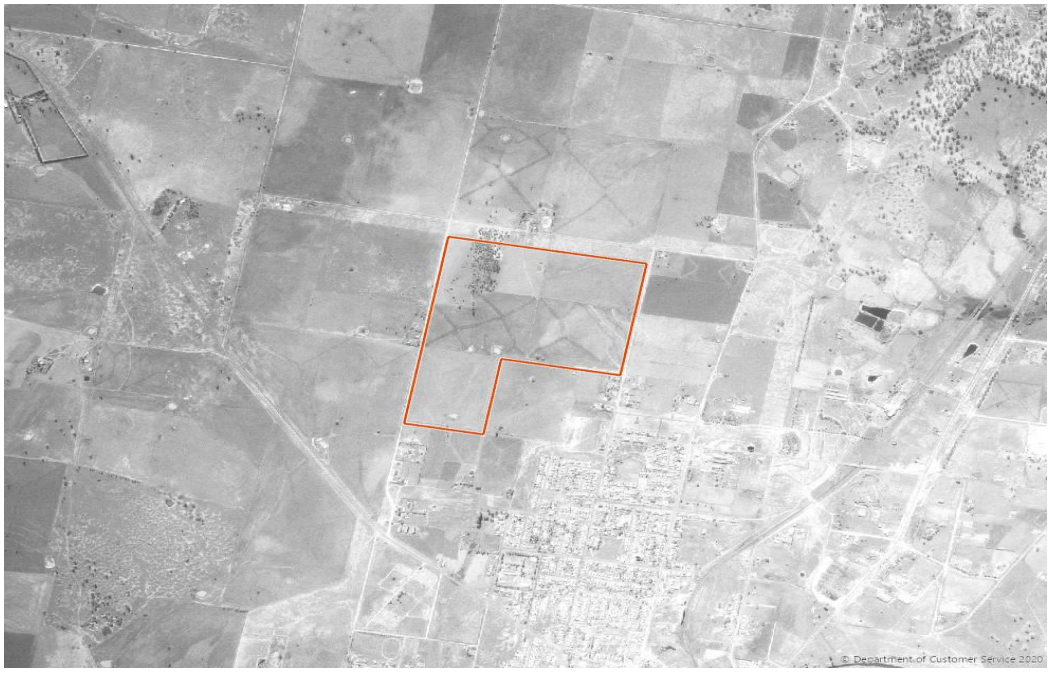


Photo 4 **1983 aerial photograph, with the study area outlined in orange (Source: NSW Spatial Services accessed 2023)**

Step 3. Can you avoid harm to the object or disturbance of the landscape feature?

The proposed works will result in disturbances to soils within the study area and therefore harm cannot be avoided.

Step 4: Desktop assessment and visual inspection

Desktop assessment

Based upon the results from Stages 2a and 2b of the Due Diligence Code, a series of statement have been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located.

This model is based on:

- Local and regional site distribution in relation to landform features identified within the study area.
- Consideration of site type, raw material types and site densities likely to be present within the study area.
- Findings of the ethnohistorical research on the potential for material traces to present within the study area.
- Potential Aboriginal use of natural resources present or once present within the study area.
- Consideration of the temporal and spatial relationships of sites within the study area and surrounding region.

Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 2). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 2 Aboriginal site prediction statements

Site type	Site description	Potential
Scarred trees	Trees with cultural modifications	Moderate: Scarred trees are a common site type within the vicinity of the study area. Due to extensive vegetation clearance only a small number of mature native trees have survived within the westernmost part of the study area. A such potential for scarred trees is moderate within the north-western extent of the study area.
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	Moderate: Stone artefact sites have been previously recorded in the region on level, well-drained topographies in proximity to reliable sources of fresh water. While the distance from permanent freshwater is high, the presence of temporary water resources indicates the potential for artefacts to as moderate.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Moderate: Sites will only occur where there is suitable horizontal sandstone rock outcrops along drainage lines. Geological and hydrological mapping indicates the potential for grinding grooves to be present within the north-western portion of the study area.

Site type	Site description	Potential
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	Low: PADs have been previously recorded in the region across a wide range of landforms. PADs are likely to be present within areas adjacent to permanent water courses, on high points in undisturbed landforms, and areas containing fertile soils.
Burials	Aboriginal burial sites.	Moderate: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Shallow erosional soils within the study area indicates potential for subsurface burials to be low while vegetation in the north-west hold moderate potential for tree burials.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist. Geologically, the study area may support such structures in the norther-western portion of the study area though topographically the terrain does not suit such structures. Potential for rock shelters is therefore low.
Conflict	Previously referred to as massacre sites where confrontations occurred between (1) Aboriginal and non-Aboriginal people, or (2) between different Aboriginal groups.	Low: While one conflict site was located within 10 kilometres of the study area, no sources indicate conflict sites to be located within the study area.
Aboriginal Ceremony and Dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are currently no recorded mythological stories for the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the study area.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: Shell midden sites have not been recorded within the vicinity of the study area. There is a very low potential for shell middens to be located in the study area as the first order drainage line is not permanent water source.

Site type	Site description	Potential
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.

Visual inspection

A visual inspection of the study area was undertaken on 25 July 2023 by Nathan Windram (Biosis, Graduate Heritage Consultant). The visual inspection consisted of a meandering survey of the study area to identify and record any Aboriginal archaeological sites visible on the surface, or areas of Aboriginal archaeological potential and cultural sensitivity with special care taken to specifically target areas of remnant vegetation. The archaeological survey was conducted on foot. The methods used during the visual inspection conformed to Requirements 5 to 8 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) (the Code). () For terminology and definitions used within this section, please refer to the aforementioned guideline. The results of the visual inspection are outlined below and in Figure 8.

The study area is located on a flat landform with a gently rising slope towards a low-lying crest comprising the north-western portion of the study area. Visibility across the site was generally moderate (50%), hampered by vegetation coverage (Photo 5). Exposure within the study area was moderate (45%) with large swathes of the terrain having been freshly ploughed (Photo 8). Multiple disturbances were present within the study area, including ground disturbing work associated with ploughing, the large scale movement of soil, the movement of heavy vehicles and the presence of structures (Photo 9 to Photo 11). It is also likely that there has been some sub-surface disturbance within the study area associated with the occupied structures present, such as through the construction of foundations or footings and trenches for sub-surface utilities.



Photo 5 Typical example of visibility within the study area, photo facing north



Photo 6 Typical example of visibility within wooded area upon low-lying crest, photo facing south



Photo 7 Young Ironbark tree, , , located upon low-lying crest in area of remnant vegetation showing natural scarring, photo facing west

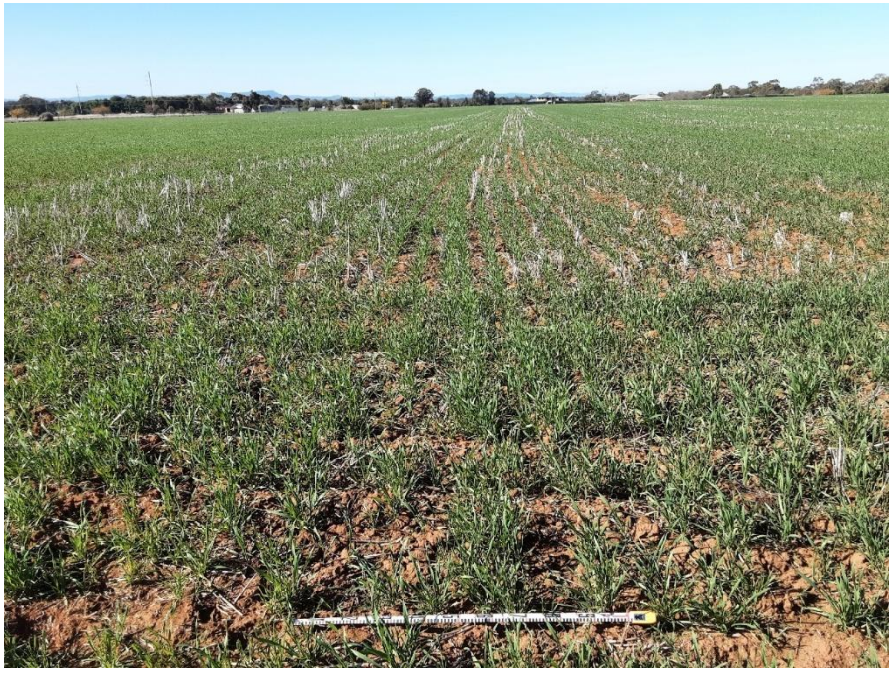


Photo 8 Area of exposure and disturbance associated with ploughing within the north-east paddock, photo facing east.



Photo 9 **Disturbance associated with heavy vehicle movement within north-central paddock, photo facing south-east**



Photo 10 **Disturbance associated with residential site occupation within north-central paddock, photo facing south**



Photo 11 **Disturbance associated with ploughing and land clearance within eastern paddock, photo facing south**



Photo 12 Artificial dam located centrally, photo facing east



Photo 13 Artificial dam at distance located within southern paddock, photo facing south

Discussion and conclusions

The archaeological investigation consisted of a total of one meandering transect walked across the entire study area. The results of the field investigation and transect location can be seen in Figure 8.

Background research identified that the study area contains the Calarie Sandstone geology occupying the north-western corner of the study area encompassed by colluvial and residual deposits, the outcrops of which could be utilised as grinding surfaces and art surfaces in proximity to creek banks, and rock shelters where appropriate overhangs may be present. Geological features can be seen in Figure 5. The study area contains two soil landscapes; the Bald Hill and Parkes soil landscapes which are both characterised as erosional. Erosional soils are generally subject to movement events which lead to poor preservation of archaeological materials, this can be an indication of low probability for the occurrence of Aboriginal sites and objects, soil landscapes can be seen in Figure 7.

A variety of flora and fauna resources were recorded and observed within proximity to the study area, offering numerous sources of exploitation. The study area contains three artificial dams tracking north to south, indicating the location of a drainage pathway which historically followed the lower lying terrain but has since been altered to accommodate agricultural activities. The action of damming the stream strongly suggests it was a non-perennial source and so would not have been reliable. When exploring trends between hydrology and occupation Pearson, M. 1981 and Koettig, M. 1985 each determined that preference was given to permanent water courses in the central west region given their correlation to high resource availiability, the lack of permanent water courses within the study area reduces the likelihood of to occur. Hydrological features can be seen in Figure 6. The study area is contained within a flat landform, topographically this does not provide clear views of the urrounding area which decreases the likelihood that the study area was occupied for extended periods.

A review of histoical aerial photofraphs displays that the study area has been used for agricultural purposes since at least 1965, with the earliest aerials showing extensive vegetation clearance and pastoral development. Aerial imagery from 1974 show a minor change in that a track is now visible extending from the northern boundary of the study area towards what may be a small structure or potentially an access gate to paddocks to the south. Due to the high amount of ground alteration as a result of pastoral activities, the overall likeliness of sites occurring within the majority of the study area is low.

No new Aboriginal sites or objects were identified during the archaeological investigation carried out on 25 July 2023. The study area has undergone extensive levels of disturbance, the historically inconsistent stream which has been dammed was likely overlooked in favour of the more permeable watercourses nearby, and the study area overall holds a low elevation level within the wider landscape. Overall the study area has been assessed to hold low potential to contain archaeological deposits (Figure 8).

Step 5: Further investigations and impact assessment

Further assessment is not warranted based upon the completion of Steps 1 to 4 of the Due Diligence Code. The study area has been determined to have been impacted by agricultural works associated with maintaining crop plantations, as well as the operation of heavy machinery and the construction of occupation structures. The field investigation undertaken as part of this project has confirmed the nature of disturbances within the study area which have likely impacted any potential sites present. Due to these disturbances, lack of appropriate environmental features such as raised topography and permanent water course access, and previous regional predictive statements identified during background research it is assessed that there is low potential for intact Aboriginal archaeological sites to occurring within the study area.

The following recommendations have been formulated for the project:

Recommendation 1: No further archaeological assessment is required, works may proceed with caution

No further archaeological work is required in the study area due to the entire study area assessed as having low archaeological potential due to previous disturbances and landscape characteristics.

Recommendation 2: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by Heritage NSW, Department of Planning and Environment (Heritage NSW). Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying Heritage NSW and Aboriginal stakeholders.

Recommendation 3: Discovery of Aboriginal ancestral remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify the NSW Police and Heritage NSW' Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by Heritage NSW.

Please contact me if you have any enquiries.

Yours sincerely



Nathan Windram
Graduate Heritage Consultant

References

Appleton, J. 2003. The archaeological investigation of the proposed route for the realignment of the Newell Hwy, Goobang Project, Parkes, Central West. Prepared for GHD on behalf of the RTA.,.

Attenbrow V 2002. Sydney's Aboriginal Past: Investigating the archaeological and historical records, University of New South Wales Press Ltd, Sydney.

Australian Archaeological Survey Consultants 2006. Aboriginal Heritage Assessment of the Northparkes Mines - E48 Project, R.W Corkery & Co. Pty Limited.

Biosis 2013. Parkes Hospital Redevelopment: Archaeological Report, Appian Group on behalf of Health Infrastructure.

Biosis 2018. Goonumbla Quarry expansion: Aboriginal and non-Aboriginal cultural heritage archaeological survey report, Geolyse.

Brayshaw, H. 1993. Water Supply Pipeline to proposed Northparkes Mine, NSW Archaeological survey for Aborgiinal Sites,.

DECCW 2010a. Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales, Department of Environment, Climate Change and Water, Sydney NSW.

DECCW 2010b. Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW, Department of Environment and Climate Change, Sydney NSW.

Forbes Shire Council n.d. Draft Local Housing Strategy (2021 – 2024).

Heritage Office and Department of Urban Affairs and Planning 1996. Regional Histories : regional histories of New South Wales, Department of Urban Affairs and Planning, Sydney.

Jackson, Julia, A. 1997. Glossary of geology, 4th edn, American Geological Institute, Alexandria, Virginia.

Kass, T. 2003. Parkes Shire Thematic History,.

Koettig, M. 1985. Assessment of Aboriginal sites in the Dubbo City area.,.

Mary Dallas Consulting Archaeology 1987. London-Victoria Gold Project Archaeological Study, National Parks and Wildlife Service.

Moore, P. C. 1977. Parkes to Peak Hill 66kV Transmission line. Survey of proposed line for Aboriginal relics., NPWS Report.

New South Wales National Parks and Wildlife Service 2003. The Bioregions of New South Wales: their biodiversity, conservation and history, New South Wales National Parks and Wildlife Service, Hurtsville.

OzArk Environmental and Heritage Management 2011. Tomingley Gold Project Cultural Heritage Assessment,.

Pearson, M. 1981., Seen through different eyes: changing land use and settlement patterns in the Upper Macquarie River region of NSW from prehistoric times to 1860,PhD Thesis, Department of Prehistory and Anthropology, Australian Nationa University.

Ritter DF, Kochel RC, & Miller JR 1995. Process Geomorphology, Wm. C. Brown.

Steve Parry 2011. Developments in Earth Surface Processes,.

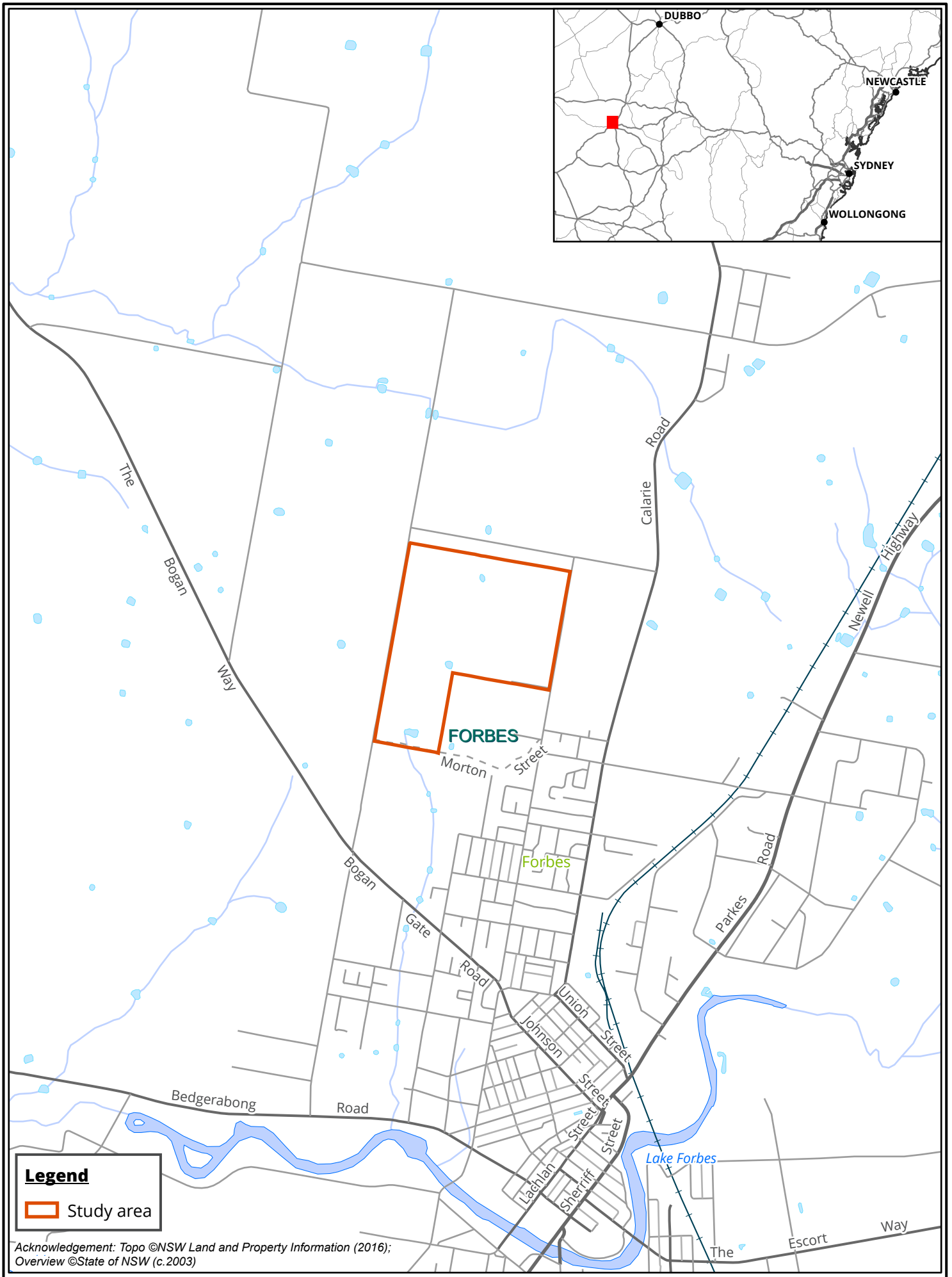
Strahler A 1952. 'Hypsometric (area-altitude) analysis of erosional topology', Geological Society of America Bulletin, 63, 11: 1117–1142.

Umwelt 2017. Technical report 8: Aboriginal Culutral Heritage and Archaeological Assessment in Parkes to Narromine Project: Environmental Impact Statement, ARTC.

Unger, L.A. 1963. Aboriginal activity in the Parkes district., Parkes and District Historical Society.

Whitehead, J. 2003. Tracking and Mapping the Explorers", Southern Cross University Printery, Lismore.

Witter D 1987. An archaeological investigation of the Bowning to Boorowa Gas Pipeline, Anutech Pty Ltd, Canberra.



biosis

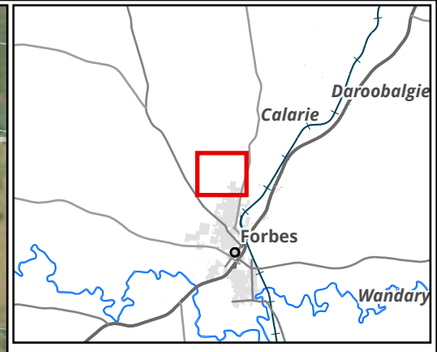
Figure 1 Location of the study area

Matter: 39273, Date: 17 July 2023,
Drawn by: JET, Checked by: BB., Last edited by: jbeckius
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA
Layout: 39273_ADDA_F1_Locality

0 200 400 600 800 1,000
Metres
Scale 1:30,000@ A4, GDA 1994 MGA Zone 55

N





Legend

- Study area
- Lot

Figure 2 Study area detail

0 100 200

Metres

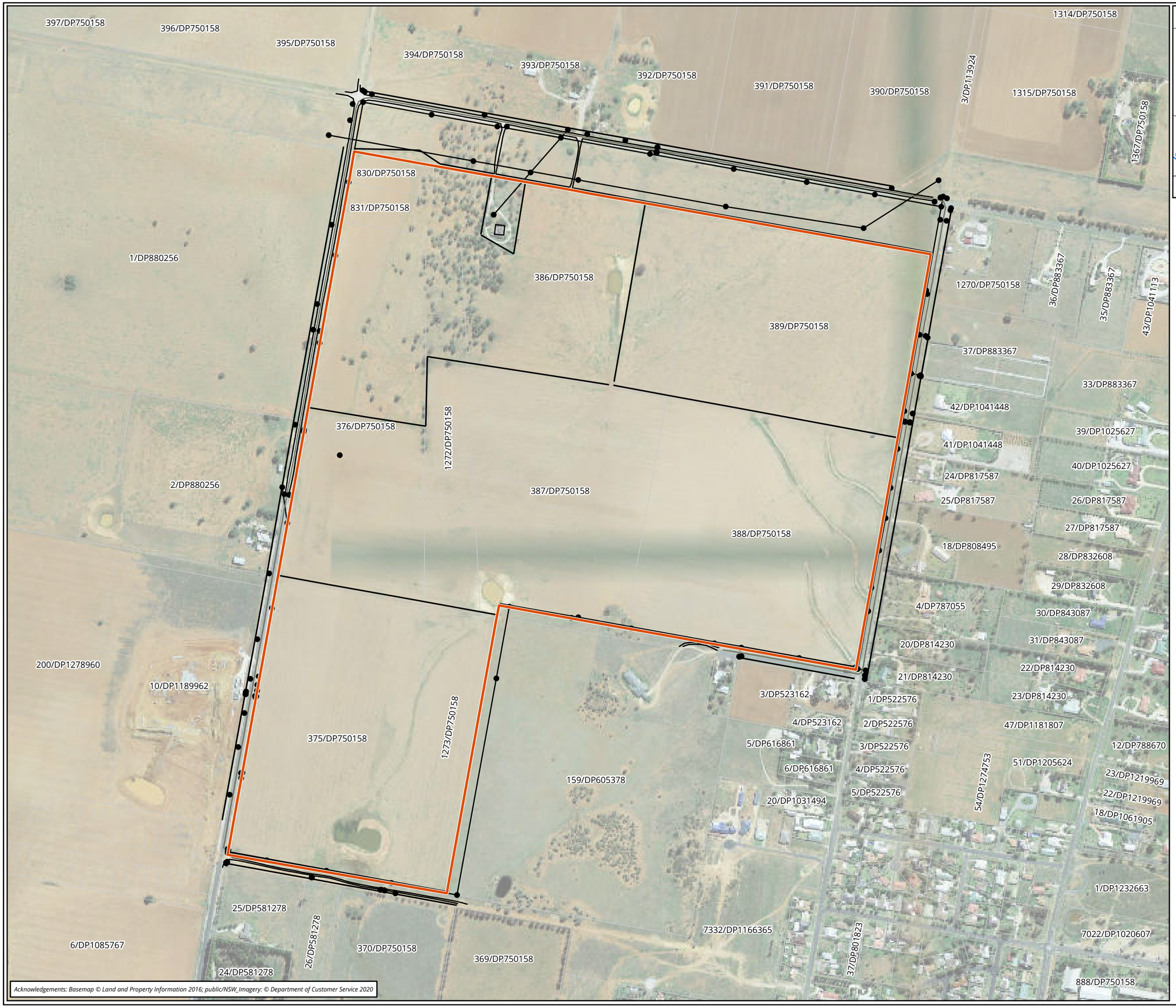
Scale: 1:6,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

N

biosis

Matter: 39273, Date: 22 August 2023,
Drawn by: JET, Checked by: BB., Last edited by: jtownsend
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F2_StudyArea



Legend

- Study area
- Lot
- Proposed works - point
- Proposed works - line

Figure 3 Proposed works

0 100 200

Metres

Scale: 1:6,000@ A3

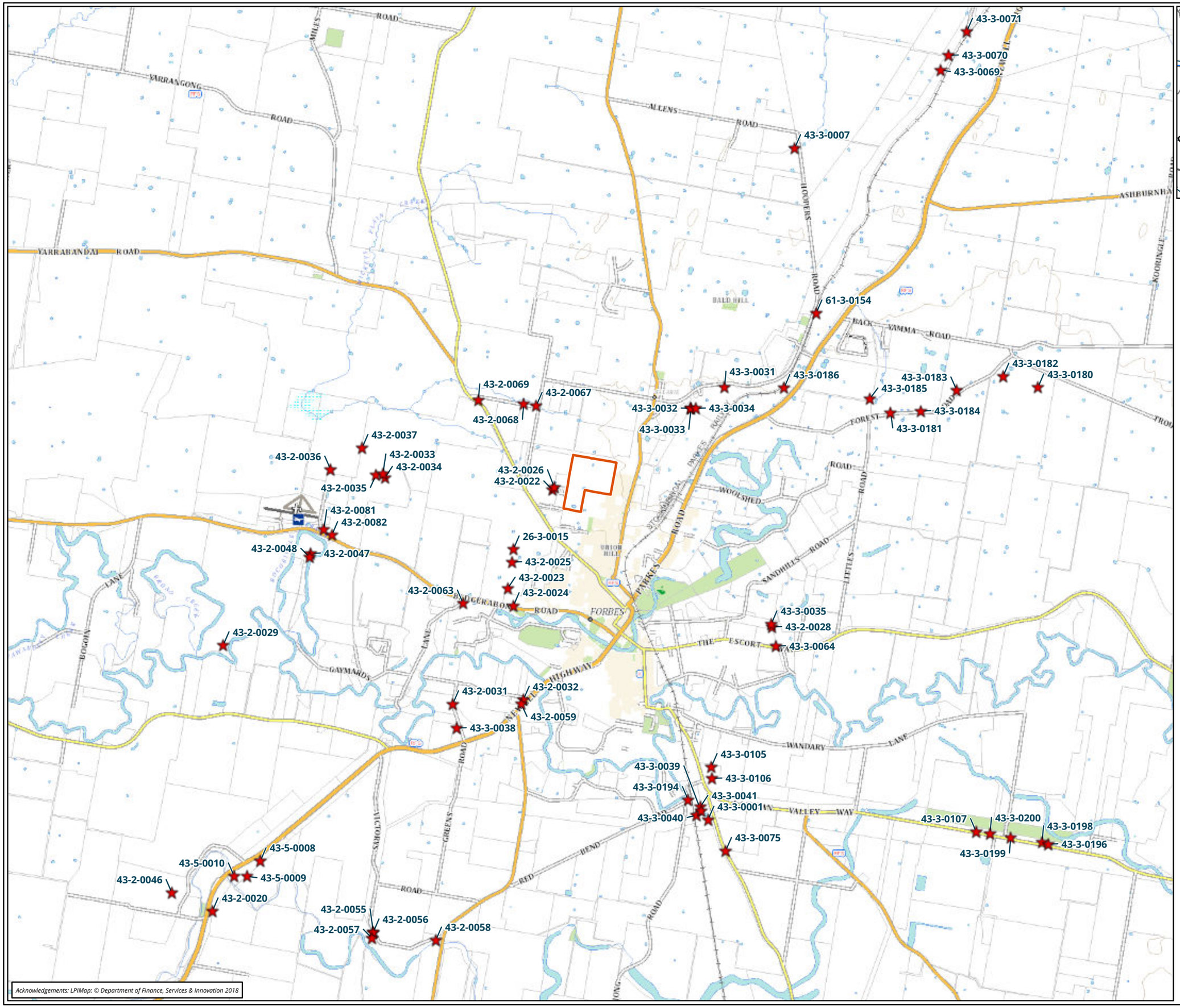
Coordinate System:
GDA 1994 MGA Zone 55

N

biosis

Matter: 39273, Date: 22 August 2023,
Drawn by: JET, Checked by: NW., Last edited by: jtownsend
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F3_Prop

Acknowledgements: Basemap © Land and Property Information 2016; public/NSW_Imagery: © Department of Customer Service 2020





Legend

- Study area
- AHIMS

NOT TO BE MADE PUBLIC

Figure 4 AHIMS within the vicinity of the study area

0 1 2 3

Kilometers

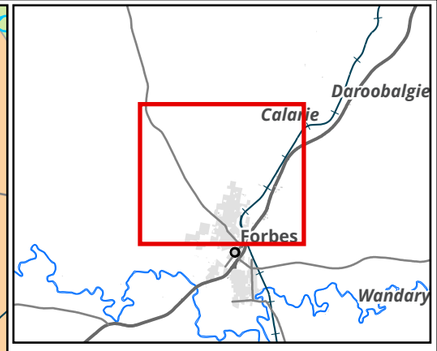
Scale: 1:80,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

N

biosis

Matter: 39273, Date: 17 July 2023,
Drawn by: JET, Checked by: BB., Last edited by: jbeckius
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F3_AHIMS



Legend

Study area

Geological units

- CZ_a,Alluvium
- Ddec,Calarie Sandstone
- Onop,Parkes Volcanics
- Q_acm,Alluvial channel deposits - meander-plain facies
- Q_af,Alluvial floodplain deposits
- Q_ca,Mixed colluvial, alluvial and aeolian deposits
- Q_cr,Colluvial and residual deposits
- Sfob,Bocobidgle Conglomerate
- Sfom,Mumbidgle Formation
- Sufc,Cotton Formation

Figure 5 Geological units in the vicinity of the study area

0 200 400 600 800

Metres

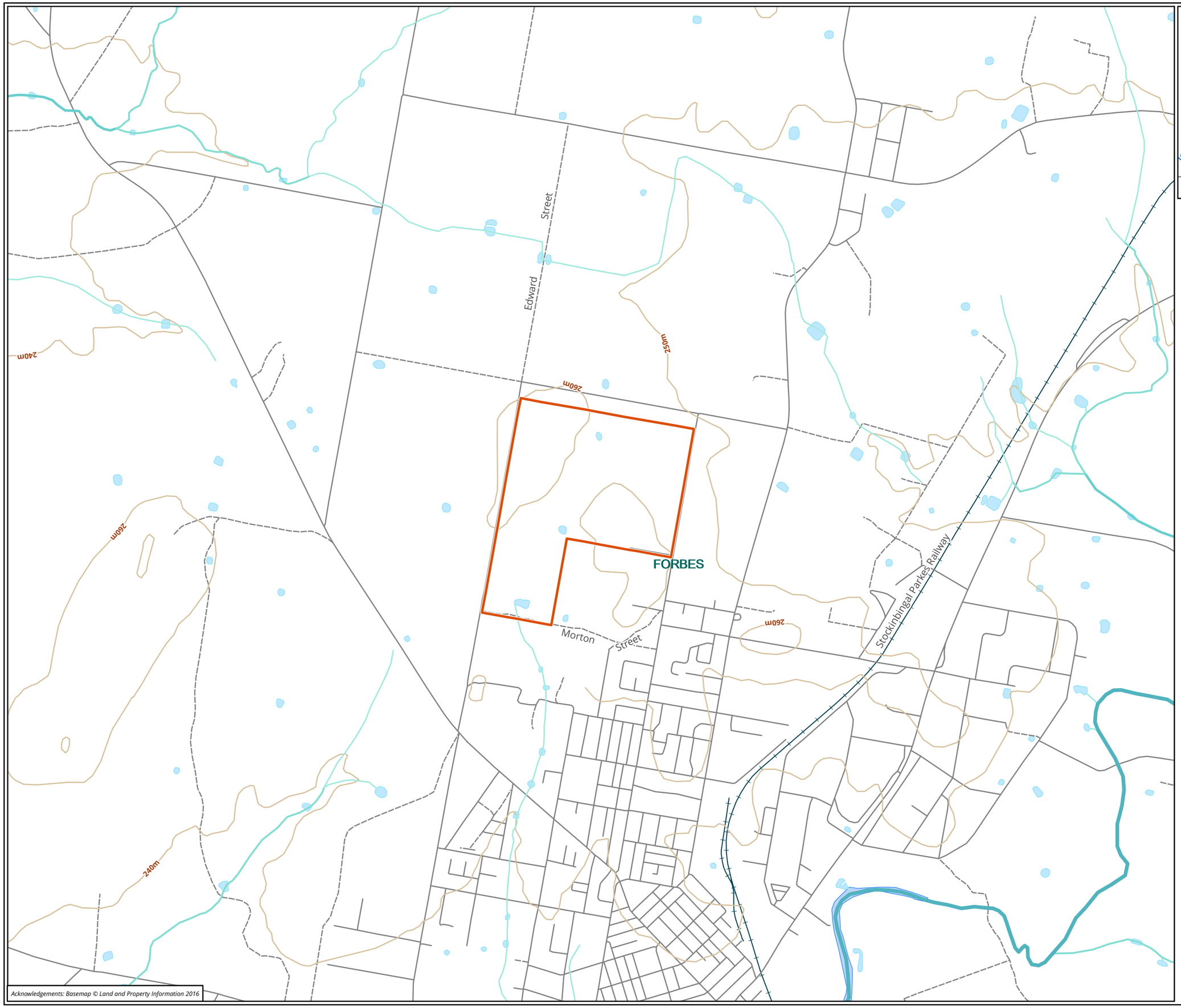
Scale: 1:20,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

biosis

Matter: 39273, Date: 17 July 2023,
Drawn by: JET, Checked by: BB., Last edited by: jbeckius
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F4_Geology

Acknowledgements: Basemap © NSW Land and Property Information 2016; Geology © State of New South Wales through Regional NSW 2020



Acknowledgements: Basemap © Land and Property Information 2016

Legend

- Study area
- Contour (10m)

Strahler Order

- 1
- 2
- 3
- 4

Figure 6 Hydrology and topography in the vicinity of the study area

0 200 400 600 800

Metres

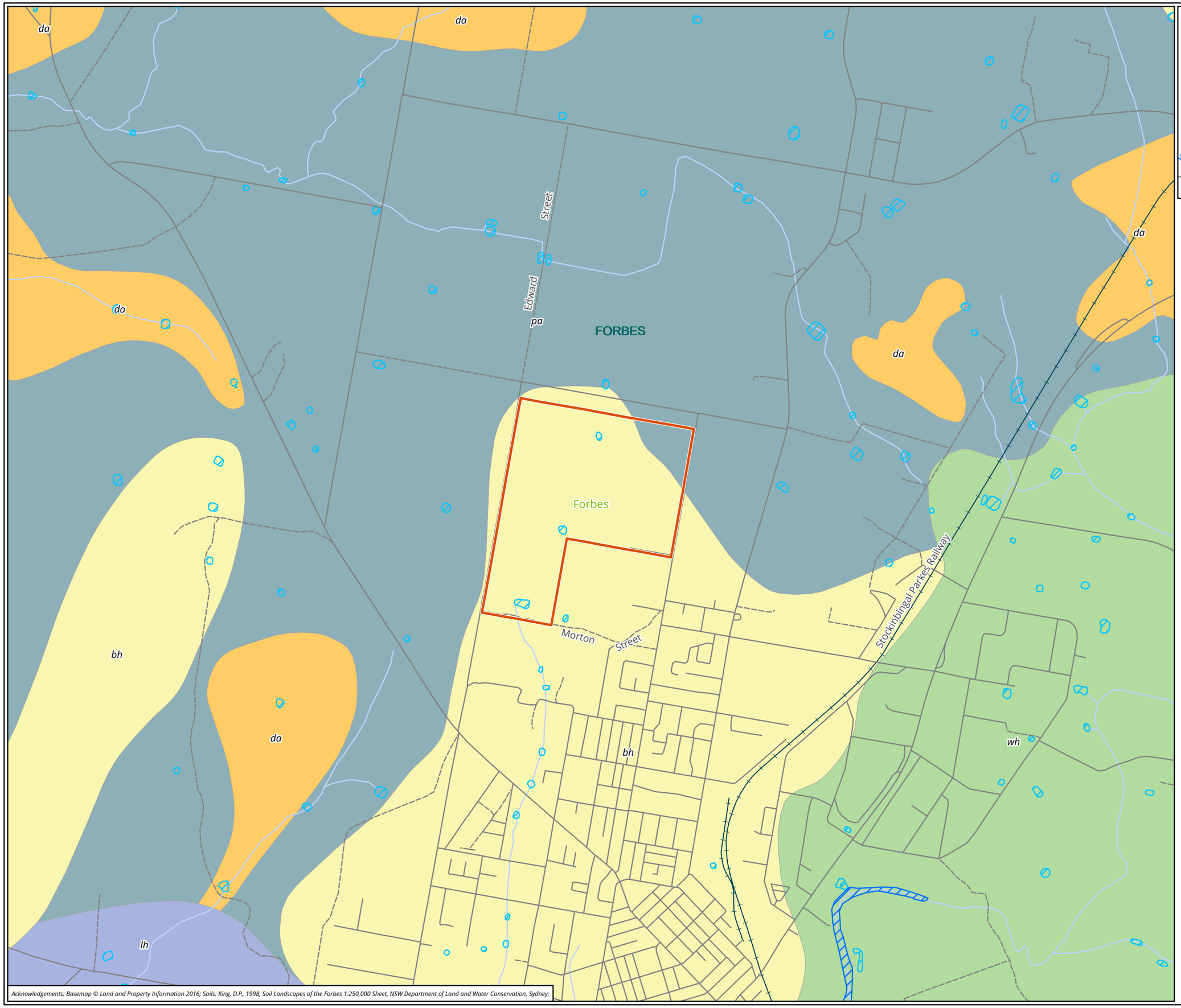
N

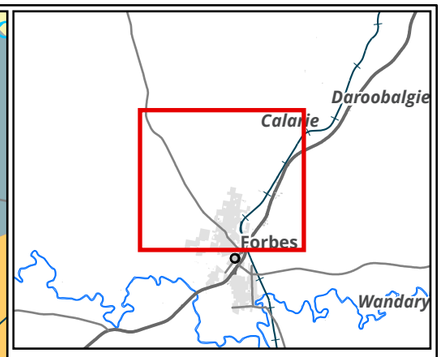
Scale: 1:20,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

biosis

Matter: 39273, Date: 17 July 2023,
Drawn by: JET, Checked by: BB., Last edited by: jbeckius
Location: P:\39200s\39273\Mapping\,
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F5_Hydrology





Legend

Study area

Soil landscape units

- bh - BALD HILL
- da - DAROOBALGIE
- lh - LACHLAN
- pa - PARKES
- wh - WAUGHAN

Figure 7 Soil landscapes in the vicinity of the study area

0 200 400 600 800

Metres

Scale: 1:20,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

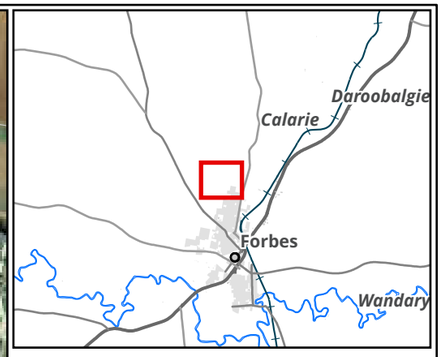
N

biosis

Matter: 39273, Date: 17 July 2023,
Drawn by: JET, Checked by: BB., Last edited by: jbeckius
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F6_Soils

Acknowledgements: Basemap © Land and Property Information 2016; Soils: King, D.P., 1998, Soil Landscapes of the Forbes 1:250,000 Sheet, NSW Department of Land and Water Conservation, Sydney;





Legend

- Study area
- Lot
- Survey tracks

Archaeological potential

- Low

Figure 8 Visual inspection

0 100 200

Metres

N

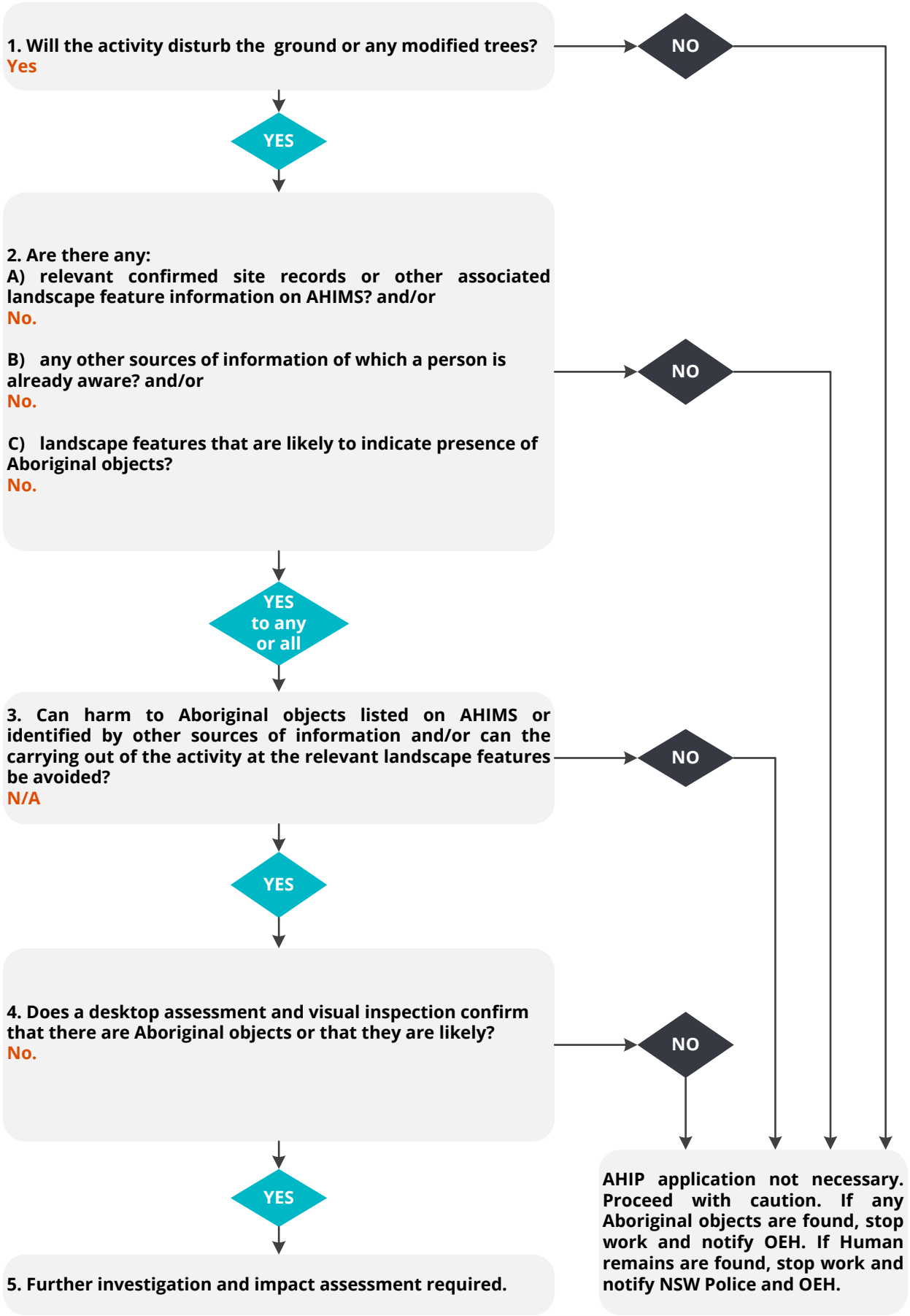
Scale: 1:5,000@ A3

Coordinate System:
GDA 1994 MGA Zone 55

biosis

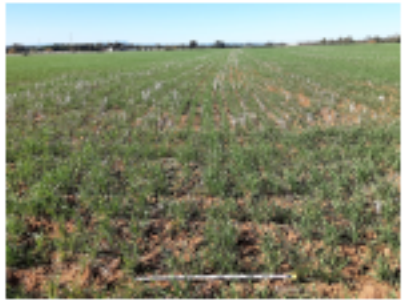
Matter: 39273, Date: 22 August 2023,
Drawn by: JET, Checked by: NW, Last edited by: jtownsend
Location: P:\39200s\39273\Mapping\
39273_School Rd Forbes ADDA,
Layout: 39273_ADDA_F8_Results

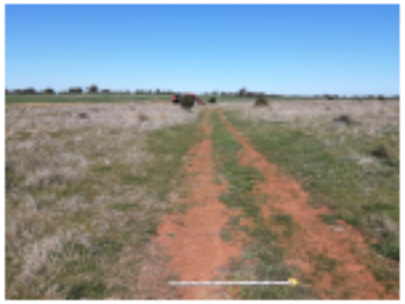
Figure 10: Due diligence flow chart



Appendix A. Photo Points

39273 Survey Photo points


2.jpg


3.jpg

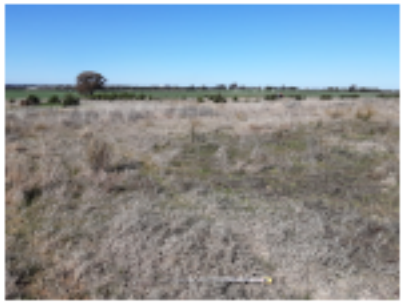

4.jpg

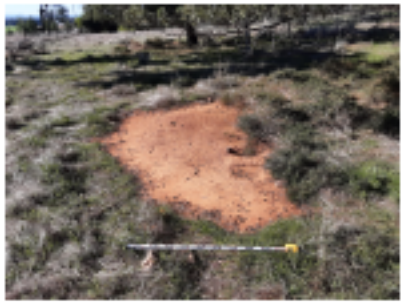

5.jpg

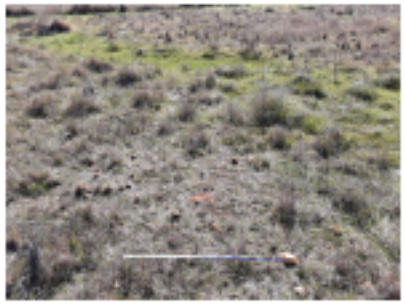

6.jpg


7.jpg


8.jpg


9.jpg


10.jpg

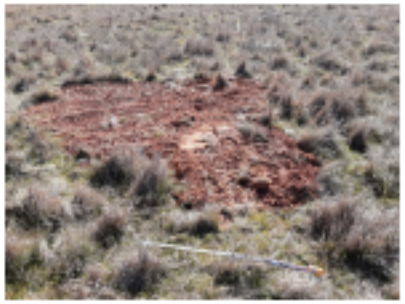

11.jpg


12.jpg

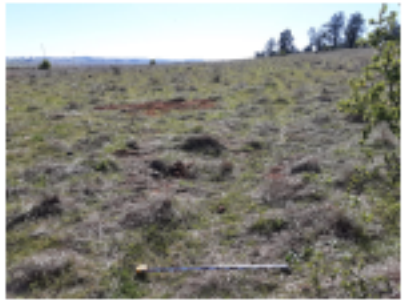

13.jpg

39273 Survey Photo points

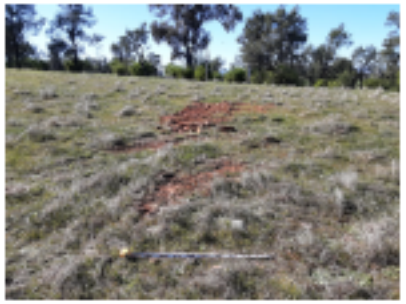

14.jpg

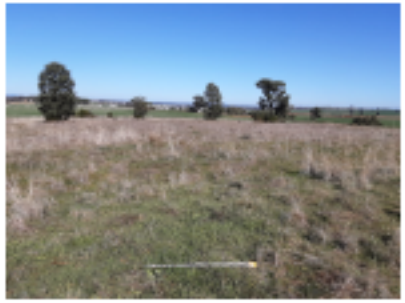

15.jpg


16.jpg


17.jpg


18.jpg


a.jpg


b.jpg


c.jpg

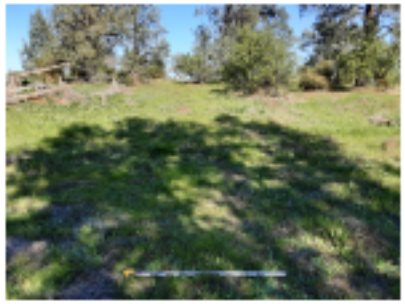

d.jpg


e.jpg


f.jpg


g.jpg

39273 Survey Photo points



GSV within tree area.jpg



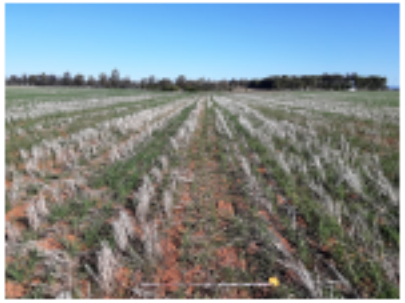
h.jpg



i.jpg



j.jpg



man made dam 2.jpg



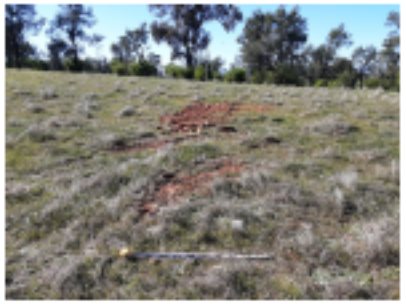
man made dam.jpg



not scar tree.jpg



Photo 1.jpg



Tree area vis 2.jpg

Appendix 10 - Social and Economic Impact Assessment



School Road, Forbes

Social and Economic Impact Assessment

Prepared for
ForbesView Pty Ltd

September 2023

HillPDA CONSULTING

CONTENTS

Executive summary 6

1.0 Introduction 10

1.1 Acknowledgement of Country 10
1.2 The site 10
1.3 The proposal 11

2.0 Planning context 13

2.1 Central West and Orana Regional Plan 13
2.2 Forbes Local Strategic Planning Statement 15
2.3 Forbes Housing Strategy 15
2.4 Forbes Recreation and Open Space Strategy 2021 19

3.0 Social baseline 21

3.1 Social impact assessment method 21
3.2 Study area 25
3.3 Local demographics 26
3.4 Projections 37
3.5 Social infrastructure audit 43

4.0 Community needs assessment 51

4.1 Population at the site 51
4.2 Housing need 52
4.3 Social infrastructure 52

5.0 Retail demand assessment 60

5.1 Demand methodology 60
5.2 Retail centres 61
5.3 Residential expenditure 62
5.4 Demand for shop front space 65
5.5 Impacts on other centres 66

6.0 Economic impact assessment 68

6.1 Economic impact assessment approach 68
6.2 Economic impacts from design and construction 69
6.3 The base case 70
6.4 Economic impacts from the proposal in operational phase 71
6.5 Net economic impact summary 72
6.6 Other economic impacts 73

7.0 Social impact assessment 75

7.1 Assessment 76

8.0 Conclusion 83

Tables

Table 1: Selected objectives and strategies, Central West and Orana Regional Plan 2041 14
Table 2: Key directions for recreation and open space, Forbes ROSS 19
Table 3: Types of social impacts 22
Table 4: Likelihood of impact 23
Table 5: Dimensions of social impacts 23
Table 6: Magnitude of impact 23
Table 7: Social impact significance matrix 24
Table 8: Comparison of selected attributes, Bathurst (LGA) residents and ATSI Bathurst (LGA) residents, 2021 Census 27
Table 9: Median personal and household incomes and housing expenses 29
Table 10: Top five industries of employment, Forbes LGA and Rest of NSW (2021) 29
Table 11: Rental payment quartile distribution, Forbes LGA and Rest of NSW (2021) 37
Table 12: Mortgage repayment quartile distribution, Forbes LGA and Rest of NSW (2021) 37
Table 13: District and town level open space and recreation facilities in Forbes 44
Table 14: Libraries and community facilities in Forbes 46
Table 15: Education and childcare facilities in Forbes 47
Table 16: Healthcare facilities in Forbes 48
Table 17: Population projection at the site 51
Table 18: Estimated population at the site by service age group 51
Table 19: Key housing needs in Forbes 52
Table 20: Recreation and open space facilities assessment 55
Table 21: Libraries and community facilities assessment 56
Table 22: Childcare and education assessment 57
Table 23: MTA population projections 63
Table 24: Total retail expenditure in the trade area from 2022-2041 ($ millions)* 64
Table 25: Assumed MTA capture rates 65
Table 26: Total potential sales 65
Table 27: Floorspace demand by broad retail type 66
Table 28: Economic impact metrics assessed 68
Table 29: Gross output from design and construction ($2022million) 70
Table 30: Construction GVA impact ($million) (2022 dollars) 70
Table 31: Construction related employment 70
Table 32: Operational phase - economic output ($m/ann) (2022 dollars) 72
Table 33: Operational phase - staff renumeration ($m/ann) (2022 dollars) 72
Table 34: Operational phase - gross value added ($m/ann) 72
Table 35: Net economic impacts 73
Table 36: Construction impact assessment 76
Table 37: Operational impact assessment 79

Figures

Figure 1: The site 10
Figure 2: Indicative masterplan for the site 11
Figure 3: The Central West and Orana region 13
Figure 4: Selected themes and planning priorities, Forbes LSPS 15
Figure 5: Forbes urban growth site suitability analysis map 17
Figure 6: Forbes urban land staging plan 18
Figure 7: SIA process 21
Figure 8: Types of social impact 22
Figure 9: The site and study areas 25
Figure 10: Comparative age structure, Forbes (LGA) and Rest of NSW, 2021 26
Figure 11: Proportion of residents requiring assistance with core needs (by age group), Forbes LGA and Rest of NSW (2021) 28
Figure 12: SA1s by IRSD decile 30
Figure 13: SA1s by IRSAD decile 31
Figure 14: Households by number of persons usually resident, Forbes LGA and Rest of NSW (2021) 32
Figure 15: Occupied dwellings by household type, Forbes LGA and Rest of NSW (2021) 33
Figure 16: Dwellings by typology, Forbes LGA and Rest of NSW (2021) 33
Figure 17: Dwellings by number of bedrooms, Forbes LGA and Rest of NSW (2021) 34
Figure 18: Dwellings by number of additional bedrooms required or spare, Forbes LGA (2021) 35
Figure 19: Dwellings by tenure type, Forbes LGA and Rest of NSW (2021) 36
Figure 20: Rent and mortgage stress, Forbes LGA and Rest of NSW (2021) 36
Figure 21: Projected population and annual growth rate, Forbes LGA (2021-2041) 38
Figure 22: Current and projected population age structure, Forbes LGA (2021-2041) 39
Figure 23: Projected number of households, household size, and implied dwelling demand, Forbes LGA (2021-2041) 40
Figure 24: Residential dwelling approvals by financial year, Forbes LGA (2018-19 to 2022-23) 41
Figure 25: Projected additional households by type, Forbes LGA (2021-2041) 41
Figure 26: Projected additional households by type (implied), Forbes LGA (2021-41) 42
Figure 27: Open space and recreation areas in Forbes and surrounds 43
Figure 28: Libraries and community facilities in Forbes 46
Figure 29: Education and childcare facilities in Forbes 47
Figure 30: Healthcare facilities in Forbes 48
Figure 31: Social infrastructure benchmarking approach 53
Figure 32: Open space and recreation hierarchy 53
Figure 33: Indicative masterplan 54
Figure 34: Methodology to forecast retail demand 60
Figure 35: Main trade area of the site 62

Quality Assurance

Report contacts

Jesse Rowlings
Consultant
BSci DipGov MURP (current) MPIA
jesse.rowlings@hillpda.com

Supervisor

Alex Peck
Associate
BSci BSocSci MPlan MPIA
alexander.peck@hillpda.com

Quality control

This document is for discussion purposes only unless signed and dated by the HillPDA Project Director.

Reviewer

Signature		Dated	27/09/2023

Report details

Job number	P23093
Version	1.1
File name	P23093 - Forbes School Road Planning Proposal SEIA v1.1
Date issued	27 September 2023

EXECUTIVE SUMMARY

This social and economic impact assessment (SEIA) report has been prepared for ForbesView Pty Ltd to accompany a planning proposal for a site northwest of Forbes' centre, in NSW's Central West region.

The planning proposal and indicative masterplan pertain to a 92 hectare site, with an indicative yield of 745 dwellings, enabling an estimated population of 1,560 residents at full development. The proposal would also provide retail and commercial space in a neighbourhood centre, around ten hectares of open space and natural areas, play and recreation space, and active transport routes.

This SEIA has been prepared to assess the likely housing, social infrastructure and economic implications of the planning proposal and provide any recommendations for how any identified benefits could be enhanced, and mitigations or management measures for any identified impacts.

Background and social baseline

To inform the SEIA, we completed a review of the planning context as it relates to Forbes and the site and assessed the social baseline of the local community, noting that:

- Both the site and Forbes' north more broadly have been flagged for future residential development in strategic planning work undertaken and consulted on by Council.
- Council has completed works in understanding and planning for social infrastructure provision across the LGA, particularly with regard to open space and recreation.
- The LGA's population is similar in age structure the Rest of NSW, though with more children and teenagers, and a larger proportion of older residents. It also has a significant Aboriginal population.
- Forbes hosts strong local employment and anchor industries, and recorded lower unemployment rates than NSW as a whole. Despite this, household incomes were lower than typically recorded across the Rest of NSW.
- Parts of Forbes have high levels of socio-economic disadvantage.

We also assessed household, dwelling, and population projections in Forbes, noting that Forbes is anticipated to experience significant population and housing demand growth over the coming years. We found:

- Most households consisted of only one or two people.
- The vast majority of dwellings in Forbes were separate houses, with few apartments or semi-detached dwellings.
- Only 20 per cent of dwellings had two or fewer bedrooms.
- Rent and mortgage repayments in Forbes were lower than those recorded across NSW as a whole.
- Projections indicate an additional 3,900 people will live in Forbes by 2041.
- Between 1,800 and 2,100 additional dwellings (approximately) will be necessary to house this additional population, and many of these will need to be diverse housing to meet the needs of smaller households.
- At present, housing delivery in Forbes is not meeting this need.

Findings

Community needs assessment

The report also provides a social infrastructure audit and community needs assessment, following from the findings of the previous sections. The key findings were:

- The existing supply of social infrastructure in Forbes – particularly sporting open space and education facilities – is more than sufficient to support the community.
- Though Forbes has a relatively small population, it hosts social infrastructure assets including a library, community centre, TAFE NSW campus, and public hospital.
- Based on the indicative masterplan for the site, we anticipate that the proposal would deliver a resident population of around 1,560 people.
- Much of the additional demand for social infrastructure from the proposal would be accommodated by the existing provision within Forbes.
- The significant open space and recreation assets proposed to be delivered as part of the proposal would significantly improve access for existing and future residents of Forbes' north
- The Forbes community needs additional housing supply. In particular, there is a strong need for smaller housing, including traditional detached dwellings on smaller lots and well-located semi-detached and attached dwellings.

Economic impacts

A detailed assessment of retail demand and economic impact of the proposal was also undertaken. The key findings include:

- The population of the trade area of the proposal is sufficient to enable the proposed neighbourhood centre.
- The centre would allow residents at the site to fulfil their day-to-day needs, whilst having minimal impact on the existing Forbes centre.
- During construction, the proposal would support 5,161 job years (directly and indirectly).
- Once operational, the proposal would support 122 full-time equivalent jobs at the site, a major benefit to the local area.
- Both the construction and operational phases would result in positive flow-on effects for the local economy.

Social impacts

The SEIA also includes a detailed social impact assessment, which identifies potential social impacts and benefits that may arise from the proposal, across the construction and operational phases.

Overall, we anticipate that the proposal would lead to few significant social impacts whilst resulting in several significant social benefits. The social impacts projected to arise from the proposal are largely considered to be typical of any development activity, and appropriate mitigation and management measures would also be typical. These would generally be sufficient to reduce the significance of social impacts arising from the proposal.

We anticipate that the proposal would lead to **social impacts of medium significance** through:

- Construction noise and vibration
- Additional traffic
- Land clearing and changes to surroundings
- Changes to community cohesion
- Increased demand for social infrastructure.

With typical mitigation and management measures, these potential impacts would be able to be reduced to a **low level of significance**. We anticipate that residual **social impacts of medium significance** would arise through additional traffic and changes to surroundings.

In terms of social benefits, we anticipate that the proposal would lead to **social benefits of medium significance** through:

- Improved access to social infrastructure
- Improved access to shops and services
- Improvements to surroundings through landscaping and tree planting.

Further, we anticipate that the proposal would lead to **social benefits of high significance** through:

- Improvements to livelihoods through employment opportunities (during construction and operation)
- The provision of additional housing supply and dwelling diversity in Forbes
- Improved access to active transport infrastructure.

Conclusion

We consider that the proposal is likely to have a small number of potential negative social and economic impacts, which are common to any development and are largely able to be sufficiently mitigated. The potential social and economic benefits of the proposal are greater in number and are assessed as being of higher significance.

The potential social impacts and benefits of the proposal must, however, be contextualised. Forbes' housing market has an identified and long-term requirement for additional housing. Addressing this need will require new dwellings, services, and infrastructure to be delivered in Forbes. Therefore, many of the potential social impacts identified in this report are likely to occur in Forbes whether the proposal proceeds or not.

We consider that the proposal presents significant opportunities to deliver social benefits and minimise the risk and scale of any impacts associated with meeting Forbes' housing needs in the short and long term. The proposal would deliver diverse housing supply, open space, and benefits to active transport, and would align with Council's vision for the Forbes Shire.

Overall, on social and economic grounds, we consider that the proposal represents a net benefit to the Forbes community.

INTRODUCTION

1.0 INTRODUCTION

1.1 Acknowledgement of Country

The site and the Forbes Shire are located on the traditional lands of the Wiradjuri people.

In the spirit of reconciliation, HillPDA wishes to acknowledge this and to pay our respect to the Wiradjuri people and their ongoing connection to the land that this report pertains to.

1.2 The site

The site is located northwest of the Forbes centre. It consists of an agglomeration of ten lots, and covers an area totalling around 92 hectares. Figure 1 shows the site and its immediate surrounds.

Figure 1: The site



Source: HillPDA, Google Maps (2022)

The site is located to the northwest of the Forbes town centre, immediately adjacent to the edge of Forbes' existing urban footprint. The site is surrounded by a variety of land uses and facilities, as summarised below:

- North: School Road, agricultural land (cropping) and associated rural-residential dwellings, some large lot residential development.
- East: Farnell Street and large lot residential development, and to the southeast, a larger agricultural landholding and associated dwelling.
- South: Morton Street and several rural-residential lots.
- West: Edward Street, agricultural land (cropping) and associated dwelling, a residential aged care facility, and the Goldridge Estate residential development (currently being developed by Forbes Shire Council).

The site currently supports agricultural and rural residential land uses, including one resident household.

1.3 The proposal

The proposal seeks to rezone the site to enable redevelopment of the site for mainly residential purposes, as well as retail and commercial uses within a village centre style shopping precinct. The proposal would implement minimum lot sizes of 250 square metres around the village centre, and 400 square metres elsewhere. These lot sizes have been determined in collaboration with Forbes Shire Council, and are deemed appropriate for the setting and desired housing diversity for the area.

The draft masterplan provides for an anticipated residential yield of around 750 lots. It also incorporates areas for conservation, open space and recreation areas, and active transport infrastructure.

The indicative masterplan would be delivered in a staged manner over a 10-15 year period. Subject to market conditions, the proponent anticipates delivering approximately 30 to 60 lots per stage.

An overview of the indicative masterplan is shown in Figure 2.

Figure 2: Indicative masterplan for the site



Source: Allera (2023)

PLANNING CONTEXT

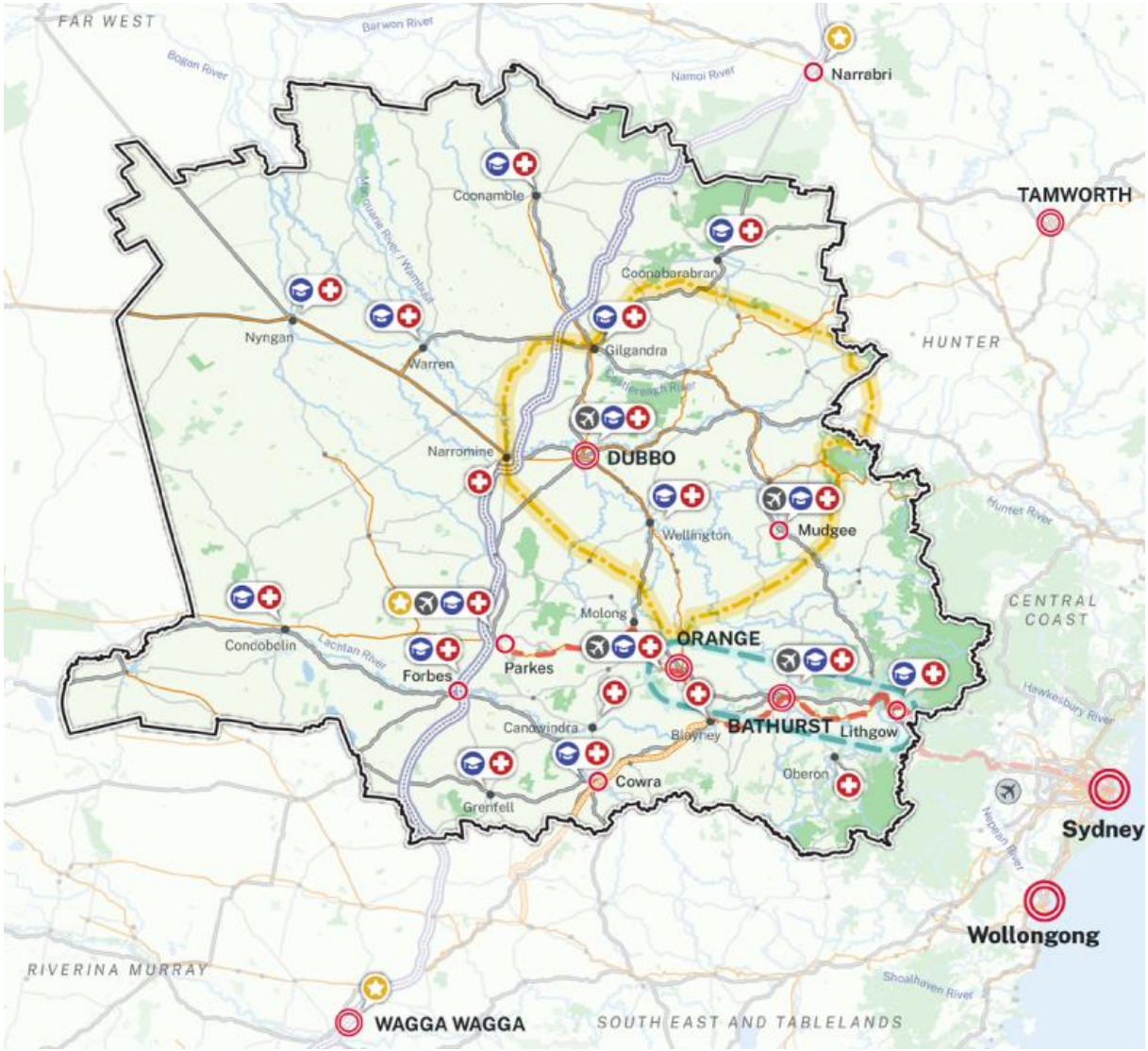
2.0 PLANNING CONTEXT

2.1 Central West and Orana Regional Plan

In December 2022, the NSW Department of Planning and Environment (DPE) published the *Central West and Orana Regional Plan 2041* (the Regional Plan) as part of its suite of regional plans for NSW.

The Regional Plan is for the Central West and Orana region (shown in Figure 3), of which Forbes is one of five identified 'strategic centres', playing a supportive role to the 'regional cities' of Bathurst, Dubbo, and Orange. These cities and centres are identified as locations where population growth and economic development will be focused within the Central West and Orana region.

Figure 3: The Central West and Orana region



Source: NSW DPE (2022)

In addition to the above, the Regional Plan identifies a range of objectives and strategies to guide strategic planning in the region. A selection of objectives and strategies considered directly relevant to this proposal are shown in Table 1.

Table 1: Selected objectives and strategies, Central West and Orana Regional Plan 2041

Objectives	Strategies
Objective 6: Support connected and healthy communities	**Strategy 6.1:** Undertake public space needs analyses and develop public space strategies by: • exploring new public space opportunities and green infrastructure in accordance with the Government Architect NSW's Greener Places and Better Placed, Designing with Country discussion paper, the Streets as Shared Spaces program and Everyone Can Play • considering the needs of future and changing populations • identifying opportunities to prioritise new and improved quality public space to areas of most need; incorporate natural drainage features within public spaces and linking them with green infrastructure networks; improve walking and cycling connections to public space; and enhance tree canopy across the private domain. **Strategy 6.2:** Strategic planning and local plans should consider opportunities to: • ensure new residential areas provide sufficient public and open space and link to existing pedestrian and cycle networks • demonstrate how the quantity of, and access to, high quality and diverse existing public space is maintained, embellished and improved.
Objective 7: Plan for resilient places and communities	**Strategy 7.1:** Reducing the level of vulnerability and risk for communities will involve early consideration of natural hazards and avoidance and mitigation for both existing and new development areas. To achieve this strategic and local planning must: • design communities that integrate, protect and deliver green infrastructure networks at the precinct and landscape scales to help avoid new hazards such as the urban heat island effect. **Strategy 7.3:** Strategic planning and local plans should encourage: • energy efficient building design and practices that respond to the natural environment.
Objective 12: Sustain a network of healthy and prosperous centres	**Strategy 12.4:** Use strategic planning and local plans to strengthen connectivity within centres by: • improving and establishing connected and accessible green walking and cycling networks that are integrated with public transport facilities • separating cycling network from road and pedestrian walkway, where possible • widening footpaths and building cycle infrastructure, all weather protection, shade, lighting, and supportive street furniture. • better integrate walking and cycling networks into the design of new communities.
Objective 13: Provide well located housing options to meet demand	**Strategy 13.1:** To ensure an adequate and timely supply of housing, in the right locations, strategic and local planning should: • respond to environmental, employment and investment considerations, and population dynamics when identifying new housing opportunities • consider how proposed release areas could interact with longer term residential precincts • provide new housing capacity where it can use existing infrastructure capacity or support the timely delivery of new infrastructure • identify a pipeline of housing supply that meets community needs and provides appropriate opportunities for growth. **Strategy 13.3:** Use strategic planning and local plans to facilitate a diversity of housing in urban areas by: • Creating flexible and feasible planning controls, including a greater mix of housing in new release areas.
Objective 14: Plan for diverse, affordable, resilient and inclusive housing	**Strategy 14.1:** To improve housing diversity, strategic and local planning should: • allow a diversity of housing, including affordable housing, student housing, shop top housing, more dense housing types and housing choices for seniors close to existing services, and on land free from hazards. **Strategy 14.2:** Plan for a range of sustainable housing choices in strategic planning and local plans including: • a diversity of housing types and lot sizes, through appropriate development standards, including minimum lot sizes, minimum frontage and floor space ratio.

Objectives	Strategies
Objective 15: Manage rural residential development	**Strategy 15.1:** When planning for new rural residential development consider: • proximity to existing urban settlements to maximise the efficient use of existing infrastructure and services • future growth opportunities of the closest local centre, nearby urban land uses and any across LGA-boundary landuse compatibility issues • context in terms of supply and demand across the subregion • cost effective service supply. **Strategy 15.2:** Enable new rural residential development only where it has been identified in a local strategy prepared by the relevant council and endorsed by the department. Avoid unplanned or unsupported rezoning of rural land.

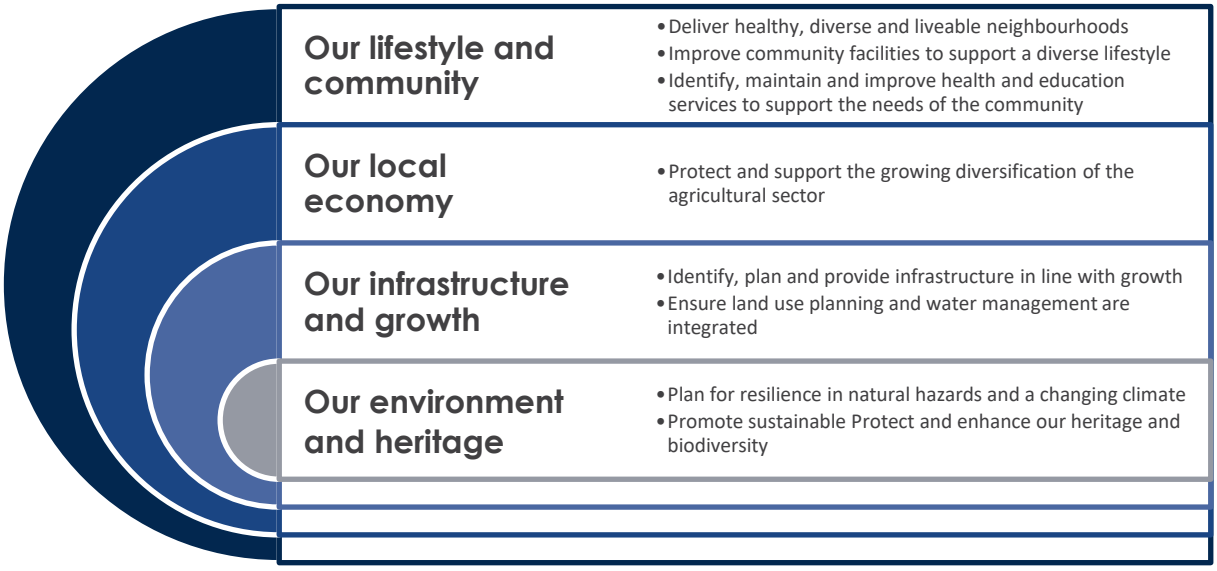
Source: NSW DPE (2022)

2.2 Forbes Local Strategic Planning Statement

Council adopted the *Forbes Local Strategic Planning Statement* (LSPS) in July 2020. It represents a 20-year vision for the future of the Forbes Shire, outlining planning priorities for the area and the actions required to achieve them.

The LSPS has four themes and 12 planning priorities that are reflective of the community's vision for the future of Forbes, based on extensive consultation with the community and other stakeholders. Selected LSPS priorities that are relevant to the proposal are shown in Figure 4.

Figure 4: Selected themes and planning priorities, Forbes LSPS



Source: Forbes Shire Council (2020)

Of particular relevance to the site, Priority LC1 ("deliver healthy, diverse and liveable neighbourhoods"), includes an action develop a Local Housing Strategy (refer following section), and includes a map of residential development options. The site is included in an area marked 'Residential Investigation Area'. It also notes the importance of ensuring that residential land development in Forbes balances environmental constraints such as flooding.

2.3 Forbes Housing Strategy

Council adopted the *Forbes Housing Strategy*, a local housing strategy for the Forbes Shire (the LHS), in May 2023. Developing an LHS was one of the key actions in the LSPS (refer previous section).

The LHS is a 20-year plan for meeting the housing needs of the Forbes Shire. It was developed in consultation with the community and other stakeholders, and it outlines a range of actions that will be taken to achieve its goals. The LHS describes three strategic directions for future housing growth in the Forbes Shire:

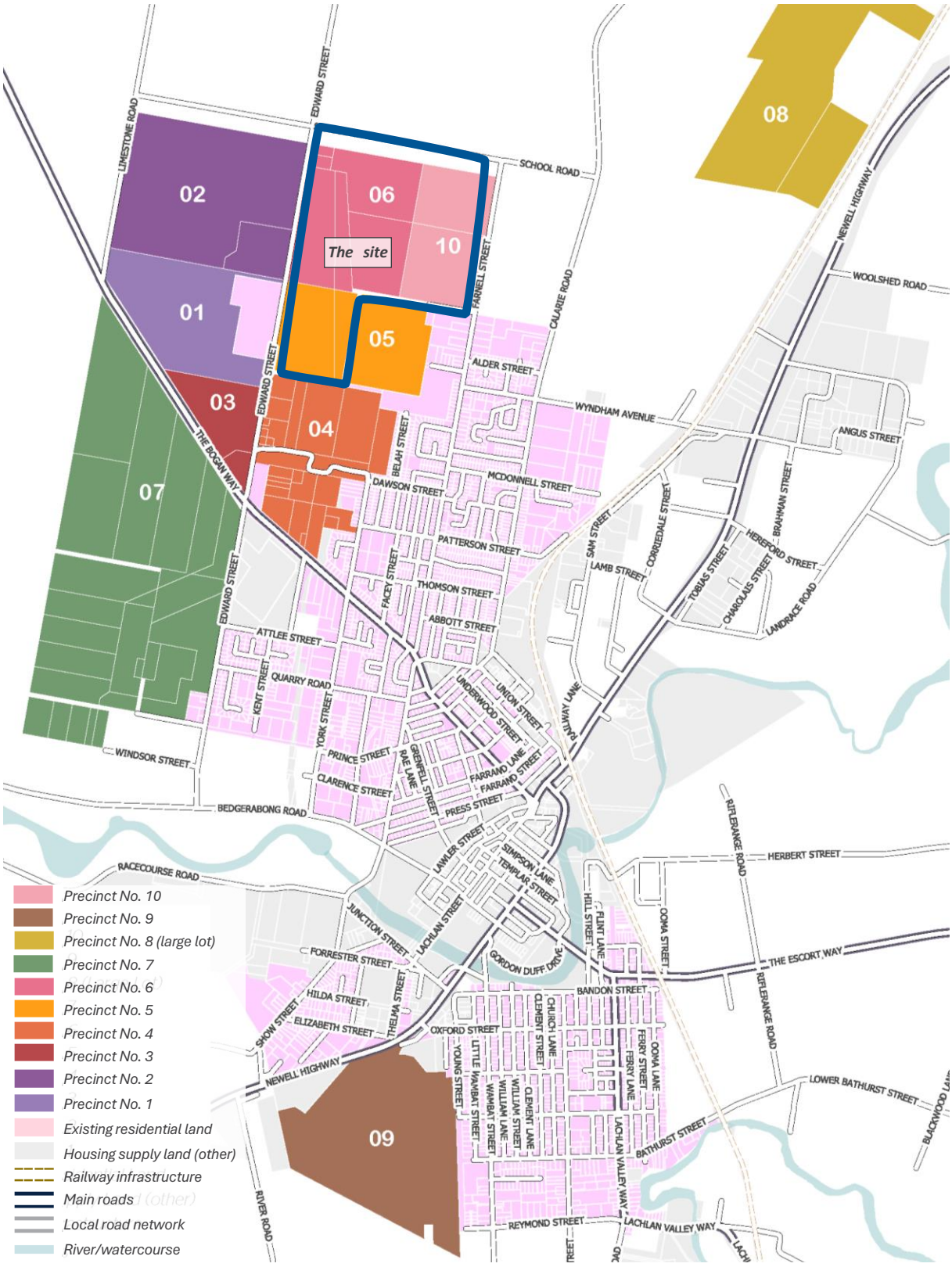
1. **Direct housing growth**
   Direct housing growth to appropriate locations in response to opportunities and constraints.
2. **Prepare a Staging Plan**
   Package land for residential release in stages to ensure efficient augmentation of services and infrastructure and subsequent land development.
3. **Strengthen connections**
   Increase the attraction and connection of the Forbes Town Centre and Lake Foreshore to new housing estates and neighbourhoods.
4. **Increase housing choice**
   Plan for more housing choice to support a diversifying community, with particular emphasis on more compact housing and more affordable housing.
5. **Create resilient neighbourhoods**
   Design housing and neighbourhoods to be 'greener' and more resilient to environmental change.
6. **Show leadership**
   Show leadership through the development of strategic development sites.

In alignment with the priorities, the LHS provides a strategic evaluation of potential urban growth areas in Forbes, identifying ten areas to be evaluated as future residential land and developing a staging plan to manage supply and demand and timing the release of new land. The site is located across three of these areas, as shown in Figure 5, which were considered to be largely unconstrained and suitable for future residential development.

The site is also shown as future residential development land in the urban area framework plan provided in the LHS. The framework plan notably also includes an indicative neighbourhood retail centre in the future residential land to Forbes' northwest, though not within the area the site occupies.

Further to the above, the LHS includes a Staging Plan to direct the release of land in response to demand projections, as shown in Figure 6. The Staging Plan provides an indicative land release program that would meet the demand identified in the LHS. The site is shown within 'Stage 4', to be released in 2036. The LHS notes, however, that the plan forms a "starting basis" to guide decision making by Council, and that other factors will influence the timing of land release. Overall, the Staging Plan and other aspects of the LHS provide a clear indication of Council's intent to enable growth in Forbes' north.

Figure 5: Forbes urban growth site suitability analysis map



Source: Forbes Shire Council (2023)

Figure 6: Forbes urban land staging plan



Source: Forbes Shire Council (2023)

2.4 Forbes Recreation and Open Space Strategy 2021

Forbes adopted the Forbes Recreation and Open Space Strategy 2021 (the ROSS) in July 2021.

The ROSS is a 20-year plan for the development and management of recreation and open space areas and facilities in the Forbes Shire. It identifies a number of key directions for recreation and open space in Forbes Shire, as shown in Table 2.

The ROSS also includes an assessment of all Council open space and recreation assets and future directions for each, as well as benchmark provisioning, access and embellishment measures to aid in assessing the supply of these facilities.

Table 2: Key directions for recreation and open space, Forbes ROSS

Direction	Detail
Access and equity	• A clear difference exists between the quality of parks in the central and southern end of Forbes town compared to the north.
Asset management	• Many park embellishments are aged, in need of repair and/or are largely unappealing.
Undeveloped open space and rationalisation	• Forbes has more than enough open space to meet current and future demand. • A number of undeveloped parks are recommended for rationalisation, with funds generated put back into further development and upgrade of the open space network.
Play opportunities	• While many parks have simple (off-the-shelf) playground equipment installed, the Shire lacks modern, innovative play nodes that create challenge and adventurous spirit for users and champion nature play.
Sport infrastructure	• Much of the infrastructure across the sporting network is of a suitable standard. • Council takes pride in the quality of sporting facilities it provides for residents and visitors.
Shade and irrigation	• With the extreme temperatures that Forbes faces in the warmer months it is important that both natural and built shade is provided in both recreation parks (at play nodes and picnic areas) and at sport parks (at key gathering areas). • Similarly, to ensure that all parks are inviting, irrigation should be considered for all forms of park (both recreation parks and sporting fields).
Council resourcing	• Council will require additional staff resources to lead implementation of this Strategy (and the existing suite of similar plans and strategies).

Source: Forbes Shire Council (2021)

SOCIAL BASELINE

3.0 SOCIAL BASELINE

This chapter outlines the social impact assessment method applied in chapter 7.0 of this report and describes the site's 'social baseline'.

The social baseline describes the social context surrounding the site in 'baseline' terms – that is, without the proposal. Developing a social baseline provides SIA practitioners with a benchmark against which the changes proposed by a development or project can be considered.

Understanding the existing social environment is critical to considering how any predicted impacts would be experienced by the community. This is because demographic factors can affect the nature and significance of potential social impacts. For example, where the social baseline indicates that a community may have less capacity to respond or adapt to major changes, a social impact may be of increased significance.

3.1 Social impact assessment method

The social impacts that may arise from the proposal will be influenced by the baseline situation, the eventual consequences of the proposal, and measures put in place to mitigate against any negative impacts and enhance positive impacts.

The assessment is informed by the analysis within this report and scoping of potential impacts. Our methodology has been designed with reference to social impact assessment best practice, and to align with DPE's *Social Impact Assessment Guidelines for State Significant Projects* (2023).

Figure 7 shows an overview of the SIA process used to inform this chapter.

Figure 7: SIA process



Source: HillPDA, DPE (2023), *Social Impact Assessment Guideline*.

3.1.1 What are social impacts?

A social impact can be defined as the net effect of an activity on a community and the wellbeing of individuals, families, and other groups within the community. Social impacts may occur across a range of aspects of an individual's and a community's life, as shown in Figure 8.

Figure 8: Types of social impact

way of life	how people live, how they get around, how they work, how they play, and how they interact on a daily basis
community	composition, character, cohesion, function, and sense of place
access	how people access and use infrastructure, services and facilities, whether provided by local, state, or federal governments, or by for-profit or not-for-profit organisations or groups
culture	both Aboriginal and non-Aboriginal culture, including shared beliefs, customs, values, and stories, and connections to country, land, waterways, places, and buildings
health and wellbeing	physical and mental health, especially for those who are highly vulnerable to social exclusion or substantial change, plus wellbeing of individuals and communities
surroundings	access to, and use of, services that ecosystems provide, public safety and security, access to and use of the natural and built environment, and its aesthetic value and amenity
livelihoods	people's capacity to sustain themselves, whether they experience personal breach or disadvantage, and the distributive equity of impacts and benefits
decision-making systems	whether people experience procedural fairness; can make informed decisions; have power to influence decisions; and can access complaint, remedy and grievance mechanisms

Source: Adapted from DPE (2023), *Social Impact Assessment Guideline*.

3.1.2 Scoping

Should the proposal be constructed, the social impacts that may arise would be influenced by:

- The social and geographic context of the site
- The construction process, final built form, and operations of the proposal
- Any measures put in place to mitigate against identified negative impacts and enhance positive impacts.

Social impacts arising from a development may be positive, negative, and cumulative. Table 3 provides an overview of how these different impacts can present.

Table 3: Types of social impacts

Type of impact	High level scoping of issues
Negative social impacts	Negative social impacts result from changes to the physical or social fabric that make it worse (in any of the impact categories) than before the project took place. These may include: • Increased dust or noise levels affecting health • Decreased amenity during construction • Alterations to community character through land use changes.
Positive social impacts	Positive social impacts result from changes to the physical or social fabric that make it better (in any of the impact categories) than before the project took place. These may include: • Increased access to jobs in the local area • Improved amenity through provision of open space • Stronger sense of community through provision of community space.
Cumulative social impacts	Cumulative social impacts result from changes to the physical or social fabric that occur from multiple projects or activities that need similar resources or affect similar impact categories. These may include: • Increased traffic level from construction vehicles for multiple projects in one area • A shortage of workers in an area due to multiple similar projects • Health impacts from persistent noise or dust levels due to ongoing projects.

Source: HillPDA, DPE (2023), *Social Impact Assessment Guideline.*

3.1.3 Predicting and evaluating impacts

The impact assessment framework presented in this report identifies and evaluates changes to the social baseline due to the proposal. This includes the assessment of positive, negative, and cumulative impacts as outlined in section 3.1.2. Changes can be tangible or intangible; qualitative or quantitative; direct or indirect; and subjectively experienced.

The likelihood of social impacts arising from each matter is assessed as part of the scoping process. Where there is an identified potential for social impacts, an evaluation is made. Professional judgement and experience is applied on a case-by-case basis to identify the significance of impact on the social environment.

The likelihood of a potential impact arising from the proposal is a primary element of considering each social impact and its risk rating. The criteria used to determine the likelihood of any potential impact are indicated in Table 4.

Table 4: Likelihood of impact

Likelihood	Description	Indicative probability
Almost certain	Definite or almost definitely expected	Greater than 90 per cent
Likely	High probability	70 per cent
Possible	Medium probability	50 per cent
Unlikely	Low probability	30 per cent
Very unlikely	Improbable or remote possibility	Less than 10 per cent

Source: DPE (2023), *Social Impact Assessment Guideline*. Adapted from Esteves A.M.et. al. (2017)

The magnitude of a potential impact is a key consideration to determine a risk rating. In determining the magnitude of a potential impact there are five key characteristics that must be considered, as shown in Table 5.

Table 5: Dimensions of social impacts

Characteristic	Details needed to enable assessment
Extent	Who is expected to be affected? Will any vulnerable groups be impacted? Which locations and people are affected?
Duration	When is the impact expected to occur? Will it be temporary or permanent?
Intensity or scale	What is the likely scale or degree of change?
Sensitivity or importance	How sensitive/vulnerable or adaptable/resilient are affected people to the impact, or (for positive impacts) how important is it to them?
Level of concern/interest	How concerned or interested are people?

Source: DPE (2023), *Social Impact Assessment Guideline*. Adapted from Esteves A.M.et. al. (2017)

Table 6 below identifies the overall magnitude level of impact rating.

Table 6: Magnitude of impact

Magnitude	Description
Minimal	No noticeable change experienced by people in locality.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time, or affecting a group of people.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time or affecting many people in a widespread area.
Transformational	Substantial change experienced in community wellbeing, livelihood, amenity, infrastructure, services, health and/or heritage values; permanent displacement or addition of at least 20% to a community.

Source: DPE (2023), *Social Impact Assessment Guideline*. Adapted from Esteves A.M.et. al. (2017)

Once the likelihood and magnitude of a potential impact is determined, a level of significance can be assigned. This is undertaken as per Table 7.

Table 7: Social impact significance matrix

		Magnitude				
		Minimal	**Minor**	**Moderate**	**Major**	**Transformational**
Likelihood	**Almost certain**	Low	Medium	High	Very high	Very high
	Likely	Low	Medium	High	High	Very high
	Possible	Low	Medium	Medium	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Very unlikely	Low	Low	Low	Medium	Medium

Source: Adapted from DPE (2023), *Social Impact Assessment Guideline.*

3.1.4 Social impact management

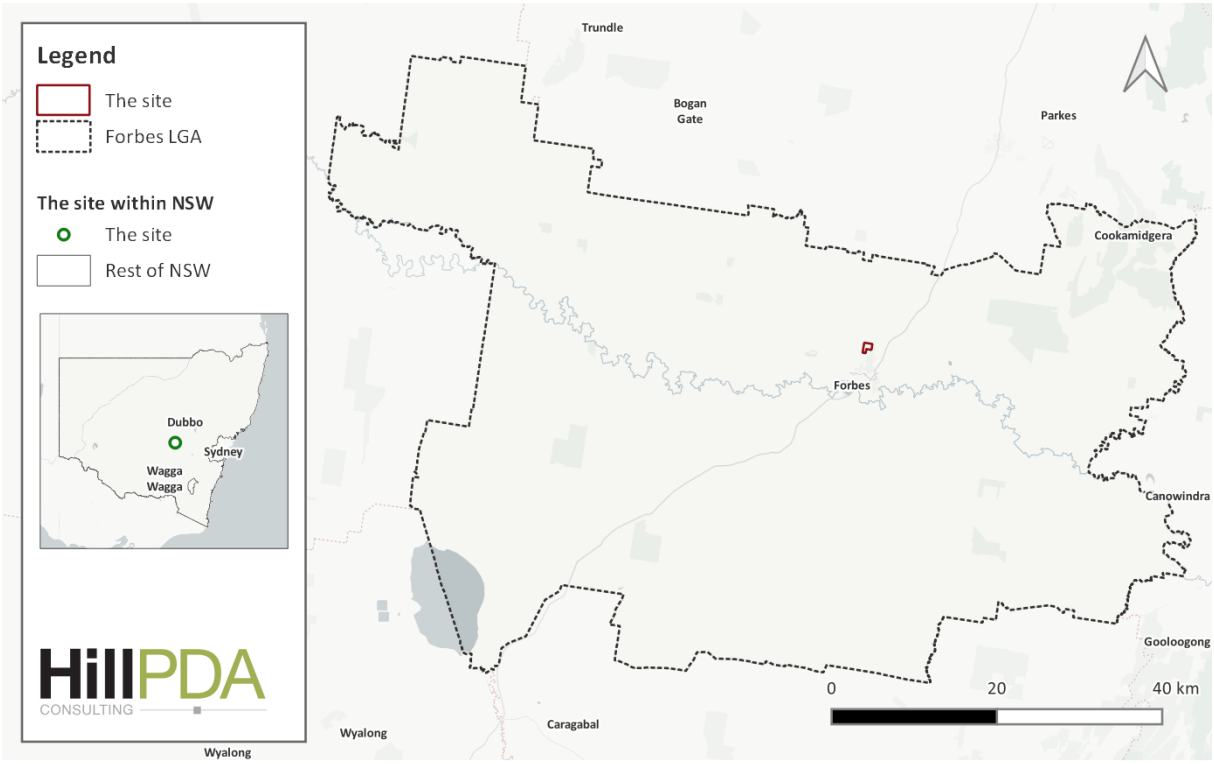
Where impacts are identified, the SIA provides mitigation and/or enhancement measures. For potential negative impacts, measures are identified to avoid or minimise impacts by amending the project or its delivery. For potential positive social impacts, the SIA identifies measures to enhance the benefit of that impact. Social impact management is an ongoing process.

3.2 Study area

The study area for the site has been defined as the Forbes LGA, with the 'Rest of NSW' used as a comparator area where relevant. The Rest of NSW is a geographic area defined by the ABS as being the State of New South Wales, with the Greater Sydney Greater Capital City Statistical Area removed. This enables comparison of the Forbes LGA with other regional areas of NSW. These study areas and their relationship with the site are shown in Figure 9.

The data and analysis in this chapter is generally based on 2021 Census data from the Australian Bureau of Statistics (ABS).

Figure 9: The site and study areas



Source: HillPDA, ABS (2022)

3.3 Local demographics

This section provides an overview of the existing social baseline in the study area.

3.3.1 Population

In 2021, more than 9,300 people lived in Forbes…

- Of these, 49.4% were male and 50.6% were female
- Over 13% of Forbes' population identified as Aboriginal and/or Torres Strait Islander.

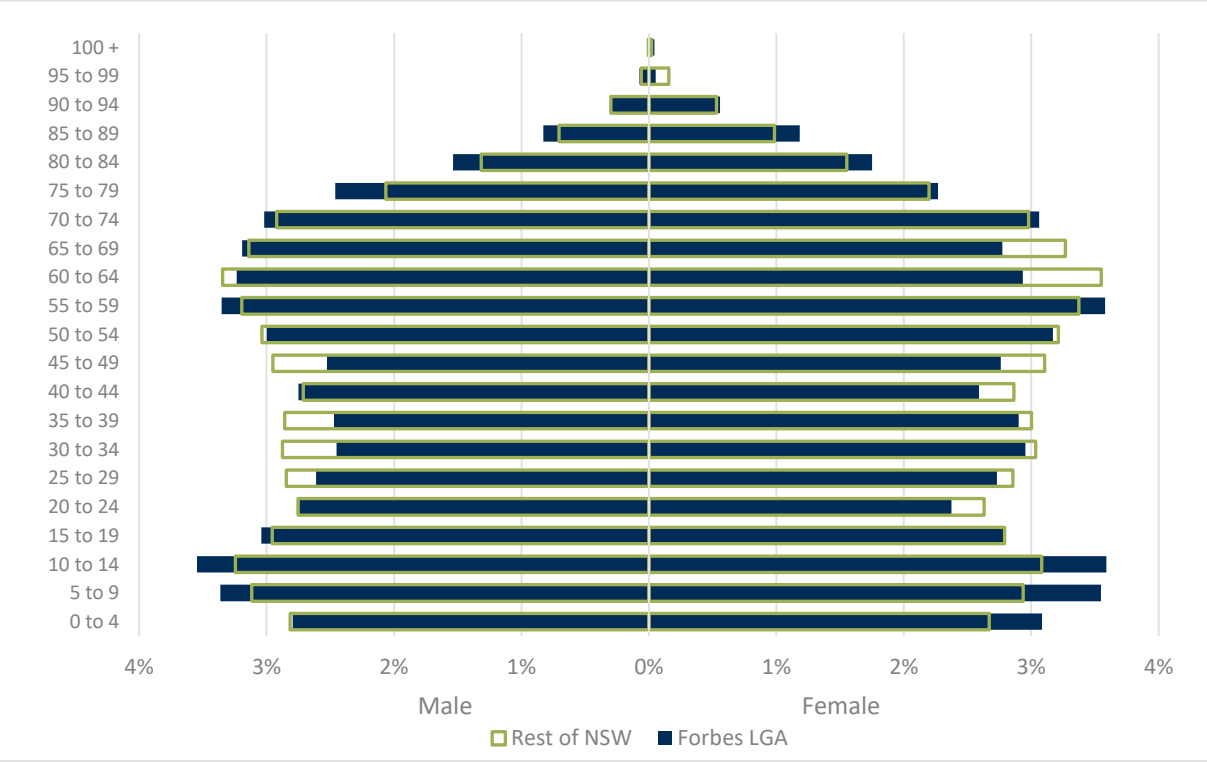
The age profile of Forbes is roughly similar to that of regional NSW as a whole…

- The median age of Forbes was 42 years, close to that of regional NSW (43 years)
- Compared to regional NSW, Forbes had a higher proportion of residents aged under 20, and a higher proportion of residents aged 70 or older.

At the 2021 Census the population of the Forbes LGA was 9,319 persons. A comparative age breakdown of the 2021 populations of Forbes LGA and the Rest of NSW is shown in Figure 10. Comparing the age structures, the population of Forbes LGA is generally similar to that of the Rest of NSW. Forbes LGA has a higher proportion of residents aged 19 years or under, and a slightly higher proportion of residents aged 70 years and over. However, proportionally fewer Forbes LGA residents were aged between 25 to 49 years.

The 2021 median age in the Forbes LGA reflects this, and was recorded as 42 years old, marginally younger than that recorded across of the Rest of NSW, which was 43 years.

Figure 10: Comparative age structure, Forbes (LGA) and Rest of NSW, 2021



Source: ABS (2022)

3.3.2 Aboriginal and Torres Strait Islander population



Forbes has a significant Aboriginal population…

- In 2021, over 13% of Forbes' population identified as Aboriginal and/or Torres Strait Islander (over 1,200 people), roughly double that of regional NSW as a whole (6.6%)
- This population was much younger than the rest of Forbes, with a median age nearly half that of Forbes as a whole (23 years).

As at the 2021 Census, 13.3 per cent of Forbes LGA's total population were Aboriginal and/or Torres Strait Islander (1,236 persons), significantly higher than the 6.6 per cent recorded across the Rest of NSW. The median age of Forbes LGA's Aboriginal and/or Torres Strait Islander population was just 23 years old, significantly younger than the overall median age recorded in the Forbes LGA, and equal to the median age of Aboriginal and/or Torres Strait Islander people across the Rest of NSW.

The vast majority of Aboriginal and/or Torres Strait Islander people in Forbes LGA reported that they spoke only English at home (97.2 per cent), whilst less than one per cent reported speaking an Australian Indigenous language at home.

An overview of available Census data (refer to Table 8) showed that Aboriginal and/or Torres Strait Islander people in Forbes LGA lived in slightly larger households compared to the LGA overall, as well as that they had somewhat lower median weekly personal and household incomes. Despite this, Aboriginal and/or Torres Strait Islander people in Forbes LGA were found to pay similar amounts in rent and mortgage repayments.

Table 8: Comparison of selected attributes, Bathurst (LGA) residents and ATSI Bathurst (LGA) residents, 2021 Census

Metric	Forbes LGA residents	Aboriginal and/or Torres Strait Islander Forbes LGA residents
Average household size	2.4	2.9
Median weekly personal income	$718	$640
Median weekly household income	$1,259	$1,257
Median weekly rent	$230	$225
Median monthly mortgage repayment	$1,283	$1,309

Source: ABS *QuickStats* (2022)

3.3.3 Diversity and specific needs



Compared to regional NSW as a whole…

- More Forbes residents were born in Australia
- Fewer households spoke a language other than English at home



Some Forbes residents may have housing needs arising from their health…

- Around 1/3 Forbes residents reported having one or more long term health conditions
- Around 6% of Forbes residents require assistance with their core day-to-day activities

3.3.3.1 Cultural diversity

In general, as at the 2021 Census, Forbes LGA was slightly less culturally diverse than the Rest of NSW as a whole. A higher proportion of Forbes LGA residents were born in Australia (86.6 per cent) than across the Rest of NSW, which recorded 81.3 per cent. Just 5.3 per cent of Forbes LGA residents reported that both their parents were born overseas, much lower than the 15.5 per cent recorded across the Rest of NSW.

The proportion of Forbes LGA households where a language other than English was spoken at home (3.1 per cent) was also lower than the 8.4 per cent recorded across the Rest of NSW.

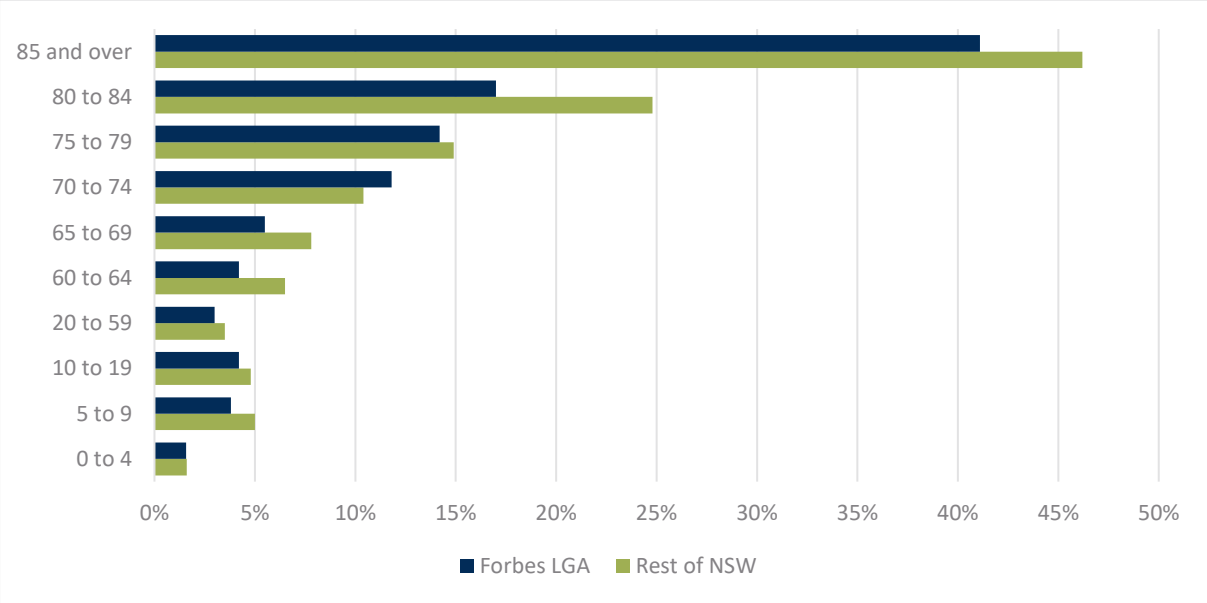
3.3.3.2 Health and disability

Overall, as at the 2021 Census, Forbes' population had a somewhat healthier population than the Rest of NSW, with fewer residents with disabilities or long term health conditions.

Fewer people in Forbes LGA needed help with their day-to-day activities due to a disability or health condition than across the Rest of NSW. In the Forbes LGA, this was around 6.1 per cent of the population, compared to around 6.8 per cent for the Rest of NSW (profile.id 2023). Around one third (34.9 per cent) of the Forbes population reported having one or more long term health conditions, lower than the 37 per cent across the Rest of NSW.

Figure 11 shows the proportion of people who require assistance with core activities by age group for Forbes and the Rest of NSW. For most age groups, a similar proportion was recorded across both areas, however, far fewer Forbes LGA residents aged over 80 years require assistance with core activities compared to the Rest of NSW. This may be indicative of older residents with higher care needs moving away from Forbes, to larger centres with more aged care facilities or services that meet their specific needs.

Figure 11: Proportion of residents requiring assistance with core needs (by age group), Forbes LGA and Rest of NSW (2021)



Source: ABS 2022, compiled by profile.id (2023)

3.3.4 Socioeconomic indicators

People in Forbes earn similar incomes to people in regional NSW, with cheaper housing…

- Forbes' median personal weekly income ($718) was close to the regional NSW median ($722), however, Forbes' median household income was almost $200 per week lower
- Median weekly rent and monthly mortgage repayments in Forbes were far lower than those across regional NSW.

Forbes has strong local employment and key anchor industries…

- As at March 2023, unemployment was just 1.9% in Forbes, lower than NSW (2.9%)
- Major employment industries in Forbes include agriculture, healthcare and social assistance, and education and training, with these industries employing over 40% of Forbes' workers.

Parts of Forbes are significantly disadvantaged…

- Most of Forbes' households are within areas ranked in the bottom third in terms of socio-economic disadvantage and advantage (compared to Australia as a whole)
- Many of the areas nearest to the site are ranked within the most disadvantaged ten per cent of areas across Australia.

3.3.4.1 Income and expenses

As at the 2021 Census, Forbes LGA residents appeared to face similar household costs to residents across the Rest of NSW. This can be seen in Table 9, as whilst Forbes LGA residents recorded somewhat lower household incomes, rent and mortgage costs were also lower.

Table 9: Median personal and household incomes and housing expenses

Metric	Forbes LGA residents	Rest of NSW residents
Median weekly personal income	$718	$722
Median weekly household income	$1,259	$1,434
Median weekly rent	$230	$330
Median monthly mortgage repayment	$1,283	$1,733

Source: ABS *QuickStats* (2022)

In addition to the above, for the 12 months preceding March 2023, the unemployment rate in Forbes LGA was 1.9 per cent (Jobs and Skills Australia, 2023). This compares favourably with the unemployment rate for the Rest of NSW for the same period, which was 2.9 per cent (ABS Labour Force Survey, 2023).

Table 10 shows the top five industries by percentage of employed persons for Forbes LGA and the Rest of NSW as at the 2021 Census. Whilst government employment – in the form of health care and education – is a key employer in Forbes as across the Rest of NSW, agriculture, forestry and fishing is the most significant employment industry overall across the LGA. Beyond these construction and retail trade are also significant employers in the Forbes LGA.

Table 10: Top five industries of employment, Forbes LGA and Rest of NSW (2021)

Industry of employment	Forbes LGA
Agriculture, Forestry and Fishing	17.6%
Health Care and Social Assistance	12.2%
Education and Training	10.8%
Retail Trade	9.4%
Construction	7.1%

Industry of employment	Rest of NSW
Health Care and Social Assistance	16.3%
Retail Trade	9.4%
Construction	9.4%
Education and Training	9.2%
Accommodation and Food Services	7.5%

Source: ABS *QuickStats* (2023)

In terms of how people travel to work, more than 70 per cent of employed people in Forbes LGA travelled in a car, as driver or passenger, on the day of the 2021 Census. This was more than five per cent higher than the rate recorded across the Rest of NSW (65.2 per cent). Very few people in Forbes used public transport to travel to work (less than one per cent), similar to the rate recorded across the Rest of NSW.

Around four per cent of people walked to work, whilst around 11 per cent worked from home. A smaller proportion of Rest of NSW residents walked to work (around three per cent), whilst more worked from home (around 16 per cent). Despite the effects of the COVID-19 pandemic on Census data across much of metropolitan Australia, Forbes' travel to work figures were broadly similar to those recorded at the 2016 Census.

3.3.4.2 Socio-Economic Indexes for Areas

The Socio-Economic Indexes for Areas (SEIFA) are rankings of relative socio-economic status (advantage and disadvantage) for different geographic areas, within each state and nationally. The indexes rank areas against others of the same geographic type (e.g. Local Government Area or Statistical Area Level 1) based on specific socio-economic metrics, selected based on the particular SEIFA index.

Relative socio-economic disadvantage

The Index of Relative Socio-economic Disadvantage (IRSD) examines factors including unemployment, proportion of lower income households, or lower education levels, to compare overall levels of disadvantage in areas.

Higher rankings on the IRSD can indicate:

- More households with lower incomes
- More residents without qualifications
- More residents in low skilled occupations or unemployed.

Lower rankings on the IRSD can indicate:

- Fewer households with lower incomes
- Fewer residents without qualifications
- Fewer residents in low skilled occupations or unemployed.

The IRSD ranking of SA1s near the site (in deciles) is shown in Figure 12.

Figure 12: SA1s by IRSD decile



Source: ABS (2023)

Relative socio-economic advantage and disadvantage

The Index of Relative Socio-economic Advantage and Disadvantage (IRSAD), in addition to the indicators of disadvantage above, examines factors like professional occupations, high income, higher education levels, larger houses to compare overall levels of advantage and disadvantage in areas.

Higher rankings on the IRSAD can indicate:

- More households with high incomes, or more people in skilled occupations
- Fewer households low incomes, or less people in unskilled occupations.

Lower rankings on the IRSAD can indicate:

- More households with lower incomes, or more people in unskilled occupations
- Fewer household with higher incomes, or fewer people in skilled occupations.

The IRSAD ranking of SA1s near the site (in deciles) is shown in Figure 13.

Figure 13: SA1s by IRSAD decile



Source: ABS (2023)

Overall, for both the IRSD and IRSAD, most of Forbes' SA1s ranked near or below the 30th percentile nationally, whilst the more urbanised SA1s in Forbes' north recorded very low rankings. Several of these areas, immediately south of the site, were ranked below the 10th percentile nationally, indicating the presence of significant disadvantage.

3.3.5 Households and dwellings

3.3.5.1 Household size and type

Most households in Forbes are small…

- Over two thirds of households house just one or two people
- Nearly 1/3 Forbes households consisted of just one person.

At the 2021 Census there were 3,563 households in Forbes LGA, with an average of 2.4 people per household. This shows a small increase in total number of households (by around 70) since the 2016 Census. The average people per household figure remained static at 2.4 over the period from 2011 to 2021, though NSW DPE's population projections suggest this will decrease to just below 2.3 persons per household by 2041.

Figure 14 shows the number of persons usually present in dwellings, both in Forbes and across the Rest of NSW as at the 2021 Census. Compared to the Rest of NSW, a higher proportion of Forbes dwellings housed just one person, at nearly a third of all dwellings. Fewer Forbes LGA households consisted of three or four people compared to across the Rest of NSW, whilst a roughly similar proportion of two person and five or more person households were recorded.

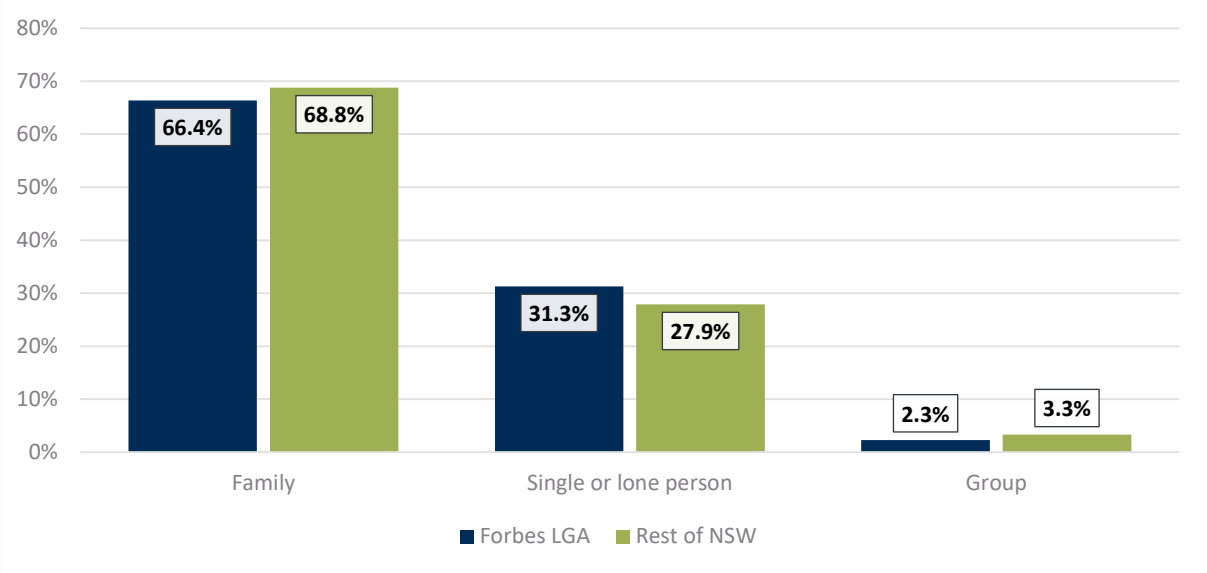
Figure 14: Households by number of persons usually resident, Forbes LGA and Rest of NSW (2021)



Source: ABS *TableBuilder* (2023)

Compared to the Rest of NSW, a higher proportion of Forbes LGA households were single or lone person households, whilst family and group households made up a smaller proportion of the total. This is shown in Figure 15.

Figure 15: Occupied dwellings by household type, Forbes LGA and Rest of NSW (2021)



Source: ABS *QuickStats* (2023)

3.3.5.2 Dwelling diversity

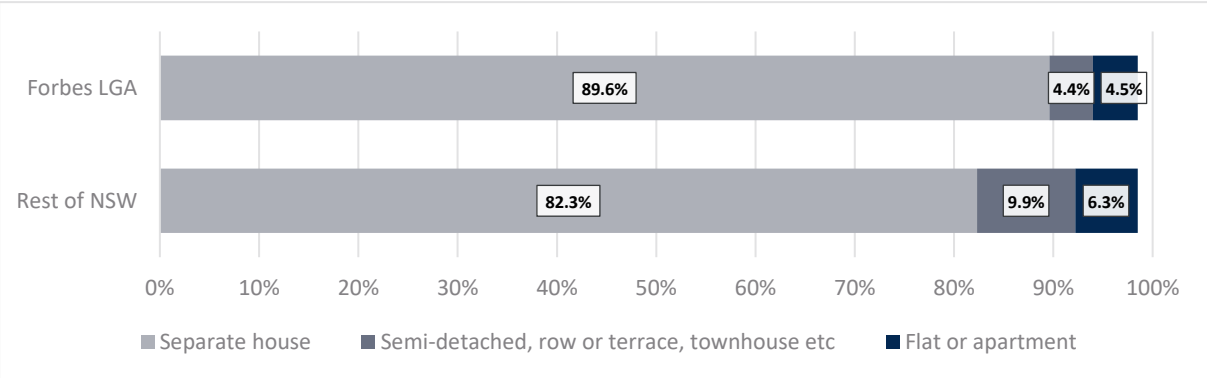
Despite its relatively small households, most dwellings in Forbes are big.

- Nearly 90% of dwellings in Forbes are separate houses
- Apartments and semi-detached dwellings make up less than 5% of Forbes dwellings each
- Only 20% of Forbes' dwellings had two or fewer bedrooms
- Many dwellings in Forbes have one or more 'spare' bedrooms.

As at the 2021 Census there were 4,365 dwellings in the Forbes LGA. This was similar to that recorded in 2016, when there were 4,370 dwellings. The vast majority of these dwellings were separate houses, as shown in Figure 16.

A greater share of Forbes' dwellings (almost 90 per cent) were separate houses compared to across the Rest of NSW (around 82 per cent). Correspondingly, fewer Forbes LGA dwellings were apartments or townhouses, with these two combined totalling around nine per cent of all dwellings (compared to around 16 per cent of all dwellings across the rest of NSW).

Figure 16: Dwellings by typology, Forbes LGA and Rest of NSW (2021)

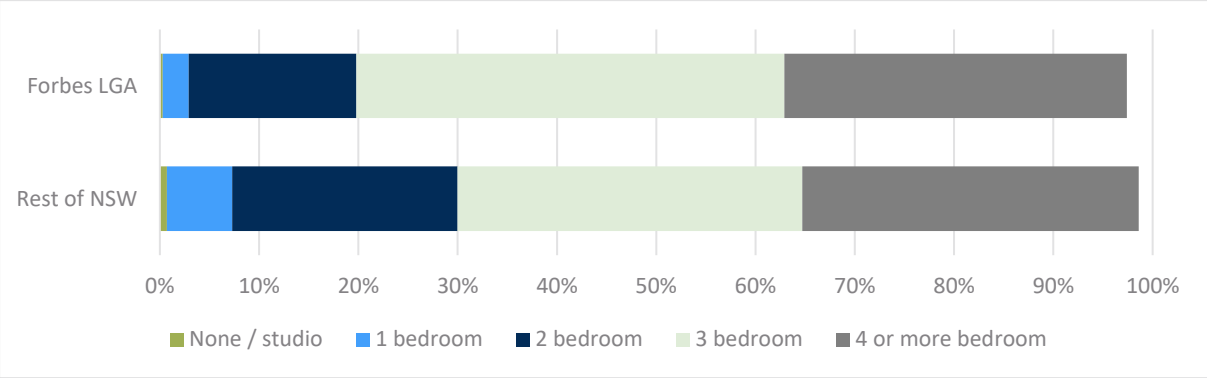


Source: ABS *QuickStats* (2022)

Further to the above, Figure 17 shows the proportion of dwellings in Forbes LGA and across the Rest of NSW, categorised by number of bedrooms. More than three quarters of Forbes LGA dwellings were three or more bedrooms, as at the 2021 Census, compared to less than 70 per cent of Rest of NSW dwellings.

Around 20 per cent of the Forbes LGA's dwellings had two or fewer bedrooms, compared to around 30 per cent across the Rest of NSW, reflecting a lack of dwelling diversity.

Figure 17: Dwellings by number of bedrooms, Forbes LGA and Rest of NSW (2021)



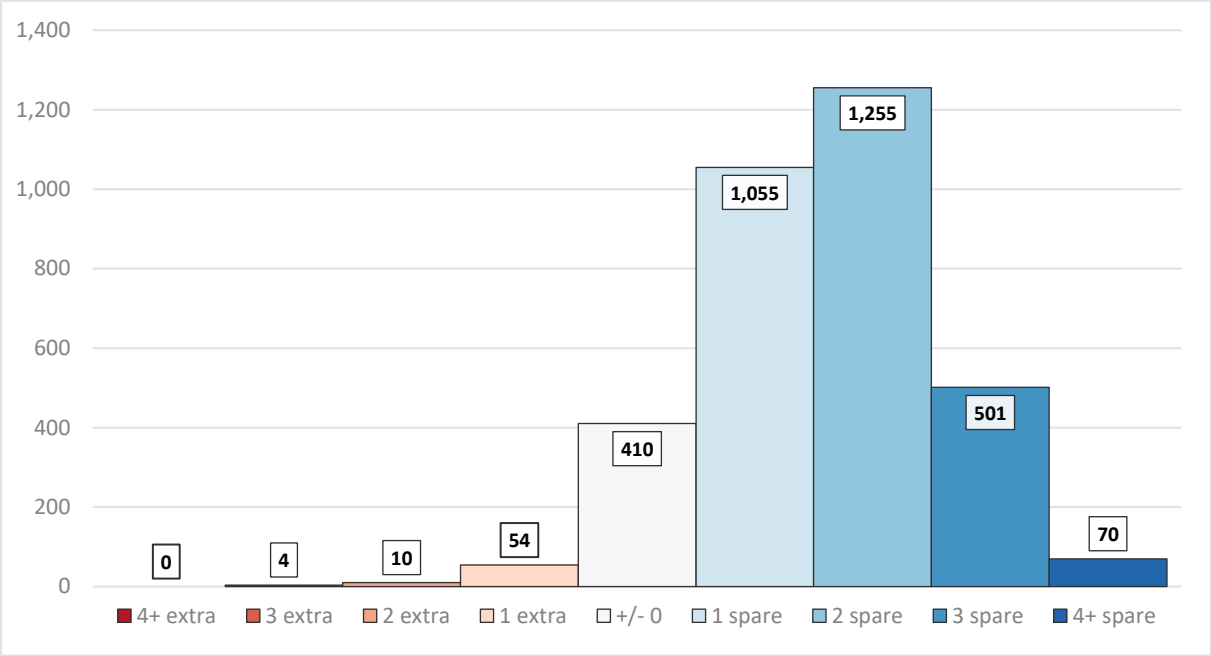
Source: ABS *QuickStats* (2022)

Figure 18 shows dwellings in Forbes LGA by the number of additional bedrooms required or spare. The ABS develops this metric based on a range of variables that indicate the number of separate bedrooms required in a dwelling, including relationships between household members, and age and sex differences.

This metric can generally indicate the level of dwelling suitability in an area. A large proportion of dwellings with an indicated need for additional bedrooms may indicate a housing affordability issue or a lack of well-located larger dwellings, whilst a large proportion of dwellings with spare bedrooms may be indicative of a lack of smaller dwellings or a large population of 'empty nesters.'

It is important to note that, as this metric is derived rather than self-reported, it is intended as a broad indication only. For example, a household with two spare bedrooms may have chosen that dwelling to use one 'spare' bedroom as a home office and a second as a guest room for adult children. Similarly, cultural differences or individual family expectations may lead to diverging views on whether a household requires an additional bedroom. Despite these caveats, the overwhelming majority of dwellings with one or more spare bedrooms in Forbes suggests that there is likely a degree of unmet demand for smaller dwellings.

Figure 18: Dwellings by number of additional bedrooms required or spare, Forbes LGA (2021)



Source: ABS *TableBuilder* (2023)

3.3.5.3 Housing market

Housing affordability in Forbes is somewhat better than across regional NSW…

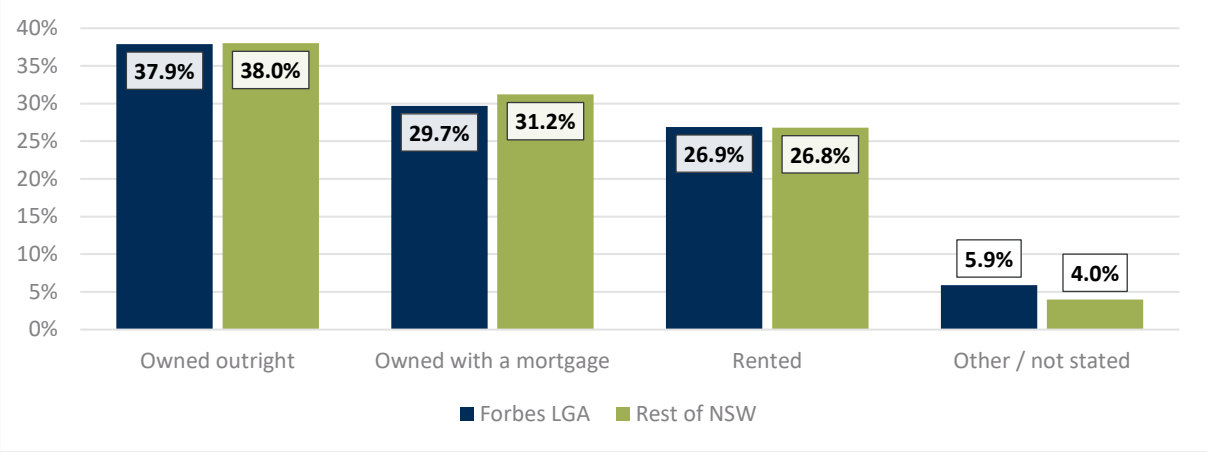
- Fewer Forbes households spend >30% of their household income on rent or mortgage payments
- Rent and mortgage payments in Forbes are generally in the lower two quartiles of payments across NSW as a whole.

…but Forbes' housing market is small and under pressure.

- Forbes has a small housing market with limited diversity, which is driving issues with housing affordability
- Rental vacancy rates are very low (0.7%), reflecting a tight rental housing market.

Figure 19 shows dwellings in Forbes LGA and the Rest of NSW as at the 2021 Census by their tenure type. Differences between the two areas were minimal overall, though notably fewer Forbes LGA households had mortgages compared to the Rest of NSW.

Figure 19: Dwellings by tenure type, Forbes LGA and Rest of NSW (2021)

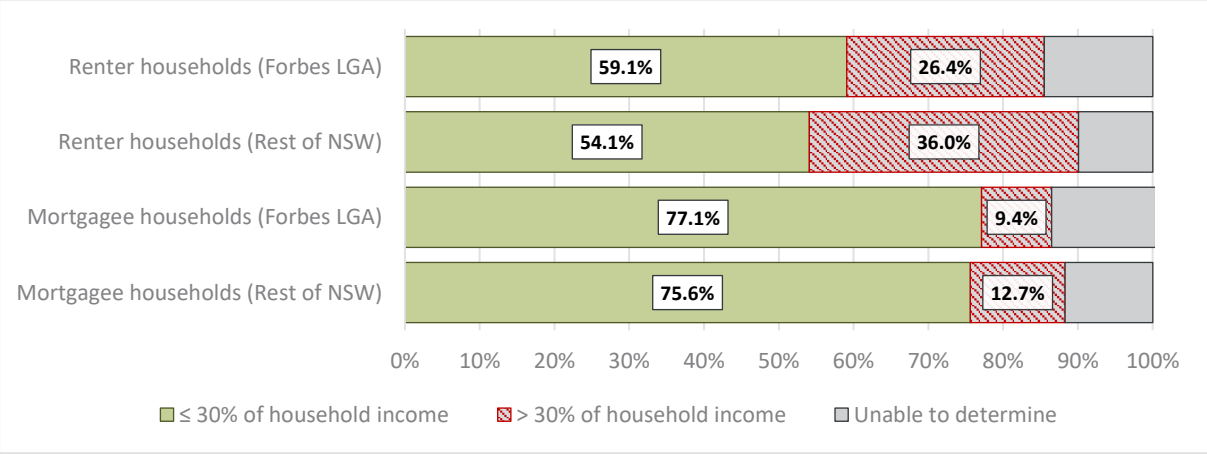


Source: ABS *QuickStats* (2022)

'Rent stress' and 'mortgage stress' are terms used to indicate where a household's expenditure on housing is likely to impact on their ability to afford other essentials such as groceries, bills, or transport. Typically, a household is considered to be experiencing rent stress when rental payments exceed 30 per cent of household income.

Figure 20 shows the proportion of renter households in the Forbes LGA and the Rest of NSW experiencing rent/mortgage stress as at the 2021 Census. Overall, a greater proportion of both renter and mortgagee households across the Rest of NSW were in rent/mortgage stress compared to Forbes LGA. In particular, a far greater proportion of NSW renter households were experiencing rental stress compared to Forbes renter households, at nearly 10 per cent more.

Figure 20: Rent and mortgage stress, Forbes LGA and Rest of NSW (2021)



Source: ABS *QuickStats* (2022)

Table 11 shows the weekly rental payment quartiles for NSW as at the 2021 Census. Weekly rental payments across NSW at each Census are distributed from lowest to highest and divided into four equal groups, or rental quartiles. This enables comparisons to be made between renter households in the Forbes LGA and the Rest of NSW.

Table 11: Rental payment quartile distribution, Forbes LGA and Rest of NSW (2021)

Rental quartiles	Quartile ranges (for NSW, rent per week)	Forbes LGA	Rest of NSW
Lowest group	$0 to $314	79.8%	43.0%
Medium lowest	$315 to $432	16.7%	30.9%
Medium highest	$433 to $562	2.3%	17.7%
Highest group	$563 and over	1.3%	8.4%

Source: ABS (2021), compiled by profile.id (2023)

Compared to the Rest of NSW, a far higher proportion of renter households in the Forbes LGA were in the lowest quartile for weekly rent payments. Nearly four in five renter households recorded weekly rental payments in the lowest quartile, close to double that recorded across the Rest of NSW as a whole.

Table 12 contains the same data as per the previous, but for monthly mortgage payment quartiles as at the 2021 Census.

Table 12: Mortgage repayment quartile distribution, Forbes LGA and Rest of NSW (2021)

Mortgage quartiles	Quartile ranges (for NSW, payment per month)	Forbes LGA	Rest of NSW
Lowest group	$0 to $1,381	58.0%	35.9%
Medium lowest	$1,382 to $2,123	27.3%	32.1%
Medium highest	$2,124 to $3,203	9.4%	20.6%
Highest group	$3,204 and over	5.3%	11.5%

Source: ABS (2021), compiled by profile.id (2023)

The results show that mortgage repayments in the Forbes LGA also differ significantly from those recorded across the Rest of NSW. At the 2021 Census, around 85 per cent of mortgagee households in the Forbes LGA were within the lowest and medium lowest quartile. That is, the vast majority mortgage repayments in Forbes were cheaper than half of all mortgages across the Rest of NSW.

Regardless of the above findings, the small size of the Forbes housing market and its limited diversity are driving affordability issues. Council has identified these as key matters to address in future housing supply, particularly with regard to young and ageing people, and rental housing.

A further contributing factor to housing affordability for renters is vacancy rates. Whilst a typical 'healthy' rental vacancy rate would be around two or three per cent, the vacancy rate in Forbes was just 0.7 per cent as at April 2023 (*Forbes 2871*, SQM Research, 2023). This matter has been raised by Council as a pressing issue.

3.4 Projections

This section contains projections for population and dwelling demand growth, derived from projections produced by the NSW Department of Planning and Environment.

3.4.1 Population

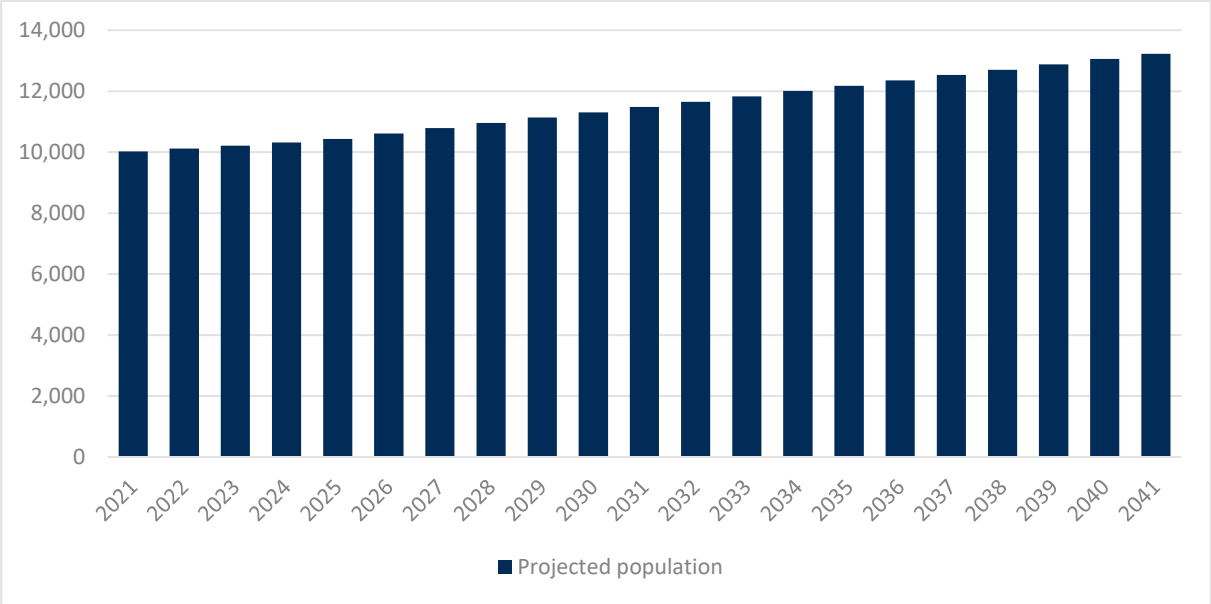


Forbes is growing…

- An additional 3,900 people are projected to live in Forbes in 2041
- This includes around 800 additional people aged under 20 years old and around 1,000 additional people aged 65 years or older.

From the recorded population of around 9,300 in 2021, Forbes' population is anticipated to grow at a steady rate of 1.4 per cent per annum across NSW DPE's forecast period, reaching over 13,200 people by 2041. This would represent an additional 3,900 residents living in the Forbes LGA, as shown in Figure 21.

Figure 21: Projected population and annual growth rate, Forbes LGA (2021-2041)

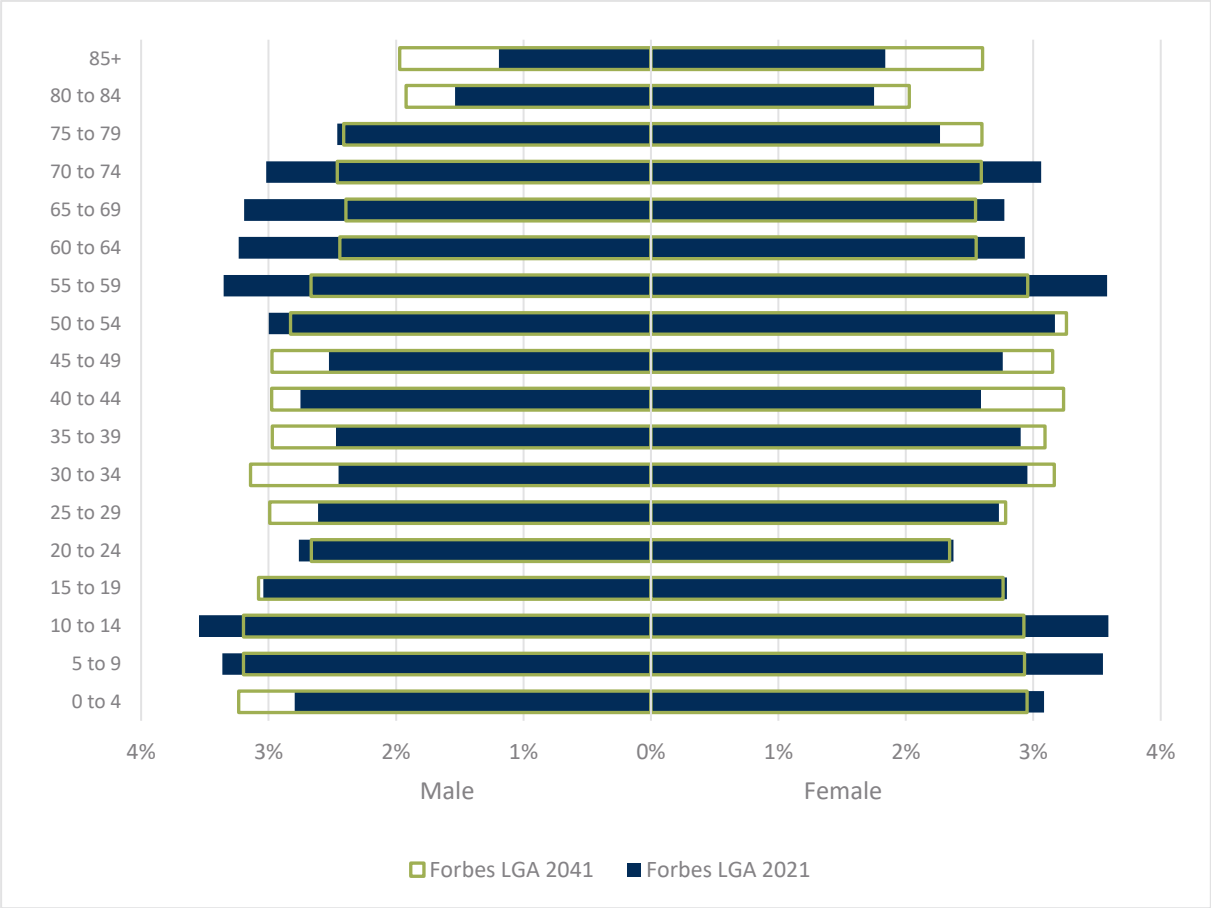


Source: NSW DPE (2023)

DPE's projections indicate that Forbes' population will become slightly younger, with the median age decreasing slightly from the 42 years recorded at the 2021 Census, to around 41.5 years by 2041. In numerical terms, the projections show growth in all age groups, however, a greater share of Forbes residents are projected to be aged between 30 and 49 years, and over 75 years, compared to at present. Meanwhile, the share of residents aged 55 to 74 is projected to decrease, as is the share of residents aged 4 to 14 years.

These findings are shown in Figure 22. Whilst the largest growth would be in younger and middle aged adults, it is notable that Forbes is projected to host around 800 more people aged under 20 years old, and around 1,000 more people aged 65 years or older by 2041.

Figure 22: Current and projected population age structure, Forbes LGA (2021-2041)



Source: NSW DPE (2023)

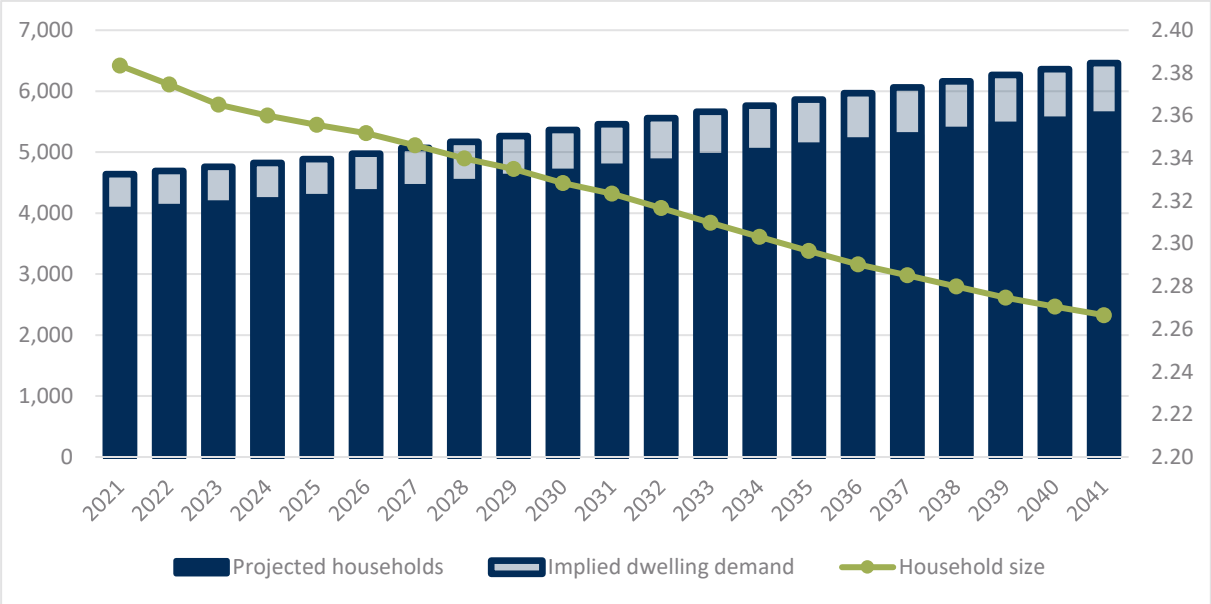
3.4.2 Households and dwellings

Forbes will need more places for people to live.

- Projections indicate Forbes will need between 1,800 and 2,100 additional dwellings by 2041 (approximately)
- This equates to between 90 and 105 additional dwellings per annum (approximately)
- These dwellings will need to be diverse, suitable for (among others) around 530 lone person households, 430 couple households, and 370 couple with children households
- Forbes is not currently approving enough housing to meet this projected demand.

The projected growth outlined above will result in additional demand for housing through the formation of new households. To inform strategic planning for this housing demand, NSW DPE undertakes analysis of population and household size projections and dwelling occupancy estimates, as shown in Figure 23. The derived 'dwelling demand' projection is based on the projected number of households and estimated dwelling occupancy rates.

Figure 23: Projected number of households, household size, and implied dwelling demand, Forbes LGA (2021-2041)



Source: NSW DPE (2023)

This dwelling demand figure exceeds the projected households figure by a rate that is equivalent to DPE's expectations of dwelling occupancy rates. To accommodate anticipated dwelling occupancy rates, a surplus of housing is required. With that in mind, dwelling demand is projected to grow to around 6,450 by 2041.

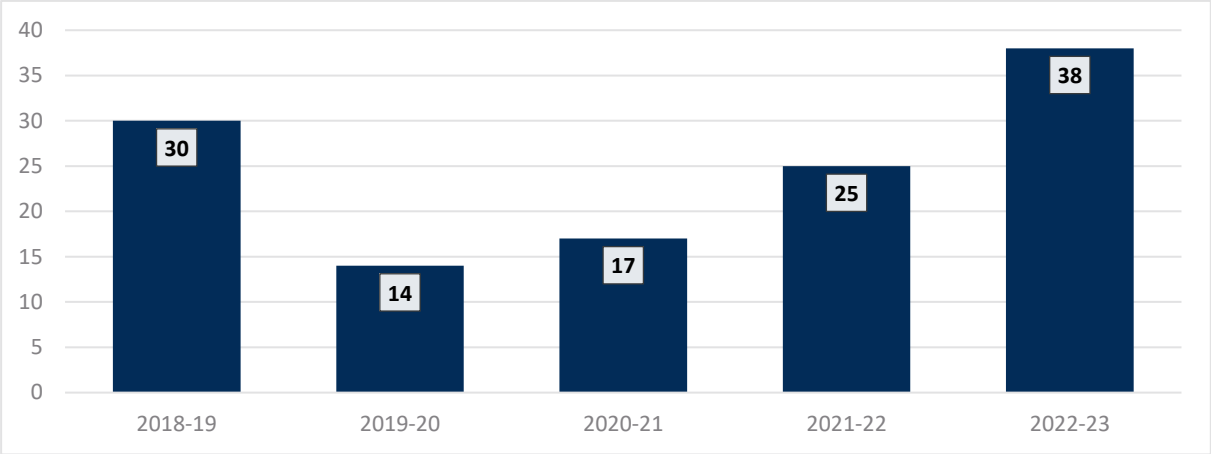
The LHS includes an assessment of the number of additional dwellings required to meet this demand, sourced from DPE's projections. These projections were finalised prior to the 2021 Census results being released, however, and therefore the 2021 figure is an estimate based on earlier data and projections. The number of dwellings recorded in Forbes at the 2021 Census was in fact lower than DPE's estimate, thereby resulting in a larger number of dwellings required by 2041. These are shown in the table below.

Scenario	Total dwellings (2021)	Dwelling demand (2041)	Additional dwellings required 2021-41	
			Total	Per annum (average)
LHS (DPE)	4,640	6,459	+1,819	+91 p/a
Census and DPE	4,365	6,459	+2,094	+105 p/a

Source: HillPDA, ABS (2022); Forbes Shire Council (2023); NSW DPE (2023)

To meet this projected demand, Forbes requires between 90 to 105 additional dwellings per year over the period 2021-2041. As per Figure 24, the number of dwellings approved across the Forbes LGA has not met this mark in the most recent five years.

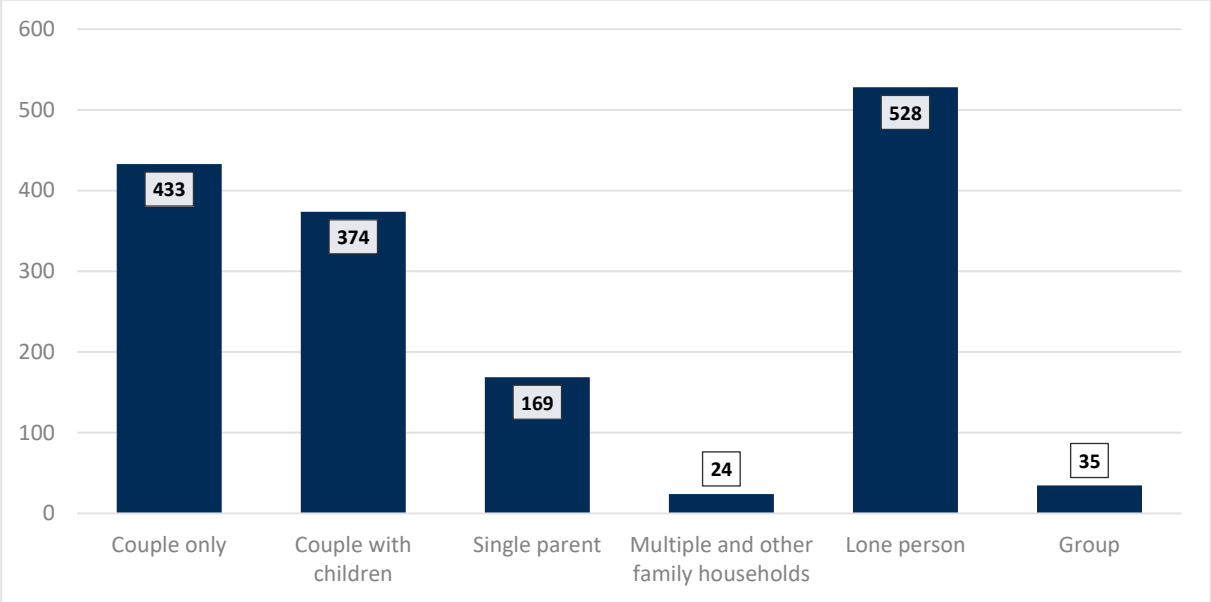
Figure 24: Residential dwelling approvals by financial year, Forbes LGA (2018-19 to 2022-23)



Source: ABS *Building Approvals* (2018-2023)

As noted in the Forbes LHS, there are few smaller lots or dwellings in Forbes' existing housing market. This was confirmed in discussions the proponent held with Council, as well as HillPDA's engagement with a Council representative, wherein delivering more diverse housing in Forbes was seen as a critical outcome of any major developments in the future. This is supported by the projections, as shown in Figure 25, which shows the number of additional households (compared to in 2021) by type projected in Forbes by 2041.

Figure 25: Projected additional households by type, Forbes LGA (2021-2041)

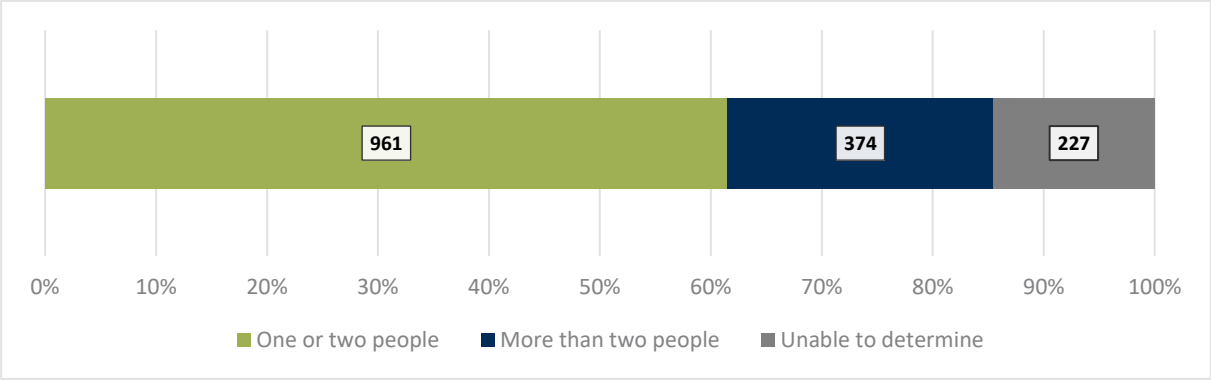


Source: NSW DPE (2023)

Whilst DPE does not provide additional household projections by number of persons present, we can glean some indication by the household type categories. Couple only and lone person households must contain one or two people, whilst couple with children households must contain more than two people.

As shown in Figure 26, over 60 per cent of additional households in Forbes are projected to consist of just one or two people. This would be in addition to the existing number of smaller households that may prefer a smaller dwelling (as noted in section 3.3.5).

Figure 26: Projected additional households by type (implied), Forbes LGA (2021-41)



Source: HillPDA, NSW DPE (2023)

3.5 Social infrastructure audit

This section identifies the social infrastructure facilities near the site across four categories: recreation and open space, libraries and community facilities, child care and education, and healthcare.

3.5.1 Recreation and open space

Recreation and open space areas are important to communities. Through enabling exercise and sports, these areas offer physical and mental health benefits to individuals, whilst they also support community cohesion and the development of social bonds. Recreation and open space areas can also provide environmental benefits including plant and animal habitat, water management, and mitigating the urban heat island effect.

This section considers the current provision of recreation and open space in the Forbes area (as it relates to the site).

Figure 27: Open space and recreation areas in Forbes and surrounds



Source: HillPDA, DPE *Points of Interest* layer (2023), Forbes Shire Council *ROSS* (2021)

Table 13: District and town level open space and recreation facilities in Forbes

ID	Name	Description	Classification	Area	Distance
1	Botanic Gardens Reserve	Large multi-sports facility to the south of Forbes that hosts athletics, soccer, touch football, and junior cricket. Includes: • 4 full-sized soccer fields • 4 smaller-sized soccer fields • 5 x cricket ovals (synthetic wicket) • 1 x canteen.	**Town** *Sports park*	14 ha	>5km
2	Ron Flannery Park / Forbes Tennis Club	Tennis/multi-purpose facility located to the south of Forbes, with a clubhouse and small playground area. • 7 x tennis courts (synthetic) • 3 x tennis / small-sided hockey fields (synthetic) • 1 x clubhouse and storage facility • 1 x playground.	**Town** *Sports park* (tennis/hockey) **Local** *Recreation park* (playground)	0.75 ha	>2km
3	Gaggin Oval / Halpin Flat	Multi-sports park west of the Forbes centre, includes: • 2 x cricket ovals (synthetic wicket) • 5 x croquet lawns and croquet clubhouse • 1 x softball field.	**District** *Sports park*	5.5 ha	>2km
4	Gum Swamp Reserve	Large nature reserve with woodland and swamp, southwest of Forbes. Serves as travelling stock route and nature observation area, popular with birdwatchers.	**Town** *Natural area*	87 ha	>5km
5	Nelson Park	District recreation park with new playground, shading, seating and picnic tables, public toilets, and 'street library'. Includes: • 1 x playground • 2 x tennis courts (hard court) • 1 x cricket / general use oval • 1 x cricket net • 1 x rebound wall.	**District** *Recreation park*	0.85 ha	1.6km
6	South Circle / Grinsted Oval	Multi-sport facility near Forbes town centre, including: • 2 x cricket ovals / rugby union fields (turf wicket) • 4 x cricket nets • 1 x clubhouse.	**Town** *Sports park*	5 ha	>2km
7	Spooner Oval / Hughie Wilson Oval	Multi-sport facility southwest of Forbes town centre, including: • 1 x cricket (synthetic wicket) oval • 1 x rugby league field • 1 x clubhouse / amenities facility • 1 x small playground.	**Town** *Sports park*	7 ha	>2km
8	Stephan Field	Multi-sport facility in the Forbes centre, with recently updated amenities and seating / picnic table areas. Includes: • 9 x netball courts • 2 x basketball/netball court • 4 x junior cricket ovals • 1 x amenities / canteen building • 1 x playground / 'ninja park'.	**Town** *Sports park* (tennis/hockey) **Town** *Recreation park* (skate/play)	3.3 ha 0.2 ha	>2km
9	Victoria Park	Victoria Park is located in the Forbes town centre and serves as a key space for events. It functions as a town square and includes formal gardens, a war memorial and band rotunda, and public toilets.	**Town** *Civic park*	0.73 ha	>2km

Source: Forbes Shire Council *ROSS* (2021)

The figure and table above indicate that residents of Forbes and its surrounds have access to a good quantity and variety of recreation and open space areas, serving a range of functions. These are generally centred around the Forbes centre or to its south, with a large proportion within the Lake Forbes precinct, adjacent to the waterway.

Most of the identified recreation and open space assets in Forbes, however, are located in near the centre or to the south of Forbes – in other words, far from the site. Further, a large proportion of the recreation and open space areas available to Forbes locals are adjacent to Lake Forbes, and are susceptible to flooding.

As indicated in Figure 27, there are no open space or recreation areas within 500 metres of the site, however, there are three areas located within two kilometres of the site:

- Nelson Park, a district level recreation park, located around 1.6 kilometres south of the site (refer item 5 in the above figure and table).
- Mabel Green Park, a 4,000 square metre local recreation park located around 750 metres southeast of the site. Includes a small playground suited to young children, but is generally limited in embellishment.
- Jenny Murphy Park, an 8,700 square metre local recreation park located around 550 metres south of the site. Includes a general purpose informal field, shelters, some play equipment and a rock climbing area.

Further to the above, other major recreation facilities in Forbes include the Council-owned Forbes Golf Course and the Forbes Olympic Pool, both around 2.5 kilometres southeast of the site.

3.5.2 Libraries and community facilities

Libraries, community centres, and other public and semi-public places serve important functions in providing facilities and amenity to residents, generally at a low cost or free of charge. They can also serve as a 'third space' between work or school and home, enabling residents to relax and socialise in the community. These facilities can be especially important in smaller or regional communities and can enable clubs, societies and other social groups to form and grow.

Figure 28: Libraries and community facilities in Forbes



Source: HillPDA, DPE *Points of Interest* layer (2023)

Table 14: Libraries and community facilities in Forbes

ID	Name	Description	Distance
1	Forbes Library	Operated as part of the Central West Libraries Network. Provides computer, printing, and internet access, as well as auxiliary services for residents with impairments or access requirements (such as a home delivery service).	2.9km
2	Forbes Town Hall and Concourse	Theatre-style venue overlooking Victoria Park, with capacity for up to 300 people, with curtained stage area, lighting and sound system. Concourse area suitable for use as foyer, with bathroom and kitchen facilities. Available for hire.	2.8km
3	Forbes Youth and Community Centre	Newly-renovated facility with large hall area, kitchen and barbecue facilities, outdoor area, and sandpit and cubby house. Available for hire.	2.4km
4	Wiradjuri Dreaming Centre	Education and community hub in a landscaped park-like setting, with various art and cultural interpretation pieces. Hosts meetings, workshops, and cultural events to promote Wiradjuri culture.	2.8km

Source: Forbes Shire Council *ROSS* (2021)

Forbes' town centre hosts a selection of important community facilities, as shown in the above figure and table.

In addition to the above formalised facilities, numerous other facilities serve community roles, either part-time or occasionally, as is often the case in regional communities. In Forbes, these informal community facilities include sports clubs and their facilities, such as the tennis or golf club, or the Forbes Sports and Recreation Club (or bowls club). These facilities may have spaces that are available for hire or hosting community events, in addition to the community role played by the club itself.

Further, several community organisations operate in Forbes including the Forbes and District Historical Museum, Forbes Country Women's Association, and the Forbes and District Lions Club. Two 'men's sheds' are also operational in Forbes; the Forbes Community Men's Shed, and Forbes Wiradjuri Men's Shed. These and other various serve a range of community needs and interests in Forbes.

3.5.3 Childcare and education

Social planners and Council are reliant on the NSW Department of Education (and any relevant private school providers) to provide input into planning for education facilities and provision, especially early in the master planning process. Nonetheless, it is important to consider the level of education provision available near a site due to the importance of education access.

Figure 29: Education and childcare facilities in Forbes



Source: HillPDA, DPE *Points of Interest* layer (2023)

Table 15: Education and childcare facilities in Forbes

ID	Name	Type	Sector	Enrolments / places	Distance
1	Goodstart Early Learning Forbes	Long day care	N/A	75	1.5km
2	Bright Beginnings Early Learning Centre	Long day care	N/A	70	1.5km
3	Forbes Learning Ladder	Long day care	N/A	90	900m
4	Forbes Community OSHC	Outside school hours care	N/A	36	1km
5	Forbes Preschool Kindergarten	Preschool	N/A	100	1.7km
6	Forbes Public School	Primary school	Public	309[a]	3km
7	Forbes North Public School	Primary school	Public	236[a]	900m
8	Forbes High School	High school	Public	308[a]	900m
9	St Laurence's Parish School	Primary school	Catholic	299[b]	2.1km
10	Red Bend Catholic College	High school	Catholic	802[b]	>5km
11	TAFE NSW – Forbes	Tertiary / vocational	Public	N/A	3km

Source: ACECQA (2023), ACARA (2019; 2022), NSW Department of Education (2023)
a: 2023 enrolment b: 2022 enrolment

As per the above figure and table, Forbes has a fair range of childcare and education facilities available locally. There are a handful of childcare facilities, consisting of three day care facilities, in addition to one outside school hours care facility and one preschool facility. Three primary schools – two public and one Catholic – are available in Forbes, alongside one public and one Catholic high school. Vocational education is available via TAFE NSW, which operates a campus in central Forbes. None of these facilities are located within 500 metres of the site, however, several are located within two kilometres.

The nearest childcare facility to the site is Forbes Learning Ladder, a long day care centre, located around 900 metres south of the site. Two further long day care centres are located around 1.5 kilometres from the site. In total, these facilities provide a maximum of 235 long day care places. Current capacity levels are unknown, however, engagement with Council representatives suggested that childcare availability in Forbes is an issue at present.

The nearest public primary school is Forbes North Public School, located around 900 metres south of the site, whilst Forbes Public School is around three kilometres south of the site. NSW Government data for 2023 indicates that these schools have FTE enrolment totalling approximately 545 students. Over the period 2019 to 2023, Forbes North Public School's enrolment has reduced by roughly 25 FTE, whilst Forbes Public School's enrolment has increased by around 40 FTE.

The nearest high school is Forbes High School, around 900 metres south of the site. Enrolment at Forbes High School was around 300 FTE in 2023; down by around 70 FTE compared to 2019.

3.5.4 Healthcare

Healthcare access can be limited in rural or regional areas, contributing to poorer health and social outcomes compared to metropolitan areas. This can also interact with other issues such as isolation, socioeconomic disadvantage, dangerous professions, and exposure to climate or natural disaster risk. Additionally, people in regional areas may have to travel further to access healthcare, especially for conditions or injuries requiring specialist treatment. As such, access to healthcare can be an important part of social infrastructure, and housing that is poorly located in relation to healthcare facilities can become an equity issue.

Figure 30: Healthcare facilities in Forbes



Source: HillPDA, DPE *Points of* Interest layer (2023)

Table 16: Healthcare facilities in Forbes

ID	Name	Type	Billing	Distance
1	Forbes Public Hospital	Hospital	N/A	4km
2	Yoorana Gunya Family Healing Centre	General Practice *(specialist Aboriginal service)*	Bulk billing	4km
3	Forbes Medical Centre	General Practice	Mixed	4km

ID	Name	Type	Billing	Distance
4	Forbes Medicine & Mind	General Practice *(inc. NSW Health Pathology)*	Mixed	2.7km
5	Life Pharmacy Forbes	Chemist	N/A	2.9km
6	Flannery's Pharmacy	Chemist	N/A	2.6km

Source: DPE *Points of* Interest layer (2023)

There are no healthcare facilities within two kilometres of the site. However, there is a generally adequate cohort of providers in the Forbes centre, and south of Forbes, with two general practitioners, two chemists, and a public hospital. Further to this, a specialist Aboriginal general practitioner is available south of Forbes. The nearest general practitioner is located around 2.7 kilometres south of the site boundary, in the Forbes CBD.

In addition to the above, the Forbes Outreach Centre (central Forbes) and Forbes Community Health Centre Social Work Service (south of Forbes), provide the local community with access to various important social work and counselling services.

COMMUNITY NEEDS ANALYSIS

4.0 COMMUNITY NEEDS ASSESSMENT

This chapter provides an overview of how the proposal impacts and addresses community needs identified in the earlier sections of this report.

4.1 Population at the site

In order to evaluate how the proposal effects community needs, it is first necessary to understand the on-site population at full development.

Based on the current draft masterplan provided by the proponent, we can estimate a total population at the site using the household size and the implied occupancy rate from NSW DPE's population projections. Once fully developed, we anticipate the 745 lots proposed to house a resident population of around 1,560 people.

This is shown in Table 17.

Table 17: Population projection at the site

Metric	Definition	Figure
Yield	Number of lots proposed in the draft masterplan.	745
Occupancy rate	Number of households per dwelling, as per NSW DPE projections.	0.88
Household size	Number of persons per household, as per NSW DPE projections.	2.38
Total population		**1,560**

Source: HillPDA, DPE (2023)

By combining the above figure and the observed 2021 Census age structure of the Forbes LGA, we can generate a projected breakdown of the population at the site by age group. This has been broken into 'service age groups', age categories developed by demographers .id to reflect typical 'life stages' and support the consideration of demand for different types of services (.id, 2023). This is shown in Table 18.

Table 18: Estimated population at the site by service age group

Service age group (age range in years)	Forbes LGA (2021, % of total)	Population at the site
Babies and pre-schoolers (0 – 4)	5.9%	92
Primary schoolers (5 – 11)	9.7%	151
Secondary schoolers (12 – 17)	8.0%	125
Tertiary education and independence (18 – 24)	7.2%	112
Young workforce (25 – 34)	10.8%	168
Parents and homebuilders (35 – 49)	16.1%	250
Older workers and pre-retirees (50 – 59)	13.1%	204
Empty nesters and retirees (60 – 69)	12.2%	190
Seniors (70 – 84)	14.1%	221
Elderly aged (85+)	3.0%	48
Total	**100.0%**	**1,560**

Source: HillPDA, ABS (2022)

4.2 Housing need

Forbes is anticipated to grow and change over the coming years, with a large proportion of future housing demand projected to arise from smaller households of one or two people. Housing affordability and a lack of housing diversity are also rising concerns in Forbes.

As indicated in section 3.4.2, Forbes requires between 90 to 105 additional dwellings per year over the period 2021-2041 to meet its projected housing demand. In the past five years, the number of approved dwellings per year across the LGA has not come near this level.

As part of its role in enabling the Forbes community to prosper and thrive, Council wishes to ensure that future housing in the Shire addresses these and other identified issues. The proposal will seek to balance these competing concerns.

Table 19 provides an overview of identified housing needs in the community, as surmised from the evidence base in this SEIA and the Forbes LHS.

Table 19: Key housing needs in Forbes

Group	Need
 **Seniors**	• Dwellings that are adaptable or universally accessible • Smaller dwellings / lots that provide a single level home with a small, manageable amount of open space • Access to amenities and transport to essential services (particularly health and social opportunities).
 **One and two person households**	• More diverse dwelling types at a range of price points • Smaller dwellings in high amenity locations.
 **Families with children**	• Standard 'traditional' size separate lots with private open space • A diversity of lot sizes to meet the needs of different families and incomes • A mix of price points and dwelling sizes to improve & support housing diversity and affordability.
 **Lower income households**	• More diverse dwelling types at lower price points • Affordable rental housing • Smaller dwellings close to key services such as schools.

4.3 Social infrastructure

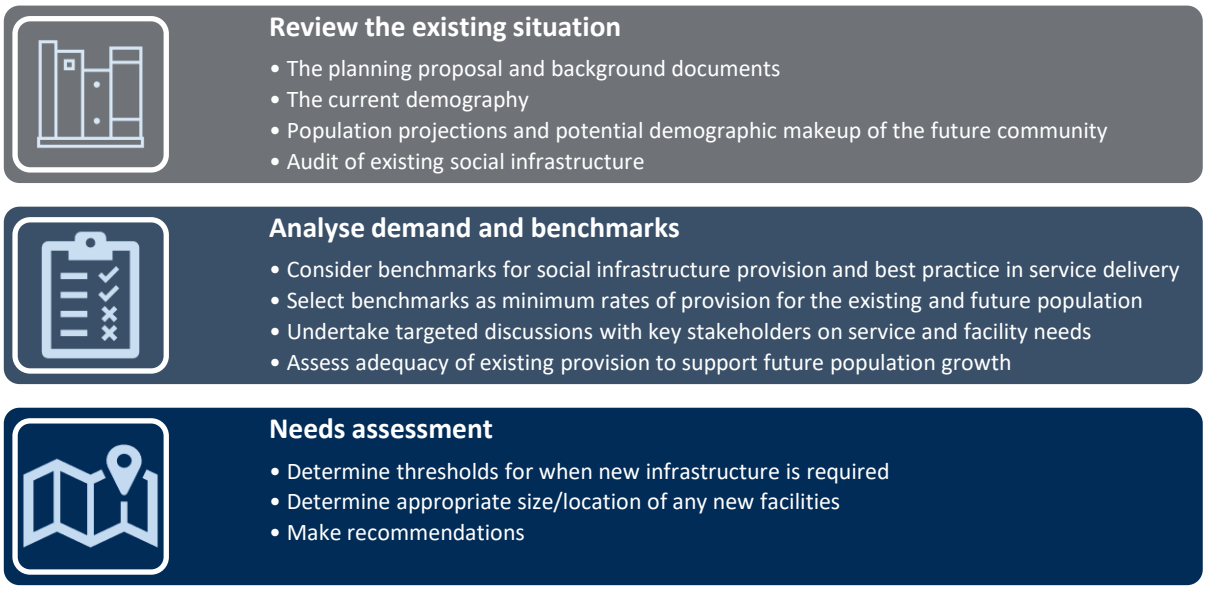
Social infrastructure should meet the needs of a current community and be responsive enough to efficiently address the needs of the future community. To ensure that social infrastructure continues to be responsive, it is important to understand its changing demography and future makeup of a community.

This section revisits the findings of the social infrastructure audit (refer to 3.5) and considers these in relation to the findings regarding the potential future population and infrastructure provision at the site. This work can help assist Council to determine how it can effectively and efficiently deliver infrastructure, and support the development of a proposal for the site that is responsive to the needs of the existing and future Forbes community.

In the following sections, the findings of the evidence base are considered through an interdisciplinary social science lens, in combination with GIS analysis and best-practice benchmarking to assess social infrastructure provision. We provide an assessment of the base case, and an assessment that assumes full development of the proposal as per the indicative masterplan.

The approach is outlined in Figure 31.

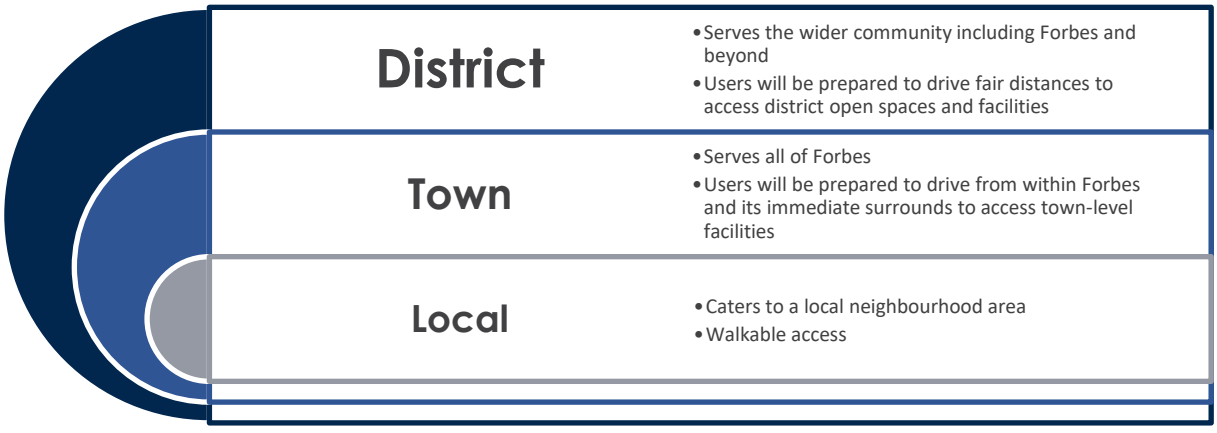
Figure 31: Social infrastructure benchmarking approach



Social infrastructure, like any form of public infrastructure, is designed with a finite capacity and intended to service a particular catchment. To that end, social infrastructure can be classified using a hierarchy of service provision as described below in Figure 32.

Whilst this hierarchy is intended to apply to open space and recreation areas and facilities, the general concept can be applied to other types of social infrastructure. An assessment of healthcare provision has not been undertaken in this section due to a lack of applicable benchmarks or provision rates.

Figure 32: Open space and recreation hierarchy



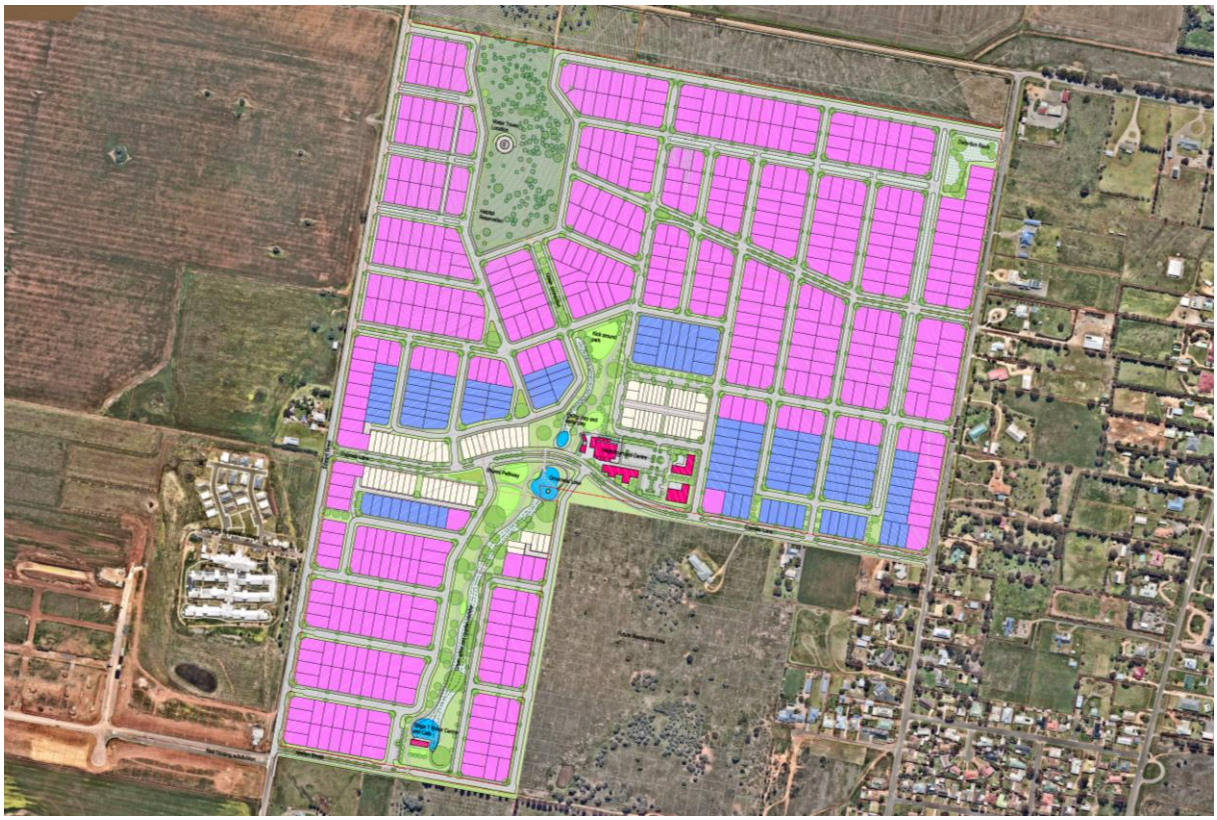
Source: Forbes Shire Council *ROSS* (2021).

Forbes' open space hierarchy also includes specialised and civic categories. Specialised facilities or areas are those suitable for only a specific use, whilst civic facilities or areas are generally informal urban spaces that may provide occasional public use opportunities (such as hosting ceremonies or events), but do not generally contribute to open space or recreation provision.

4.3.1 Provision within the site

The indicative masterplan (as shown in Figure 33) shows provision of a range of social infrastructure elements would be delivered at the site, assuming full development.

Figure 33: Indicative masterplan



Source: Allera

According to the indicative masterplan, the proposal would result in the provision of a range of social infrastructure at the site, including:

- A 'green spine' open space corridor traversing the site in a north-south direction
- A total of 5.6 hectares of open space, including:
  - A 'kick around park'
  - A play space and water play area for young children
  - Ornamental water features
- A total of 4.4 hectares of natural open space
- Shared pathway network
- Space for a child care centre.

4.3.2 Recreation and open space

Benchmarking for recreation and open space facilities and areas has been undertaken per the benchmarks established in the ROSS, as well as being informed by various other guidelines and experience.

Indicative benchmarking for recreation and open space is provided in Table 20.

Table 20: Recreation and open space facilities assessment

Type	Benchmark	Existing	Base case			Base case and proposal		
			Parameter	Need	Assessment	Parameter	Need	Assessment
Playgrounds	1:2,000 people[a] **OR** 1 within 500m / 5 minute walk [b]	5 x play grounds **OR** 0 within 500m / 5 minute walk	9,319	4.7	**Met**	10,879	5.4	**Met**
Local open space	0.5-1.5ha within 500m / 5 minute walk[b]	0ha	n/a	0.5-1.5ha	**Not met**	n/a	0.5-1.5ha	**Met**
Town open space	2-5ha within 2km / 5 minute drive[b]	0ha	n/a	2-5ha	**Not met**	n/a	2-5ha	**Not met**
District open space	5-10ha within a reasonable drive[b]	6.4ha	n/a	0-3.6ha	**Met**	n/a	0-3.6ha	**Met**
Desired standards of service (overall LGA-wide quantitative measure) [b]								
Recreation open space	2.5ha:1,000 people[b]	16.4ha	9,319	23.3ha	**Not met**	10,879	27.2ha	**Not met**
Sporting open space	1.5ha:1,000 people[b]	32.2ha	9,319	14.0ha	**Met**	10,879	16.3ha	**Met**

a: Parks and Leisure Australia WA (2020); b: Forbes Shire Council *ROSS* (2021)

Base case

Overall, under the base case and with the full development of the proposal, the overall level of provision across Forbes is very good. There are a range of sporting facilities that are well embellished and that provide significant quantity of space. All identified open space facilities or areas, however, are located beyond 500 metres from the site.

Accordingly, under the base case, only the overall provision of playgrounds, district open space, and sporting open space are met across the LGA. It is noted, however, that a quantity of town open space sufficient to meet the benchmark is located just beyond the benchmark travel time/distance.

Base case and proposal

With the proposal, however, the existing provision would be supplemented by around ten hectares of open space, including a playground and water play area, and an informal sporting open space area, local open space, and natural open space.

Under this scenario, whilst the overall assessment in the table above does not change significantly, the outcome would be much improved. The playground benchmark would be met, and the aforementioned town open space benchmark would remain unmet within the travel time/distance parameters, but generally well-supplied. Further, whilst the LGA-wide recreation open space standard of service would continue to be unmet, the ten hectares within the site would reduce the shortfall to less than one hectare across the LGA.

Other considerations

Beyond the existing and proposed provision, it is noted that the masterplan for Council's Goldridge Estate indicates that the site would also have access to a large amenity park area with a playground. This would be located within walking distance of much of the site.

In addition to this, as per the FOSS, Council is in the process of upgrading several of its key open space and recreation assets. Though these would remain separated from the site by some distance, draft masterplans for several parks indicate upcoming improvements to embellishment and sporting facilities that would vastly improve the quality of these areas.

Assuming implementation of the proposed works by Council across its parks, sporting areas, and provision of new facilities in the Goldridge Estate, the minor shortfalls identified in open space and recreation at the site would be negligible.

4.3.3 Libraries and community facilities

Benchmarking for libraries and community facilities has been undertaken per the benchmarks established in the *Growth Centres Development Code* (2006) and the City of Parramatta's *Community Infrastructure Strategy* (2020), and informed by various other guidelines and experience.

Indicative benchmarking for libraries and community facilities is provided in Table 21.

Table 21: Libraries and community facilities assessment

Type	Benchmark	Existing	Base case			Base case and proposal		
			Parameter	Need	Assessment	Parameter	Need	Assessment
Youth centre	1:20,000 residents[a]	1 x youth centre	9,319	0.5	**Met**	10,879	0.5	**Met**
Local community centre	1:6,000 residents[a]	1 x community centre	9,319	1.6	**Not met**	10,879	1.8	**Not met**
Branch library	1:33,000 residents[ab]	1 x library	9,319	0.3	**Met**	10,879	0.3	**Met**
Performing arts / cultural centre	1:30,000 residents[a]	1 x town hall 1 x Aboriginal cultural centre	9,319	0.3	**Met**	10,879	0.4	**Met**

a: *Growth Centres Development Code* (2006); b: NSW State Library (2021)

Base case

The above assessment indicates that under the base case, Forbes residents generally have adequate or better access to libraries and community facilities. For local community centres, however, an unmet need is apparent in the base case scenario. This is exacerbated by locational factors, as the Forbes Community Centre is located in central Forbes, some distance from many residents and the site.

It is noted that other facilities such as sports clubs or informal areas in the Forbes LGA provide a supplemental community centre functionality, however, this is unlikely to sufficiently address the unmet demand as a whole, particularly in the long term. With projected growth to 2041, this shortfall would continue to grow.

Base case and proposal

Assuming full development at the site, the above assessment indicates that the proposal is unlikely to generate significant additional demand. The assessment shows that additional demand for a youth centre, a library, and a performing arts/cultural centre would be minimal under each scenario, and effectively serviced by the existing provision.

The assessment does indicate that the existing unmet demand for a community centre would be exacerbated, however. It is therefore likely that a new community facility serving Forbes' northern areas may be required in the medium to long term future. It is noted that Council is aware of this matter and is considering options to address it.

As such, consideration could be given to whether the proposal could incorporate land or floorspace to enable a future local community centre or other multi-purpose facility, to be determined in collaboration with Council. Dependent on the outcome of this, the proposal may alleviate the unmet demand for a local community centre.

Finally, though the overall level of provision is acceptable, it is noted that none of the identified libraries or community facilities are located near the site, consistent with the assessment of Forbes' northern areas being poorly served by social infrastructure. To manage this, the design of the proposal should ensure that access to key social infrastructure facilities to the south is prioritised, in terms of active transport corridors, road layout, and urban structure. These appear to have been considered as part of the overall masterplan design.

Other considerations

Beyond the existing and proposed provision, it is noted that the masterplan for Council's Goldridge Estate indicates that a community centre would be established there, providing a much improved level of access to residents and the site and ensuring that the indicated need for an additional community centre is met.

4.3.4 Childcare and education

School benchmarking has been undertaken with regard to recent benchmarks established in the *Central Precinct Renewal Program - Social Infrastructure and Health Impact Assessment* (2022) by Transport for NSW, which HillPDA understands has been informed by more recent consultation with the Department of Education on school infrastructure design. Child care needs have been benchmarked using the City of Parramatta's *Community Infrastructure Strategy* (2020).

Indicative benchmarking for early childhood (e.g. long day care), as well as primary and secondary school needs has been undertaken below in Table 22.

Table 22: Childcare and education assessment

Type	Benchmark	Existing	Base case			Base case and proposal		
			Parameter	Need	Assessment	Parameter	Need	Assessment
Long day care centre	1 place: 2.48 children aged 0-4[c]	235 places (3 x LDC centres)	548	221	**Met**	640	258	**Met**
Public primary school	1:500 students aged 5-11[e]	2 x public primary schools	901	1.8	**Met**	1,052	2.1	**Met**
Public high school	1:1,200 students aged 12-17[d]	1 x public high school	748	0.6	**Met**	873	0.7	**Met**

c: City of Parramatta (2020); d: Approved maximum places; e: TfNSW (2022); f: 2023 enrolment (FTE)

Base case

Under the base case scenario, there is an adequate level of long day care places in Forbes. However, this assessment has not considered current availability, which may be lower than the number of approved places. In discussion with HillPDA, Council has indicated that there is an existing shortfall of childcare facilities in Forbes.

In terms of education, under the base case there is adequate supply of both public primary schools and high schools in Forbes. Further, these are well-located, relatively close to the site.

Base case and proposal

With the population arising at the proposal (assuming full development), the assessed need for long day care would exceed the current number of places.

However, the proposed neighbourhood centre provides space for a child care facility (indicative). As per section 6.4.1, we estimate that the centre would provide 65 additional long day care places, increasing the total places to around 300. This would be sufficient for additional need to be met.

Education needs would continue to be met by the existing provision under full development of the proposal.

Other considerations

It is noted that Forbes also hosts private schools, which would likely be used to some degree by future residents at the site. This would reduce any pressure on existing public services that may arise.

Additionally, whilst not contributing to the base case or base case with the proposal, the masterplan for the nearby Goldridge development indicates a childcare centre located near the site. Should this be delivered in future, provision would be further improved.

ECONOMIC ANALYSIS

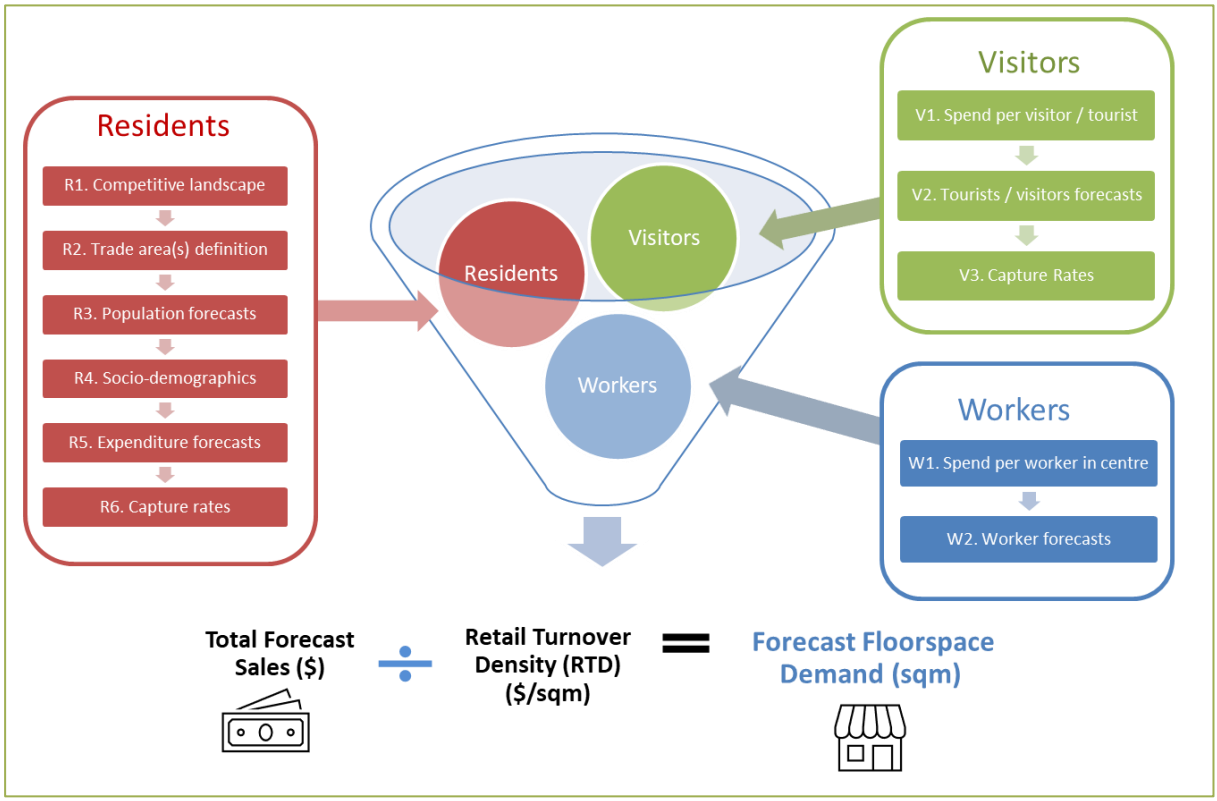
5.0 RETAIL DEMAND ASSESSMENT

This chapter provides an assessment of the amount of the amount of retail space that could be accommodated on the site based on future demand largely derived from population growth.

5.1 Demand methodology

The process of forecasting total potential retail demand is shown in Figure 34.

Figure 34: Methodology to forecast retail demand



Source: HillPDA

As illustrated above, there are three key sources of demand for retail floor space being:

- Residents in the locality
- Workers in the centre and
- Visitors and tourists.

For the site, we anticipate that residents will be the main source of expenditure for a retail centre on site, with low numbers of workers and tourists expected. As such, we have limited the source of demand to residents in the locality, whilst allowing for a small proportion of additional expenditure to be derived from other sources.

To forecast potential retail demand for the site, we developed a trade area, based on factors such as the location of competing centres, travel times, urban settlement patterns, and other criteria. It is essential to have an understanding of competing centres, their location relative to the site and their respective retail offers. This is provided in section 5.2.

We then utilised our proprietary expenditure models (which takes into account socio-demographics of the catchment, real growth in expenditure, population growth, potential capture rates and industry standard retail

turnover densities) to forecast the quantum of retail floorspace that could be accommodated on the site. The results are detailed in sections 5.3 to 5.4.

5.2 Retail centres

The key retail centres that would compete with and influence the trade area and capture rates of a retail centre on site are described as follows:

- There are two regional centres[1] in the Central West Region – Dubbo and Orange.
  - Dubbo, located an hour and forty minutes north of the site by road, has a very extensive trade area that covers the northern half of the Central West and extends north-west to Bourke. It also extends southwards to Forbes as travel times along the Newell Highway make it as equally attractive as Orange. Dubbo has more than 150,000 square metres of retail space and is anchored by a Myer department store, two discount department stores and several supermarkets. Dubbo also has an extensive range of restaurants and other personal services as well as an extensive range of bulky goods retailing and commercial services.
  - Orange, located an hour and thirty minutes east of the site by road, has an extensive trade area encompassing the southern half of the Central West and extends west to Lachlan and Bland Shires, and south to Weddin and Cowra. This regional centre provides a substantial retail offer (exceeding 100,000 square metres) featuring major national anchors like Kmart and Big W discount department stores, along with numerous national bulky goods retailers. Retail floor space in Orange is primarily concentrates in two areas: the town centre on Summer Street, which includes a 7,200 square metres Big W, Coles, Woolworths, and Aldi; and the Homemakers Centre on Bathurst Road and Lone Pine Avenue, (approximately 2 km east of the city centre) which is anchored by Bunnings, Autobarn, Spotlight, Early Setter and a Harvey Norman.
- Parkes, located around 30 kilometres or 25 minutes north of the site by road, Parkes which encompasses Parkes Central and Orange Grove Plaza offers around 35,000 square metres and includes anchor tenants such as Big W, Woolworths, Coles, Aldi as well as a variety of speciality stores, cafes and restaurants.
- Forbes Town Centre, located around four kilometres south of the site, the Forbes Town Centre provides the greatest level of competition given its proximity and comparative offer. The town centre is bounded by the railway line to the north, Forbes Lake to the east and south and a large belt of open space to the west which includes Stephen Fields Park, Goggin Park, Halpins Flat and the public swimming pool. The retail core is centred on Lachlan Street between Cross Street and Browne Street and also on Rankin Street between Cross Street and Grenfell Street. The centre provides around 21,000 square metres of retail floorspace, including a small format Kmart discount department store (former Target Country), 4,250 square metres of supermarket space (a 2,637 square metres Woolworth supermarket and independent grocer, Bernardi's Marketplace). Outside the retail core the town centre has mixed uses including dwelling houses, commercial buildings, dwellings used for commercial purposes and home occupations, churches, community uses, light industrial and automotive industries.
- Future retail developments: A review of development applications sourced from Cordell indicates that only small-scale retail businesses have been proposed. Some of these businesses offer different types of retail offerings, such as highway service stations. Should these retail spaces progress as planned, they are not expected to present substantial competition to the proposed retail centre on the site.

[1] Regional Centres: generally having more than 80,000sqm of retail floor space and anchored by a national department store (Myer or David Jones) and at least one discount department store (Big W, Kmart and/or Target). They also include entertainment uses such as a multi-screen cinema, ten-pin bowling or the like. Regional centres have an extensive trade area covering five or more local government areas with a population of at least 150,000 people. Examples include Wollongong, Tamworth, Dubbo, Orange and Wagga Wagga.

5.3 Residential expenditure

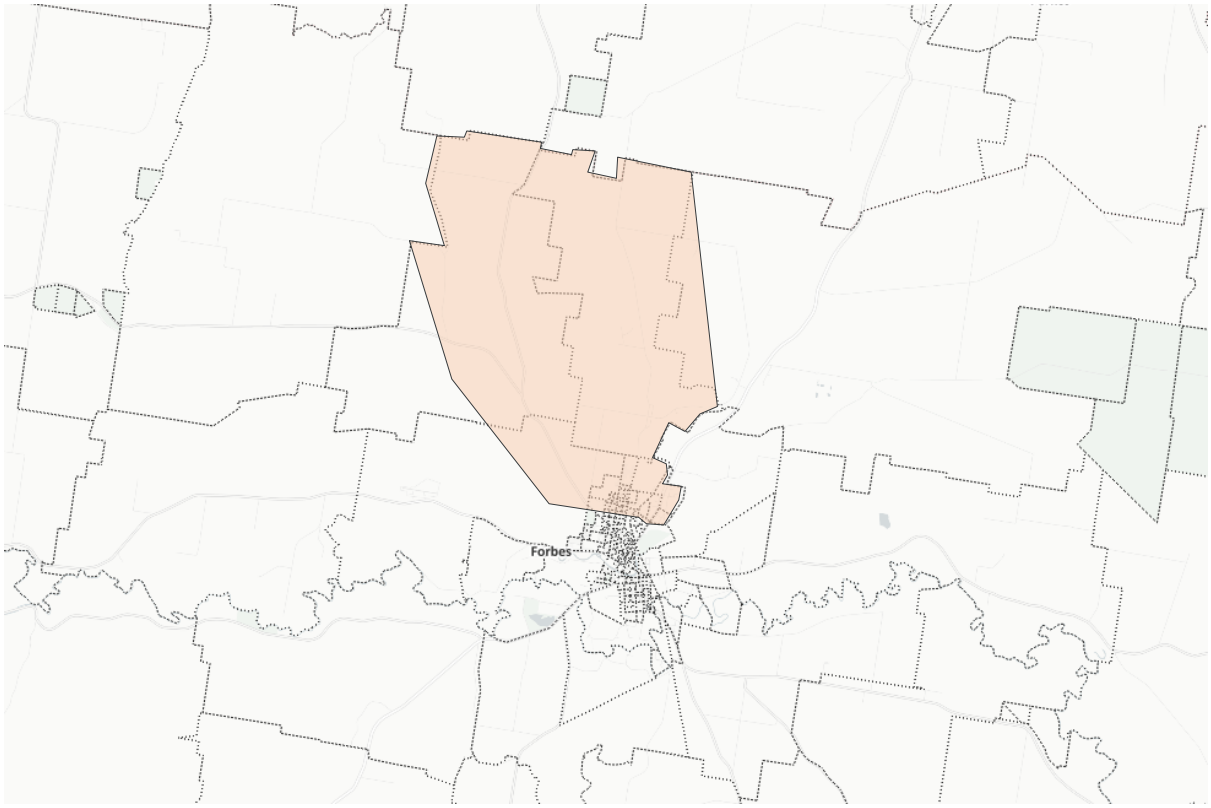
Current and forecast expenditure captured from surrounding residents is quantified by identifying the trade area(s), the current and future population in the trade area(s), the expenditure levels of trade area residents and the likely percentage of capture.

5.3.1 Trade area(s)

With consideration given to the surrounding retail centres, retail hierarchy, accessibility, travel times, urban settlement patterns and other criteria the proposed retail centre likely to serve as a neighbourhood centre is expected to service a main trade area (MTA) which extends south to Patterson Street and ten kilometres north of the site.

The MTA is shown in Figure 35.

Figure 35: Main trade area of the site



5.3.2 Population growth

Based on the 2021 Census data, the MTA accommodated around 1,800 persons. NSW DPE projects that the broader Forbes LGA will accommodate an additional 3,200 persons from 2021 to 2041, growing at an annual rate of 1.4 per cent. A substantial amount of land flagged for future residential development (over 60 hectares) is within the MTA. It should also be noted that these projections do not account for the proposed residential uses on the site which may result in higher than anticipated population projections.

For the purpose of this assessment, two scenarios have been considered:

- Lower growth: assumes full development of the site and half of the vacant and/or underutilised residential lots in the trade area by 2041 are developed at a density of 10 dwellings per hectare.[2]
- Higher growth: assumes full development of the site and all the vacant and/or underutilised residential lots in the trade area are redeveloped by 2041 at a density of 10 dwellings per hectare.[3]

Based on the above assumption the MTA population is projected to increase to over 4,000 persons by 2041 under the lower growth scenario and almost 4,700 persons under the higher growth scenario as shown in the table immediately below.

Table 23: MTA population projections

Trade area	2022	2026	2031	2036	2041
Lower growth	1,874	2,202	2,695	3,298	4,035
Higher growth	1,888	2,286	2,904	3,688	4,685

Source: ABS Census of Population and Housing: Mesh Block Counts.

5.3.3 Household expenditure

Compared to non-metro averages, MTA residents have slightly lower spend levels, with the average per capital spend on retail goods and services at around $14,736 ($2022) per person per annum which is one per cent below the non-metro average ($14,832).[4]

As shown in the table immediately below, retail expenditure generated by MTA residents is forecast to increase from $27.6 million in 2022 to $68.9 million in 2041 under the lower growth scenario and to $80.0 million under the higher growth scenario.

[2] Allows for residential vacancy at a rate of 11% which aligns with the LGA average
[3] Allows for residential vacancy at a rate of 11% which aligns with the LGA average
[4] ABS retail sales data. Expenditure includes selected personal services such as optical dispensing, hair and beauty and clothing alterations but excludes financial, travel, real estate, medical and other commercial services and online spend.

Table 24: Total retail expenditure in the trade area from 2022-2041 ($ millions)[5]*

Scenario / retail category	2022	2026	2031	2036	2041
Lower growth scenario					
Supermarkets and grocery stores	9.6	11.8	15.2	19.5	25.1
Specialised food stores	2.4	2.9	3.7	4.7	6.0
Bulky goods stores	4.5	5.4	6.8	8.7	11.0
Department stores	1.4	1.6	1.9	2.2	2.7
Apparel stores	2.4	2.9	3.7	4.6	5.8
Other non-food stores	3.9	4.7	6.0	7.6	9.6
Restaurants and fast food services	2.5	3.0	3.9	5.1	6.5
Personal services	0.9	1.1	1.4	1.8	2.3
Total	**27.6**	**33.5**	**42.6**	**54.1**	**68.9**
Higher growth					
Supermarkets and grocery stores	9.7	12.2	16.3	21.8	29.1
Specialised food stores	2.4	3.0	4.0	5.2	6.9
Bulky goods stores	4.5	5.6	7.4	9.7	12.7
Department stores	1.4	1.6	2.0	2.5	3.1
Apparel stores	2.4	3.0	3.9	5.2	6.8
Other non-food stores	3.9	4.9	6.4	8.5	11.1
Restaurants and fast food services	2.5	3.2	4.2	5.7	7.6
Personal services	0.9	1.2	1.5	2.0	2.6
Total	**27.8**	**34.7**	**45.9**	**60.6**	**80.0**

Source: ABS retail sales data

* Allows 0.8% per annum real growth in spend per capita in line with the long term historic trend since 1986.

** Bulky Goods includes fabrics, soft goods, furniture, floor coverings, hardware, houseware, electrical appliances, sports and camping stores.

*** Turnover relating only to consumption of food and liquor (excludes all other types of revenue such as accommodation, gaming and gambling

**** Selected Personal Services includes hair and beauty, laundry, clothing hire and alterations, shoe repair, optical dispensing, photo processing and hire of videos

5.3.4 Capture of household expenditure

The previous analysis identified the total volume of retail expenditure in the trade area. However, it is important to note that not all of this expenditure would be captured by retailers in the proposed development. Reasons for this include:

- **Proximity to competing centres**: The presence of nearby retail centres offering a broader and more varied range of shopping and grocery options may divert some expenditure away from the proposed development.
- **Brand preferences:** Residents who have a preference for particular supermarket brand other than that provided on site.
- **Leisure and discretionary shopping:** Residents leaving the locality to, predominantly, undertake leisure and discretionary shopping (in department stores, apparel stores and bulky goods stores in destinations such as Dubbo, Orange, Parkes etc). This can result in them also doing their supermarket and grocery shopping in these locations also.
- **Workplace spending:** Working residents spending a portion of retail expenditure close to their place of work (approximately 15-25 per cent).
- **Temporary absences:** Expenditure from residents who are on holidays/business trips or are away for other reasons for any extended period.

To account for these potential leakages we have assumed the capture rates shown in Table 25 across both scenarios.

[5] In 2022 dollars

Table 25: Assumed MTA capture rates

Retail store type	Capture rate (2022)
Supermarkets and grocery stores	55.0%
Specialised food stores	55.0%
Bulky goods stores	-
Department stores	-
Apparel stores	-
Other non-food stores	10.0%
Restaurants and fast-food services	25.0%
Personal services	25.0%
Total	**28.5%**

Source: HillPDA

Note that actual capture rates may vary depending on the size, quality and range of the retail offer.

Table 26 shows ultimate potential retail sales the retail centre could achieve assuming the above capture rates. The result is a potential to capture $16.6 million from MTA residents by 2036 under the lower growth scenario and $18.5 million under the higher growth scenario.

Table 26: Total potential sales

Scenario / retail store type	2026	2031	2036	2041
Lower growth				
Supermarkets and grocery stores	6.8	8.8	11.3	14.5
Specialised food stores	1.7	2.1	2.7	3.4
Bulky goods stores	0.0	0.0	0.0	0.0
Department stores	0.0	0.0	0.0	0.0
Apparel stores	0.0	0.0	0.0	0.0
Other non-food stores	0.5	0.6	0.8	1.0
Restaurants and fast food services	0.8	1.0	1.3	1.7
Personal services	0.3	0.4	0.5	0.6
Total	**10.1**	**12.9**	**16.6**	**21.2**
Higher growth				
Supermarkets and grocery stores	7.1	9.4	12.6	16.8
Specialised food stores	1.7	2.3	3.0	4.0
Bulky goods stores	0.0	0.0	0.0	0.0
Department stores	0.0	0.0	0.0	0.0
Apparel stores	0.0	0.0	0.0	0.0
Other non-food stores	0.5	0.7	0.9	1.2
Restaurants and fast food services	0.8	1.1	1.5	2.0
Personal services	0.3	0.4	0.5	0.7
Total	**10.5**	**13.9**	**18.5**	**24.7**

Source: ABS retail sales data; HillPDA Research

Please note also that the above figures make an allowance for 5 per cent of sales to be derived from beyond the trade area. This includes residents that live further afield, workers in the locality and day trippers.

5.4 Demand for shop front space

Demand for shop front space is calculated by dividing potential retail sales by industry target retail turnover density levels ($/sqm). Target RTDs are derived from a number of sources including ABS Retail Sales, ABS Retail Survey 1998-99, Shopping Centre News, Property Council of Australia, Urbis Retail Averages, various annual reports and other consultancy studies. The results are shown in Table 27.

Table 27: Floorspace demand by broad retail type

Retail Store Type	Target RTD ($/sqm)*	2026	2031	2036	2041
Lower growth scenario					
Supermarkets and grocery stores	11,000	607	761	955	1,197
Specialised food stores	9,500	173	215	266	330
Bulky goods stores	3,500	0	0	0	0
Department stores	3,500	0	0	0	0
Apparel stores	5,000	0	0	0	0
Other non-food stores	5,000	98	123	154	192
Restaurants and fast food services	6,500	120	151	190	239
Personal services**	4,000	73	91	114	141
Total retail	9,222	1,072	1,341	1,678	2,100
Non-retail shopfront***		93	116	145	181
Total		**1,165**	**1,457**	**1,823**	**2,281**
Higher growth scenario					
Supermarkets and grocery stores	11,000	630	820	1,068	1,390
Specialised food stores	9,500	180	231	298	383
Bulky goods stores	3,500	0	0	0	0
Department stores	3,500	0	0	0	0
Apparel stores	5,000	0	0	0	0
Other non-food stores	5,000	102	132	172	223
Restaurants and fast food services	6,500	125	163	213	278
Personal services**	4,000	76	98	127	164
Total retail	9,222	1,113	1,445	1,877	2,438
Non-retail shopfront***		97	125	162	210
Total		**1,209**	**1,570**	**2,039**	**2,648**

* Assumes to increase at 0.5% per annum for food and food services and 0.25% for non-food retailing

** Including hair and beauty, laundry, clothing hire and alterations, optical dispensing

*** Assumes 20% of non-grocery retail floorspace and includes financial, real estate, travel and medical services that occupy shop front space

With no other traditional retail space provided or planned within the MTA, the above retail demand analysis identifies demand for 1,450 square metres of shopfront space by 2031 under lower growth scenario and 1,570 square metres under the high growth scenario, increasing to 2,281 square metres by 2041 under the lower growth and 2,648 square metres under the higher growth scenario. This would suggest that the site has the potential to support a centre of approximately 1,450 square metres by 2031 which could include a supermarket of 750-900 square metres (such as an IGA), along with a small provision of speciality shops. In the early years of the site's development, the centre may trade below industry targets due to lower population levels, particularly under the lower growth scenario. However, establishing a centre early on enhances the amenity, attractiveness, and marketability of the estate. Once the estate and surrounding areas establish the retail centre trading levels should improve.

5.5 Impacts on other centres

If the retail centre were to capture the amount of trade identified in Section 5.3.4 there would still be sufficient expenditure remaining across the trade area to ensure minimal impact to nearby centres such Forbes Town Centre. We would not expect a centre of 1,800-2,000 square metres to trade much above $12 million (which is $8,500 per square metre, in line with the average trading levels for similar size centres throughout Australia). If it traded at this level in 2031 it would only be capturing around 26 per cent of trade area expenditure under the high growth scenario (allowing for 5 per cent of trade from other sources). This leaves 74 per cent of expenditure to be directed to other existing and proposed centres in the Forbes LGA, including the Forbes Town Centre.

Moreover, the analysis indicates that there is a clear demand for increased retail space in the trade area to appropriately service the local community. Such provision of space would increase the liveability, productivity and sustainability of the new suburb while also reducing the need for residents to travel further than necessary to access essential services.

Although the Town Centre is relatively close to the site (around five kilometres away), establishing a centre on site would not only provide residents with convenient access to their everyday retail shopping needs but also deliver numerous additional economic advantages. These benefits include time and cost savings for residents' journeys and positive environmental impacts. Additionally, the retail space provided at the site would provide Forbes with increased resilience to natural disasters, as the existing retail and commercial space in Forbes' centre is subject to risk from flooding.

6.0 ECONOMIC IMPACT ASSESSMENT

This chapter examines the potential economic impacts associated with proceeding with the proposed development during the construction phase and post-construction (operational) phase. The economic impacts of the proposed development are measured against the base case ('do nothing' or 'status quo' option).

For the purposes of this analysis we have assumed the following uses:[6]

- 745 single dwellings
- Supermarket or convenience store of 850 square metres (GFA)
- Specialty shops (including a café) totalling 600 square metres (GFA)
- Allied health of 850 square metres (GFA)
- Child care of 700 square metres (GFA)
- Gym of 950 square metres (GFA)
- 100 car spaces[7] and
- A small provision of open space / parks to service the on-site residents.

6.1 Economic impact assessment approach

6.1.1 Economic impact phases

Economic impacts are measured at both the construction phase and operational phase.

- **Design and construction phase:** is the economic activity generated and supported by the design and construction of the estate. These impacts are expected to be short-term, concluding when construction activity is completed. The base case assumes no construction activity and hence is not assessed in this phase.
- **Operational phase (post-construction):** is the annual economic activity generated by operations post construction measured against the base case (no redevelopment option).

6.1.2 Key performance indicators

The modelling for this report is based on the Australian National Accounts Input Output tables 2020-21. Four key performance indicators were adopted to measure the economic impacts as described in Table 28.

Table 28: Economic impact metrics assessed

Performance Indicator	Description
Gross output	Output is a gross measure of the total sales generated by the types of land uses present on the site or in the proposal
Employment	Employment generated by the types of land uses present on the site or in the proposal (either full time or part time)
Remuneration	Gross wages and salaries paid to workers
Gross value added	Gross value added (GVA) of an industry refers to the value of outputs less the costs of inputs. It measures the contribution that the industry makes to the country's wealth or gross domestic product (GDP).

6.1.3 Economic multipliers

Economic multipliers refer to the level of additional economic activity generated or supported by a source industry. There are two types of effects captured by multipliers:

[6] As advised by the client
[7] Allows for an additional 11 parking spaces beyond the minimum requirements outlined in the DCP.

Production induced effects: which is made up of:

- *First round effects:* which are all outputs and employment required to produce the inputs for the source industry, and
- *Industrial support effects:* which is the induced extra output and employment from all industries to support the increased production by suppliers in response to increased sales.

Consumption induced effects: which relates to the demand for additional goods and services due to increased spending by the wage and salary earners across all industries arising from employment.

As discussed above for the purpose of this report economic impacts have been assessed at NSW State level.

Limitations with multipliers

Both the ABS and the NSW Treasury Employment Calculator describe several limitations with input-output multipliers, or at least shortcomings with typical interpretations of the multipliers, which generally result in an over-estimation of impacts. The main shortcomings or limitations are as follows:

- Production induced impacts can leave the impression that extra output can be produced without taking resources away from other activities.
- Multipliers assumed fixed input ratios and hence measure impacts based on average effects rather than marginal effects.
- The impacts are nationwide and are not regional or local impacts which would be smaller.

Other limitations are described in both the NSW Treasury Guide and on the ABS website.[8]

6.2 Economic impacts from design and construction

Re-development of the site in accordance with the uses outlined above would require capital investment, which would drive economic activity and create employment. The construction and design costs (i.e. Capital Investment Value or CIV) for proposed development are estimated to be around $643.4 million and are calculated as follows:

- 745 single dwellings at a rate of $550,000/dwelling[9]
- Non-residential uses at a rate of $3,000/ square metres[10]
- Car parking at $3,500 per space[11]
- Land development costs at $1.6 million / hectare[12]
- Contingencies set at 10 per cent
- Design, project management, and application fees, totalling 8.5 per cent of land development and non-residential building costs.

Based on this estimate, the following assesses the economic activity supported on site and statewide during the construction phase.

6.2.1 Gross output from construction

The proposal will have a direct impact on construction output as well as indirectly stimulating other industries which assist in production and cater to increased consumption.

[8] https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-input-output-tables/latest-release
https://www.treasury.nsw.gov.au/information-public-entities/nsw-treasury-employment-calculator
[9] Assumes a single level 3 to 4 bedroom dwelling with standard finishes; Source: various local and project home builder websites
[10] Source: Rawlinsons Australian Construction Handbook; RLB; and various consultancy reports
[11] Source: Rawlinsons Australian Construction Handbook; RLB; and various consultancy reports, Forbes Development Control Plan 2013 (V2)
[12] This includes open space / parks; Source: RLB and various consultancy reports

Table 29 details the output multipliers and shows the impact of the change in demand supported by the development and the impact on the NSW economy. The forecast increase in total output supported Statewide is estimated at approximately $1.8 billion (directly and indirectly).

Table 29: Gross output from design and construction ($2022million)

	Direct effects	Production induced effects		Consumption induced effects	Total
		First round effects	Industrial support effects		
Total output ($m)	643.4	385.0	352.1	452.5	1,833.0

Source: HillPDA estimate using data from ABS Australian National Accounts: Input-Output Tables 2020-21

6.2.2 Gross value added

The Gross Value Added (GVA) of an industry refers to the value of outputs less the costs of inputs. It also measures the contribution that the industry makes to the region's wealth or gross state product (GSP). The main components of GVA are workers' remunerations, profits and government taxes.

As shown in Table 30, the CIV would directly contribute around $189.9 million to NSW GSP. When taking into account the multiplier effects, the GVA generated and/or supported by the project would reach a total of $733.9 million across the state.

Table 30: Construction GVA impact ($million) (2022 dollars)

	Direct effects	Production induced effects		Consumption induced effects	Total
		First round effects	Industrial support effects		
Total GVA ($m)	189.9	148.3	155.3	240.5	733.9

Source: HillPDA estimate using data from ABS Australian National Accounts: Input-Output Tables 2020-21

6.2.3 Job creation from construction

Each million dollars of design and construction work undertaken generates 2.2 job years[13] directly.[14] Based on the estimated construction and design costs 1,354 job years would be directly generated.

Including the multiplier impacts the works are forecast to generate and/or support a total of 5,161 job years statewide. The number of job years (direct and indirect) supported by the construction and design works of this project are shown in Table 31.

Table 31: Construction related employment

	Direct effects	Production induced effects		Consumption induced effects	Total
		First round effects	Industrial support effects		
Total job years	1,354	1,160	1,092	1,555	5,161

Source: HillPDA estimate using data from ABS Australian National Accounts: Input-Output Tables 2020-21

6.3 The base case

The site is currently used for low intensity rural activities which contribute to minimal job opportunities and economic activity. Therefore, any employment opportunities and economic activity generated by the proposed development once it becomes operational would constitute a net gain over the base case.

[13] Note: One job year equals one full-time job over one year
[14] Source: ABS Australian National Accounts: Input – Output Tables 2019-20 (ABS Pub: 5209.0)

6.4 Economic impacts from the proposal in operational phase

6.4.1 Employment

The proposed land uses are expected to support permanent jobs on-site once they are operational. It is estimated that these uses, when combined, will support a total of 122 Full-Time Equivalent (FTE) jobs on-site, distributed as follows:

- The convenience and specialty retail components are projected to employ approximately 44 FTE workers, assuming a rate of 33 square meters of Gross Leasable Area Retail (GLAR) per worker.[15]
- The childcare facility is expected to employ 13 FTE workers, assuming a 65-place childcare capacity[16] with one worker per 5 children.[17]
- The gym is anticipated to employ 9 FTE workers, based on a rate of one worker per 108 square meters.
- The allied health component is estimated to employ 21 workers, assuming a rate of one worker per 42 square meters.[18]
- Additionally, there will be residents who primarily work from home. It is assumed that 6.0 per cent of workers will work mainly from home, or 6.0 per cent of the total paid work hours will be done at home.[19] According to Census data, there is an average of 1.05 working residents per occupied dwelling, which translates to one job per 16 occupied dwellings. Based on this analysis, it is estimated that there will be 36 FTE home-based workers on-site when the development is fully occupied, assuming an 11 per cent vacancy rate.

Accounting for multiplier effects, total employment directly generated and indirectly supported by the development statewide is estimated at 244 FTE jobs per annum.

6.4.2 Gross output from operations

Table 32 provides an estimate of the output that could be supported on site and statewide per annum. It is estimated that the proposed development could directly generate $21.3 million in gross output per annum. Accounting for multiplier effects, total output directly and indirectly supported by the proposed development statewide is estimated at $56.9 million per annum.

[15] Various sources including ABS Retail Survey 1998-99, NSW Government Common Planning Assumptions, City of Sydney Floor Space and Employment Survey 2017, various consultancy studies and HillPDA estimates from ABS I/O Tables, IBIS World reports and reported mean annual turnovers of shopping centres (PCA and Shopping Centre News).

[16] The assumed 65-place childcare capacity has been based on the floor areas provided, adherence to DPE Child Care Planning Guidelines thresholds, and a comprehensive assessment of local childcare facilities in the area.

[17] Various sources including DPE Child care planning guidelines, ABS Retail Survey 1998-99, NSW Government Common Planning Assumptions, City of Sydney Floor Space and Employment Survey 2017, various consultancy studies and HillPDA estimates from ABS I/O Tables, IBIS World.

[18] Various sources including ABS Retail Survey 1998-99, NSW Government Common Planning Assumptions, City of Sydney Floor Space and Employment Survey 2017, various consultancy studies and HillPDA estimates from ABS I/O Tables, IBIS World reports.

[19] In Forbes UCL 6% of residents worked at home during Census 2021. However this occurred during COVID lockdown. In 2016 the rate was slightly lower at 4%. While currently workers are returning to the office COVID is having some long term impacts including a high proportion of white collar workers continuing to work from home and/or working under more flexible working arrangements including some proportion of working from home. This is expected to continue in the long term and is having an adverse impact on the demand for office space with as much as a 20% reduction predicted from industry experts. As such we have assumed a rate of 6% of residents worked at home.

Table 32: Operational phase - economic output ($m/ann) (2022 dollars)

	Direct output	Production induced		Consumption induced	Total
		First round	Industrial support		
Gross Output	21.3	8.5	6.2	21.0	56.9

Source: Australian National Accounts Input Output tables 2020-21, IBIS World Reports 2023, HillPDA
Totals may not sum due to rounding

6.4.3 Remuneration of workers on site

Table 33 provides an estimate of the renumeration that could be supported on site and statewide per annum. On completion, remuneration of workers on site during the operational phase is estimated at approximately $8.4 million per annum. Accounting for multiplier effects, total renumeration directly and indirectly supported by the proposed development statewide is estimated at $17.9 million per annum.

Table 33: Operational phase - staff renumeration ($m/ann) (2022 dollars)

	Direct output	Production induced		Consumption induced	Total
		First round	Industrial support		
Staff remuneration	8.4	2.5	1.6	5.3	17.9

Source: Australian National Accounts Input Output tables 2020-21, IBIS World Reports 2023, Profile.id, HillPDA
Totals may not total due to rounding

6.4.4 Gross value added from operations

Once operational, it is estimated that the development could directly contribute $11.5 million in GVA to NSW GSP per annum. Accounting for multiplier effects, total GVA directly and indirectly supported by the proposed development statewide is estimated at $30.0 million per annum as shown in Table 34.

Table 34: Operational phase - gross value added ($m/ann)

	Direct output	Production induced		Consumption induced	Total
		First round	Industrial support		
GVA	11.5	4.3	3.0	11.2	30.0

Source: Australian National Accounts Input Output tables 2020-21, IBIS World Reports 2023, Profile.id, HillPDA
Totals may not total due to rounding

6.5 Net economic impact summary

Compared to the base case (which assumes no jobs are supported on site) the proposed development would support a more intensified economic outcome. The net increase in economic activity supported by the development on site and statewide once the development is fully operational, when compared to the base case, is estimated at:

- **Employment:** a net increase of 122 jobs directly on site and a further 123 jobs supported statewide through multiplier impacts
- **Gross output:** a total increase of around $56.9 million in gross output per annum (including $21.3 million directly)
- **Remuneration:** a total increase of $17.9 million per annum (including $8.4 million directly).
- **GVA:** an increase of $11.5 million per annum directly generated by jobs on site and a further $18.5 million supported statewide through multiplier impacts.

The net impact of the proposed development once it is fully operational versus the base case is presented in Table 35.

Table 35: Net economic impacts

Net economic impact	Direct	Indirect	Total
Employment (FTE)	122	123	**244**
Gross output ($ million per annum)	21.3	35.6	**56.9**
Remuneration of workers ($ million per annum)	8.4	9.4	**17.9**
GVA ($ million per annum)	11.5	18.5	**30.0**

Source: HillPDA

6.6 Other economic impacts

6.6.1 Impacts on local businesses

The proposed development would provide around 745 new residential dwellings on site. Assuming 89 per cent of the dwellings are occupied and an average occupancy rate of 2.4 persons per dwelling we estimate 1,591 permanent residents on site when fully developed.

These residents would generate demand for local retail and commercial goods and services. With an assumed average retail spend of around $14,736 per capita[20] the residents would spend around $23.4 million every year on retail goods and services. Assuming the proposed centre captures $11.7 million of this residential spend,[21] the Forbes town centre is expected to be a major beneficiary of the residual retail spend ($11.7 million). The balance would be captured by other centres in outside the LGA such as Parkes, Dubbo and Orange.

6.6.2 Investment stimulus

Where a significant property investment decision has been made it is generally viewed as a strong positive commitment for the local area. Such an investment can in turn stimulate and attract further investment. The direct investment in the site would support a wide range of economic multipliers as outlined above which would in turn support investment in associated industries. It would also raise the profile of Forbes to potential investors and in doing so increase the financial feasibility of similar types of developments, potentially acting as a catalyst on surrounding sites. From an economic perspective, this is a good outcome given that it maximises the potential of this site and creates a greater economic benefit from it.

[20] This is equivalent to Forbes average based on 2022 ABS expenditure data

[21] Assumes centre trades at $8,500/sqm in line with the average trading levels for similar size centres throughout Australia and excludes trade from beyond and other sources at 5%

SOCIAL IMPACT ASSESSMENT

7.0 SOCIAL IMPACT ASSESSMENT

This chapter examines the potential social impacts that may arise should the proposal be approved, constructed, and developed to full extent.

Our assessment aligns with the approach outlined in section 3.1. Changes predicted to arise from the proposal are considered against the social baseline established in chapters 3.0 and 4.0. For the purposes of this assessment, we have assumed that the proposal (at full development) would consist of:

- 745 dwellings
- An estimated resident population of around 1,560 people
- An open space corridor with active transport, areas for conservation, and open space and recreation areas
- A village centre style shopping precinct.

These assumptions are based on the draft indicative masterplan associated with the proposal, current as at the time of writing. The findings in this section would require revision should the proposal change.

7.1 Assessment

7.1.1 Construction impacts

An evaluation of potential social impacts and mitigation responses during the construction phase of the proposal is shown in Table 36.

Table 36: Construction impact assessment

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Way of life			
Noise and vibration from construction activity may negatively affect amenity for residents, workers and businesses surrounding the site, impacting upon quiet enjoyment of surroundings, way of life and health and wellbeing. This impact is also likely to lead to cumulative impacts as development to Forbes' north and northwest progresses.	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium	• Prepare a construction management plan (or similar) that considers noise and vibration impacts at the detailed design phase.	• **Likelihood:** Likely • **Magnitude:** Minimal • **Significance:** Low
Community			
Major projects that are of a high significance or scale (compared to the locality) can cause conflict in communities between people who support the proposal and people who are against it.	• **Likelihood:** Possible • **Magnitude:** Minimal • **Significance:** Low	• Extensive strategic planning and community consultation has been undertaken by Council over a number of years, aligning expectations for the future of the site. • Prior to construction works commencing, prepare a strategy to manage and address any communications and complaints from community members.	• **Likelihood:** Unlikely • **Magnitude:** Minimal • **Significance:** Low
Access			
Additional construction vehicle movements may increase congestion on surrounding roads, impacting way of life, access and livelihoods for surrounding residents, workers, and businesses. Further, any road closures required to facilitate construction works at the site could impact access, causing disruptions or delays for some people.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• At the detailed design phase, prepare a construction traffic management plan (or similar) that considers site access routes and identifies the potential level of additional traffic. • Avoid or minimise road closures as far as possible.	• **Likelihood:** Unlikely • **Magnitude:** Minor • **Significance:** Low
Existing residents near the site could be impacted by any interruption to utilities caused by works at the site.	• **Likelihood:** Unlikely • **Magnitude:** Minimal • **Significance:** Low	• Provide notification of any service interruption required in advance.	• **Likelihood:** Unlikely • **Magnitude:** Minimal • **Significance:** Low

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Culture			
Potential impact on community and culture through fear of impacts to Aboriginal cultural heritage sites during construction.	• **Likelihood:** Possible • **Magnitude:** Minor **Significance:** Medium	• The proponent engaged an archaeologist to undertake an Aboriginal Due Diligence Assessment survey at the site. The survey determined that the site had low potential for Aboriginal archaeological sites, due to factors including significant disturbance from agricultural activities. • Consult with the relevant Local Aboriginal Land Council prior to undertaking any construction works at the site. • Cease works in the vicinity if an unexpected find is discovered and contact an archaeologist to assess the situation.	• **Likelihood:** Unlikely • **Magnitude:** Minor • **Significance:** Low
Health and wellbeing			
Dust from construction activity could cause a decline in air quality, potentially impacting the amenity of surroundings and health and wellbeing of neighbouring residents and workers.	• **Likelihood:** Likely • **Magnitude:** Minimal • **Significance:** Low	• Carry out construction works using standard dust mitigation measures (as necessary).	• **Likelihood:** Possible • **Magnitude:** Minimal • **Significance:** Low
Surroundings			
Impacts to landscape and visual amenity may occur as construction works proceed, contributing to feels of loss of connection and change in character of the surroundings.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium	• None possible	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium
Impact to surroundings, community cohesion and wellbeing, mental health, and amenity through clearing of land required for construction.	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium	• The majority of the site is cleared at present. • Ensure that existing vegetation and significant trees are retained wherever possible. • The proposal would result in significant landscaping and tree planting at the site.	• **Likelihood:** Possible • **Magnitude:** Minimal • **Significance:** Low
Livelihoods			
The proposal would create around 1,350 full time equivalent job years directly through construction activity, providing a significant positive impact to livelihoods. This would also have flow-on effects to the broader Forbes community and economy. Benefits would be of increased significance noting the existing socio-economic disadvantage present in Forbes' north. Providing employment opportunities near where residents live would be a significant benefit.	• **Likelihood:** Almost certain • **Magnitude:** Moderate (positive) • **Significance:** High (positive)	• At the detailed design phase, consider appropriate mechanisms to maximise local worker employment.	• **Likelihood:** Almost certain • **Magnitude:** Moderate (positive) • **Significance:** High (positive)

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Decision making systems			
Potential feeling of powerlessness or lack of means to have input or say on the proposal during construction for surrounding properties and the wider community, negatively impacting decision-making systems	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• Extensive strategic planning and community consultation has been undertaken by Council over a number of years, aligning expectations for the future of the site. • The proposal would be subject to a public exhibition period. • Regularly communicate with the public about the progress of the proposal during the construction period. • Provide information about communications and complaints protocols to neighbouring premises prior to any works commencing.	• **Likelihood:** Unlikely • **Magnitude:** Minor • **Significance:** Low

7.1.2 Operational impacts

An evaluation of potential social impacts and mitigation responses during the operational phase of the proposal is shown in Table 37.

Table 37: Operational impact assessment

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Way of life			
Increased traffic congestion on local roads from increased number of vehicle movements to the site could impact on way of life and access for local residents and workers, and livelihoods for nearby businesses.	• **Likelihood:** Possible • **Magnitude:** Minimal • **Significance:** Low	• In consultation with Council, undertake a traffic study at the detailed design phase.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Low
The proposal would enable 745 residential lots to be developed in Forbes, helping the Shire to accommodate its growing population. The proposal provides housing at a range of lot sizes, with a limited number of larger lots that Forbes' existing housing market has adequate supply of.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)	• In collaboration with Council, consider opportunities to partner with a Community Housing Provider to deliver additional housing within the proposal as affordable or social housing. • In collaboration with Council, consider mechanisms (such as a site-specific development control plan, maximum lot size, or minimum density provision) that ensure that the site delivers diverse housing (in terms of lot size and typology). • Ensure that proposed minimum lot sizes and lots delivered are aligned. Where lots significantly larger than the proposed minimum lot size are indicated, provide long-term housing flexibility for Forbes (where appropriate) by enabling future subdivision to the minimum lot size (eg deliver lots at 800sqm instead of 700sqm).	• **Likelihood:** Almost certain • **Magnitude:** Moderate • **Significance:** High (positive)
Community			
An influx of new residents moving into an established community in high volumes (compared to the existing population) could cause negative impacts to community cohesion.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• The proposal would lead to the development of the site over 10 to 15 years, minimising any potential impacts to community cohesion.	• **Likelihood:** Unlikely • **Magnitude:** Minimal • **Significance:** Low
Access			
The addition of 745 lots and 1,560 people at the site would result in significant additional road traffic.	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium	• The proponent is preparing a Traffic Assessment for the site which will consider the potential impacts of the project on the surrounding road network. • The proposal includes significant active transport infrastructure, reducing car dependence. • The future road network would be designed to align with Council's vision for the wider area, and access points would be designed and constructed in alignment with anticipated future development.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Increased access for current and future Forbes residents to active transport through the provision of shared paths in the proposed development.	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium (positive)	• Ensure that active transport within the proposal supports leisure use as well as purposeful trips, reducing the need for residents (particularly children) to travel by car by: – Providing safe routes through and between neighbourhoods and to key destinations like schools and shops – Planning street layouts that enable direct travel for pedestrians and cyclists (shorter blocks, mid-block through lanes, and legible layouts). • In collaboration with Council, determine key active transport destinations and future network investments. At the detailed design stage, ensure that the proposal aligns with these.	• **Likelihood:** Likely • **Magnitude:** Moderate • **Significance:** High (positive)
Ongoing increase in demand for social infrastructure associated with the addition of around 1,560 people at the site. This could cause reduced access for current and future Forbes residents. Increased demand which cannot be met by the existing provision includes: • Demand for playgrounds, local open spaces, town open spaces, and recreation open spaces in general • Demand for a local community centre • Demand for childcare (long day care) places. For other assessed social infrastructure, existing provision was largely adequate or better, particularly for sporting areas and facilities. However, the site is generally separated from these facilities, reducing access and increasing car dependence for future residents at the site. This is of particular note in relation to sporting areas and access for children and teens, who would be reliant on family members or friends to drive them to sporting facilities.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• Infrastructure contributions generated by the development of the proposal would support increased investment in social infrastructure by Council. • The proposal includes provisions for a playground, childcare centre, and a total of ten hectares of open space. • In collaboration with Council, consider: – Opportunities to provide versatile informal sporting recreation areas or facilities within open space provided (for example, a kick wall or soccer goal, basketball half court, outdoor table tennis tables etc) – Suitable locations to provide play spaces to meet the benchmark of all residents having access to play space within 500 metres of their residence – Opportunities to provide land or floorspace for a future local community centre in the proposed neighbourhood centre – Opportunities to provide land or floorspace for a multi-purpose indoor sporting facility or to deliver such a facility.	• **Likelihood:** Unlikely • **Magnitude:** Minimal • **Significance:** Low

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Existing residents in Forbes' north would have improved access to social infrastructure through the provisions within the proposal.	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium (positive)	• N/A	• **Likelihood:** Likely • **Magnitude:** Minor • **Significance:** Medium (positive)
Improved access to shops and services for residents at the site and surrounding areas through provision of retail and commercial space within the proposed neighbourhood centre. The centre would provide for the day-to-day needs of local residents. Further, the addition of a centre in Forbes' north would provide local residents with flood-free access to essential goods and services.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)	• The proposed neighbourhood centre is located within a ten minute walk of the vast majority of the site. • Ensure that the neighbourhood centre retail and commercial area is able to cater to a range of business size and types to maximise the variety of goods and services available for future residents. • Ensure the future design prioritises active transport by including connections to the centre from all directions, and well-located bicycle parking.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)
Culture			
No impacts identified	*N/A*	*N/A*	*N/A*
Health and wellbeing			
Improved access to open space and recreation areas within the site would support active and healthy lifestyles for future residents and existing local residents.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)	• N/A	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)
Surroundings			
Provision of landscaping and tree plantings on site would positively impact surroundings through amenity, aesthetic, and natural environment improvements.	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)	• N/A	• **Likelihood:** Almost certain • **Magnitude:** Minor • **Significance:** Medium (positive)
Reduced enjoyment of agricultural and rural landscape surroundings for nearby residents through changing land use. This would also present as a cumulative impact alongside ongoing change of land use from rural and agricultural to residential in Forbes' north.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• The proposal includes open, undeveloped areas, as well as significant landscaping and vegetation planting.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium

Impact detail	Evaluation	Mitigation / management measures	Residual evaluation
Livelihoods			
The retail and commercial floorspace proposed for the site would provide benefits to livelihoods through additional employment opportunities in Forbes. The site would provide 121 jobs directly, with further indirect employment to flow from retail and commercial operations at the site, benefiting the Forbes community. This would be of increased significance noting the existing socio-economic disadvantage present in Forbes' north. Providing employment opportunities near where residents live would be a significant benefit.	• **Likelihood:** Almost certain • **Magnitude:** Moderate (positive) • **Significance:** High (positive)	• None required	• **Likelihood:** Almost certain • **Magnitude:** Moderate (positive) • **Significance:** High (positive)
The proposal would contribute additional diverse housing to Forbes' housing supply, supporting affordability by providing smaller lot sizes and dwellings. Smaller households would be more able to find a dwelling suited to their needs at a range of price points, compared to the existing market.	• **Likelihood:** Possible • **Magnitude:** Moderate (positive) • **Significance:** Medium (positive)	• Ensure that diverse housing is delivered on the site, not only separate dwellings on smaller lots. • In collaboration with Council, consider mechanisms to provide community housing or set aside housing to be rental-only.	• **Likelihood:** Likely • **Magnitude:** Moderate (positive) • **Significance:** High (positive)
Decision making systems			
Sense of loss of agency through inability to influence ongoing presence of development and permanent change to physical and social landscape. This would also present as a cumulative impact alongside ongoing change of land use from rural and agricultural to residential in Forbes' north.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium	• The proposal is consistent with the vision and aims of the Forbes LHS, for which extensive community consultation was undertaken.	• **Likelihood:** Possible • **Magnitude:** Minor • **Significance:** Medium

8.0 CONCLUSION

HillPDA prepared this SEIA to assess the likely housing, social infrastructure and economic implications of a planning proposal for a site in Forbes, NSW, and provide any recommendations for how any identified benefits could be enhanced, and mitigations or management measures for any identified impacts.

We found that the proposal is aligned with strategic planning for Forbes, with the north Forbes area earmarked for future residential development in Forbes' LHS. Council has undertaken strategic planning works for this area in consultation with the Forbes community.

The review of Forbes' social baseline undertaken for the SEIA identified a population with high proportions of both young and old people, strong employment, a relatively high Aboriginal population, and household incomes slightly below the rest of regional NSW. Housing costs were seen to be somewhat lower, with fewer households experiencing housing stress.

We also identified a lack of diversity in housing in Forbes, with many large, detached dwellings, but mostly smaller households of one and two people. Population and dwelling demand projections indicate significant growth in Forbes' future, for which 1,800 to 2,100 additional dwellings will be required. Council is keen to ensure that many of these additional dwellings add to Forbes' housing diversity.

Our social infrastructure audit and community needs assessment found that Forbes has a good supply of social infrastructure, especially sporting and education facilities. In general, this provision meets the needs of the existing community. However, the proposal would add around 1,560 people to Forbes, and this would require additional social infrastructure in order to meet the identified benchmarks. The proposed masterplan addresses much of this additional need.

The detailed assessment of retail demand and economic impact of the proposal found that the proposed neighbourhood centre retail and commercial area would be supported by the population and local trade area. It would have minimal impact on the existing Forbes centre and would enable residents at the site to fulfil their everyday needs. The proposal would generate significant employment, totalling over 1,350 job years during construction and 122 full-time equivalent jobs once operational.

The social impact assessment identified a small number of potential negative social and economic impacts, largely typical of all development and able to be sufficiently mitigated. The potential social and economic benefits of the proposal are greater in number and are assessed as being of higher significance.

The potential social impacts and benefits of the proposal must be considered within the context of Forbes' housing market, which has an identified and long-term requirement for additional housing. Addressing this need will require new dwellings, services, and infrastructure to be delivered in Forbes. Therefore, many of the potential social impacts identified in this report are likely to occur in Forbes whether the proposal proceeds or not.

The proponent's collaborative approach to developing a concept masterplan for the site, in combination with the site's consolidation and lack of significant development constraints represent a significant opportunity to deliver social benefits and minimise the risk and scale of any impacts associated with meeting Forbes' housing needs in the short and long term. The proposal would enable the delivery of diverse housing supply, open space, and active transport benefits in Forbes, and would align with Council's vision for the Forbes Shire.

Overall, on social and economic grounds, we consider that the proposal represents a net benefit to the Forbes community.

Disclaimer

1. This report is for the confidential use only of the party to whom it is addressed ("Client") for the specific purposes to which it refers and has been based on, and takes into account, the Client's specific instructions. It is not intended to be relied on by any third party who, subject to paragraph 3, must make their own enquiries in relation to the issues with which this report deals.
2. HillPDA makes no representations as to the appropriateness, accuracy or completeness of this report for the purpose of any party other than the Client ("Recipient"). HillPDA disclaims all liability to any Recipient for any loss, error or other consequence which may arise as a result of the Recipient acting, relying upon or using the whole or part of this report's contents.
3. This report must not be disclosed to any Recipient or reproduced in whole or in part, for any purpose not directly connected to the project for which HillPDA was engaged to prepare the report, without the prior written approval of HillPDA. In the event that a Recipient wishes to rely upon this report, the Recipient must inform HillPDA who may, in its sole discretion and on specified terms, provide its consent.
4. This report and its attached appendices are based on estimates, assumptions and information provided by the Client or sourced and referenced from external sources by HillPDA. While we endeavour to check these estimates, assumptions and information, no warranty is given in relation to their reliability, feasibility, accuracy or reasonableness. HillPDA presents these estimates and assumptions as a basis for the Client's interpretation and analysis. With respect to forecasts, HillPDA does not present them as results that will actually be achieved. HillPDA relies upon the interpretation of the Client to judge for itself the likelihood of whether these projections can be achieved or not.
5. Due care has been taken to prepare the attached financial models from available information at the time of writing, however no responsibility can be or is accepted for errors or inaccuracies that may have occurred either with the programming or the resultant financial projections and their assumptions.
6. This report does not constitute a valuation of any property or interest in property. In preparing this report HillPDA has relied upon information concerning the subject property and/or proposed development provided by the Client and HillPDA has not independently verified this information except where noted in this report.
7. This report is expressly excluded from any reliance for mortgage finance purpose or any lending decisions. Furthermore, this report is not intended to be relied upon for any joint venture or acquisition / disposal decision unless specifically referred to in our written instructions.
8. HillPDA makes no representations or warranties of any kind, about the accuracy, reliability, completeness, suitability or fitness in relation to maps generated by HillPDA or contained within this report.

Liability limited by a scheme approved under the Professional Standards Legislation

DRAFT

HillPDA CONSULTING

SYDNEY

Level 3, 234 George Street
Sydney NSW 2000
GPO Box 2748 Sydney NSW 2001
t: +61 2 9252 8777
f: +61 2 9252 6077
e: sydney@hillpda.com

MELBOURNE

Suite 114, 838 Collins Street
Docklands VIC 3008
t: +61 3 9629 1842
f: +61 3 9629 6315
e: melbourne@hillpda.com

WWW.HILLPDA.COM

Allera Planning Pty Ltd
Suite 1903, 201 Miller Street, North Sydney, NSW 2060