

304000956

Gwynneville Estate - Geotechnical Desktop Review

Homes NSW

21 February 2025





**Gwynneville Estate - Geotechnical
Desktop Review**

This report provides a summary of the geotechnical desktop review of the projects, which highlights geotechnical constraints for factors such as groundwater, slope stability, foundations, excavatability and material reuse.

21 February 2025

Prepared for:

Homes NSW

Prepared by:

Stantec Australia Pty Ltd



GWYNNEVILLE ESTATE - GEOTECHNICAL DESKTOP REVIEW | February 2025

Revision	Description	Author		Quality Check		Independent Review	
01	Draft for client review	NI	27/06/2023	RD	22/08/2023	ET	27/09/2023
02	Final Draft Issue Following Client Review	NI	12/07/2024	RD	12/07/2024	ET	15/07/2023
03	Issued for Final	NI	16/07/2024	RD	16/07/2024	ET	16/07/2023
04	Final incorporating client commentary	NI	21/02/2025	RD	21/02/2025	LG	21/02/2025



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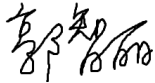
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Civil Engineer

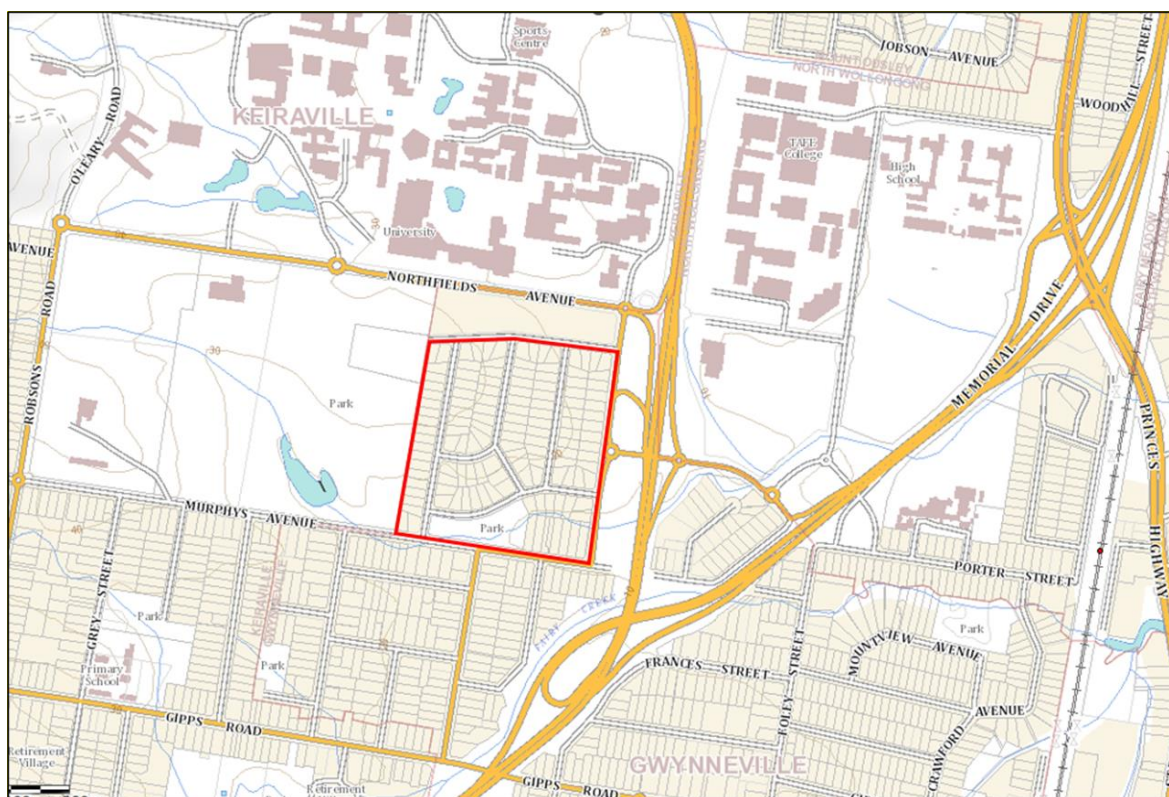


Gwynneville Precinct – Project Summary

This report has been prepared by Stantec Australia Pty Ltd (Stantec) on behalf of Homes NSW (formerly the NSW Land and Housing Corporation - LAHC) to support a planning proposal for urban renewal of land at Gwynneville, NSW.

Covering approximately 9 hectares in area, the Gwynneville precinct is located 2km north-west of the Wollongong CBD. The site sits immediately south of the University of Wollongong, and east of the Botanic Gardens. Irvine Street makes up the site's eastern boundary, with Murphy Avenue to the south. Refer Figure 1 below.

Figure 1



Source: SIX Maps, 2023

The Northfields Avenue Bus Interchange is approximately 150m northwest of the site, and North Wollongong Railway Station is approximately 1km to the east.

Many of the existing dwellings in Gwynneville were constructed by the NSW Government during the 1950s. The precinct is made up of predominantly single storey detached dwellings set in a modified grid-type street layout.

The Gwynneville precinct has been identified as a location capable of supporting more social, affordable and diverse private market housing for the Illawarra community, and to contribute to addressing NSW's housing crisis.



GWYNNEVILLE ESTATE RE-DEVELOPMENT - GEOTECHNICAL DESKTOP REVIEW

The site currently comprises approximately 131 residential lots, consisting of:

- A total of 79 social dwelling units on 75 individual lots owned by Homes NSW; and
- Approximately 56 privately owned dwelling units on 56 individual lots.

Over 60% of the homes in the precinct are owned by Homes NSW, providing an opportunity to consider additional density while taking into account key constraints such as traffic, views to and from Mount Keira as well potential to increase and embellish existing areas of open space.

Redevelopment of the Gwynneville precinct requires a formal rezoning process to confirm an amended land use zone; increased FSR and building heights, and result in improvements to the current street network, pedestrian connectivity, open space / parkland, and public amenity.

Homes NSW propose amending the Wollongong Local Environmental Plan 2009 (WLEP) to help deliver a diverse range of housing typologies which will include additional social and affordable housing, market housing products and seniors housing, as well as opportunities to develop build-to-rent, key worker housing and student accommodation.

The planning proposal intends to change the current zone of the land from R2 Low Density Residential to R4 High Density Residential, with new and expanded areas of RE1 Public Recreation. This will create the opportunity for more low to mid- rise apartments in the precinct.

The base FSR of 0.5:1 and the height control of 9m that currently applies to the precinct is not proposed change. However, building height and FSR incentives will facilitate site amalgamation to create lots more capable of accommodating increased density and providing amenity. Height and FSR bonuses will be contingent upon achieving design excellence outcomes, providing public benefits such as social and affordable housing, and increased public open space within the precinct.

Homes NSW aims to create a high-amenity, walkable residential neighbourhood with an increased density and choice of affordable and diverse housing options that provide for a broad range of community needs and family types - including students, people on low incomes, people with disability and seniors.

New residential development will enable increased housing choices within in a well-connected location benefiting from frequent free shuttle bus services operating between University of Wollongong, North Wollongong railway station and a multitude of destinations including the city centre and hospital.

The planning proposal was submitted to Wollongong City Council on 19 July 2024, which was then placed on preliminary notification for public and agency comment. Following this notification period, Council and Homes NSW worked together to establish key amendments to the proposal and master plan that formed the basis of the reporting to Council in November 2024. The planning proposal was unanimously approved by Council on 25 November 2024 to proceed to the next step in the approval process, i.e. Gateway Determination. The revised proposal and masterplan included revisions which relate to key sites and implementation, built form outcomes, and public open space delivery. This report has been updated to reflect the outcomes of the amended planning proposal and master plan, current as at February 2025.



Executive Summary

This report provides a summary of the geotechnical desktop review of the projects, which highlights geotechnical constraints for factors such as groundwater, slope stability, foundations, excavatability and material reuse. At a high level these:

- Groundwater will likely be present within the vicinity of the creek in the south east.
- Erosion is not considered a likely issue due to shallow slopes of the site, excluding the creek to the south east where vegetation is deemed to have kept steep batters stable.
- Slope instability is unlikely except for the location of the creek alignment in the south east
- Foundations will likely be underlain by residual soils or sandstone bedrock which is relatively low risk, some colluvium/alluvium may however be present around the creek area in the south east which could cause.
- The site soils should be readily excavatable with standard earthmoving equipment, however rock will depend on intact strength and defects to confirm excavatability, for which investigation would be required.
- Topsoil and alluvial soils across the site are likely not suitable for re-use as structural filling, residual soils and rock excavation would likely be with some confirmation testing required.

Recommendations

This report addresses the issue of geotechnical constraints and has been prepared in support of the Gwynneville Precinct Planning Proposal.

This report includes the following recommendations:

- Additional geotechnical investigation will be required across the site to assess the subsurface conditions for the proposed development in the future.
- This investigation will be proposed based on finalised development plans for the site, including the extent of earthworks and proposed infrastructure such as pavements, subsurface utilities or buildings.
- The investigation would likely comprise a mixed approach between shallow test pit and deeper borehole investigations.



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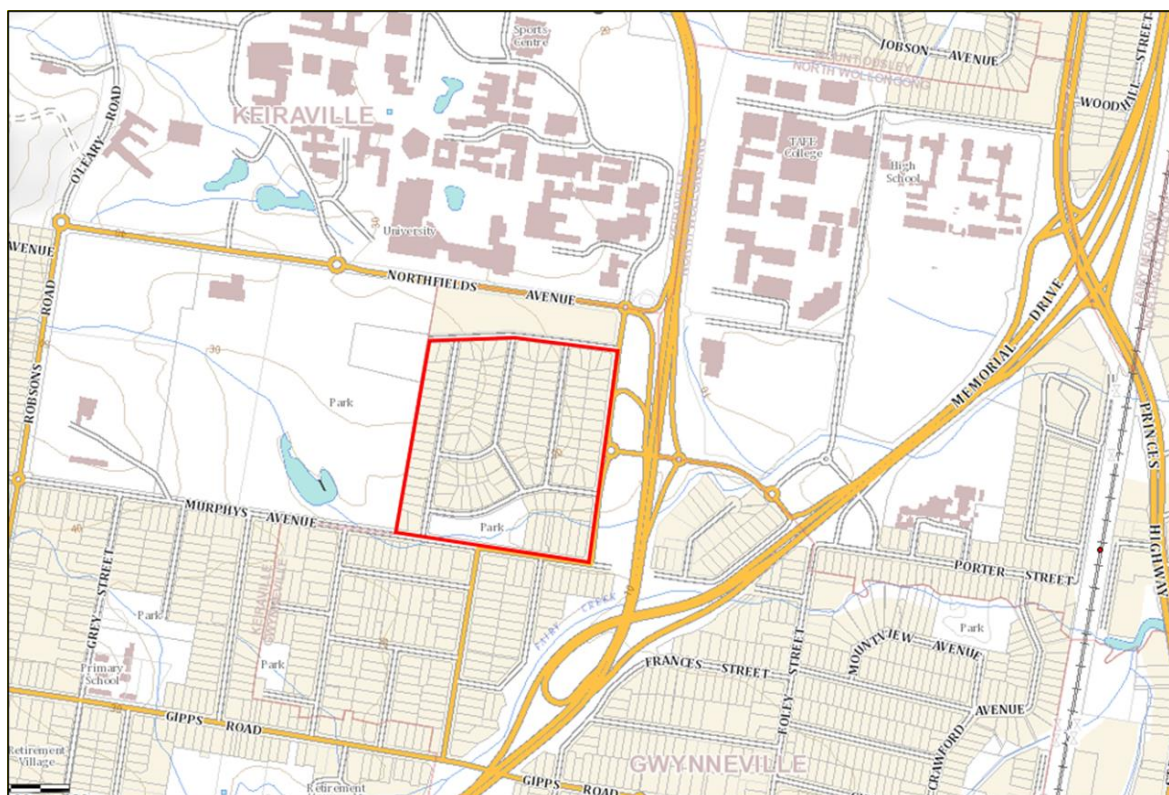
1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

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Covering approximately 9 hectares in area, the Gwynneville precinct is located 2km north-west of the Wollongong CBD. The site sits immediately south of the University of Wollongong, and east of the Botanic Gardens. Irvine Street makes up the site's eastern boundary, with Murphy Avenue to the south. Refer Figure 1-1 below.

Figure 1-1 Site Location



Source: SIX Maps, 2023

The Northfields Avenue Bus Interchange is approximately 150m northwest of the site, and North Wollongong Railway Station is approximately 1km to the east.

Many of the existing dwellings in Gwynneville were constructed by the NSW Government during the 1950s. The precinct is made up of predominantly single storey detached dwellings set in a modified grid-type street layout.

The Gwynneville precinct has been identified as a location capable of supporting more social, affordable and diverse private market housing for the Illawarra community, and to contribute to addressing NSW's housing crisis.

The site currently comprises approximately 131 residential lots, consisting of:

- A total of 79 social dwelling units on 75 individual lots owned by Homes NSW; and
- Approximately 56 privately owned dwelling units on 56 individual lots.

Over 60% of the homes in the precinct are owned by Homes NSW, providing an opportunity to consider additional density while taking into account key constraints such as traffic, views to and from Mount Keira as well potential to increase and embellish existing areas of open space.

Redevelopment of the Gwynneville precinct requires a formal rezoning process to confirm an amended land use zone; increased FSR and building heights, and result in improvements to the current street network, pedestrian connectivity, open space / parkland, and public amenity.

Homes NSW propose amending the Wollongong Local Environmental Plan 2009 (WLEP) to help deliver a diverse range of housing typologies which will include additional social and affordable housing, market housing products and seniors housing, as well as opportunities to develop build-to-rent, key worker housing and student accommodation.

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The base FSR of 0.5:1 and the height control of 9m that currently applies to the precinct is not proposed change. However, building height and FSR incentives will facilitate site amalgamation to create lots more capable of accommodating increased density and providing amenity. Height and FSR bonuses will be contingent upon achieving design excellence outcomes, providing public benefits such as social and affordable housing, and increased public open space within the precinct.

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New residential development will enable increased housing choices within in a well-connected location benefiting from frequent free shuttle bus services operating between University of Wollongong, North Wollongong railway station and a multitude of destinations including the city centre and hospital.

The proposal is supported by an urban design concept plan (refer Figure 1-2 below).



Figure 1-2 Urban Design Concept Master Plan (source: Gyde Consulting, 2025)

1.2 OBJECTIVES

A geotechnical desktop review for the site was conducted with the following objectives at the forefront of this report:

- Assessment of site topography and production of topographical plan based on available LiDAR data for the site.
- Review of subsurface geology and production of geological map for the sites.
- Review of soil landscape data including potential acid sulfate soil data (PASS).
- Review of any watercourses present with relevance to geotechnical constraints.
- Historical satellite imagery review.
- High level commentary on likely constraints for the development based on assessment of the above.

2.0 SITE DESCRIPTION

2.1 TOPOGRAPHY

The site is an existing residential area, located north-west of the Wollongong CBD. The proposed development site is sloping downhill toward the south-east of the lot where it eventually becomes relatively flat with slightly undulated areas. Undulation throughout the site is mainly caused by a creek alignment which originates from the western side of Wollongong Botanic Gardens at Robsons Road, flowing through the Botanic Garden Duck Pond and into the south-west of the proposed development site and out through the south-east. Aerial imagery and transects of the proposed re-development site are provided in Figure 2-1, Figure 2-2 and Figure 2-3 below.



Figure 2-1 Section Plan Plot

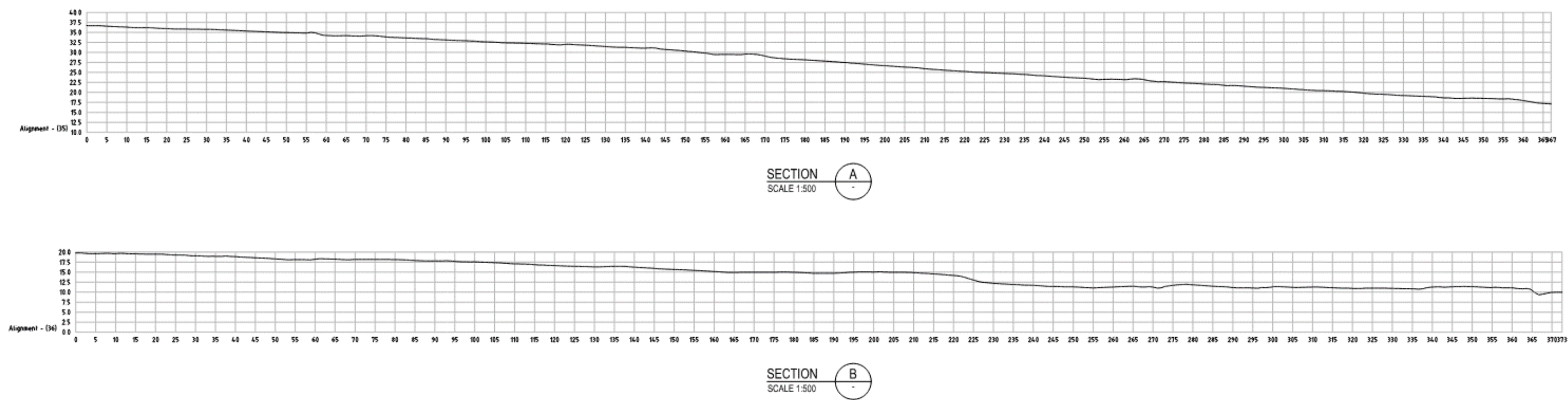


Figure 2-2 West to East Topographic Transect

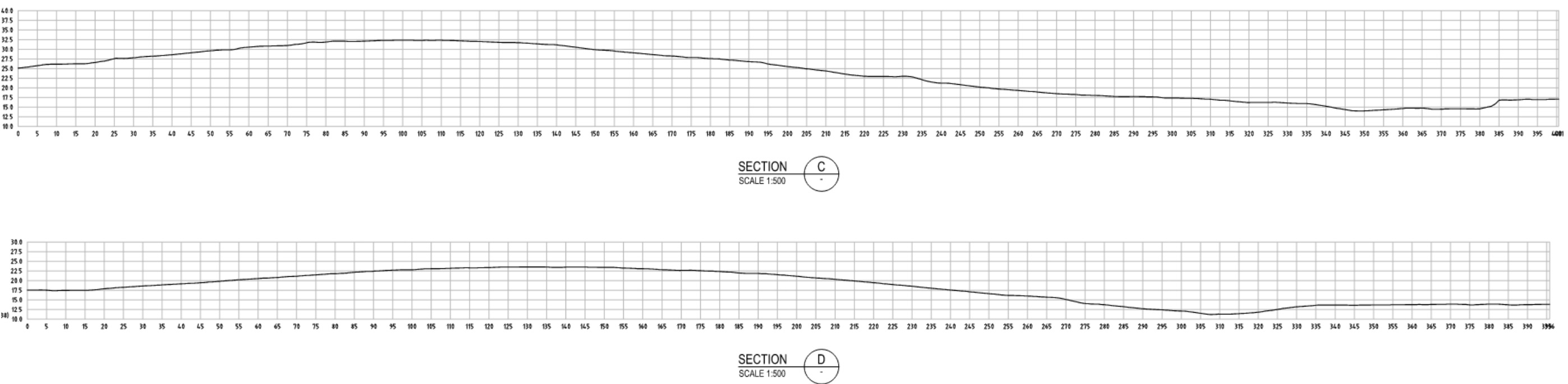


Figure 2-3 North to South Site Topographic Transect

2.2 GEOLOGY

2.2.1 QUATERNARY DEPOSITS

The 1:100,000 Wollongong Coastal Quaternary Geology Map (Troedson, 2016) suggests the lower lying areas of the site to be part of a Quaternary alluvial and permian plains. Utilising the Quaternary Geology Map and (MinView, 2023), the site is likely to be underlain by the following geological units:

- **Q_avf – Alluvial Fan Deposits:** fluvially-deposited quartz-lithic sand, silt, gravel and clay.
- **Pshr – Broughton Formation:** red-brown or green-grey, lithic to feldspathic sandstone with minor interbedded siltstone and polymictic pebble conglomerate, sporadic shelly fossils, varying degrees of bioturbation.
- **Picp – Pheasants Nest Formation:** shale, siltstone, sandstone with lenticular coal seams; sporadic thin cherty tuff(s) and syenite intrusives (in the southwest).

The site geological map has been produced for the proposed redevelopment site located in Gwynneville and is shown below in Figure 2-4, and attached in Appendix A.

2.2.2 GEOLOGY

Reference to the Wollongong 1:250,000 Geological Series Sheet (Rose, 1966) indicates the site is underlain by Quaternary Alluvial Deposits and Permian Aged Illawarra Coal Measures, which includes Lithgow Coal Measures.

The Quaternary Alluvial Deposit is known to be discovered in the form of gravel, swamp deposits and sand dunes, with a typically shallow transition to medium strength rock. The Permian Aged Illawarra Coal Measure is known to be discovered in the form of shale, sandstone, conglomerate, tuff, chert, coal and torbanite seams. The transition to medium strength rock is typically shallow and is more prominent on slopes and crests.

The site geological map has been produced for the proposed redevelopment site located in Gwynneville and is shown below in Figure 2-4, and attached in Appendix A.

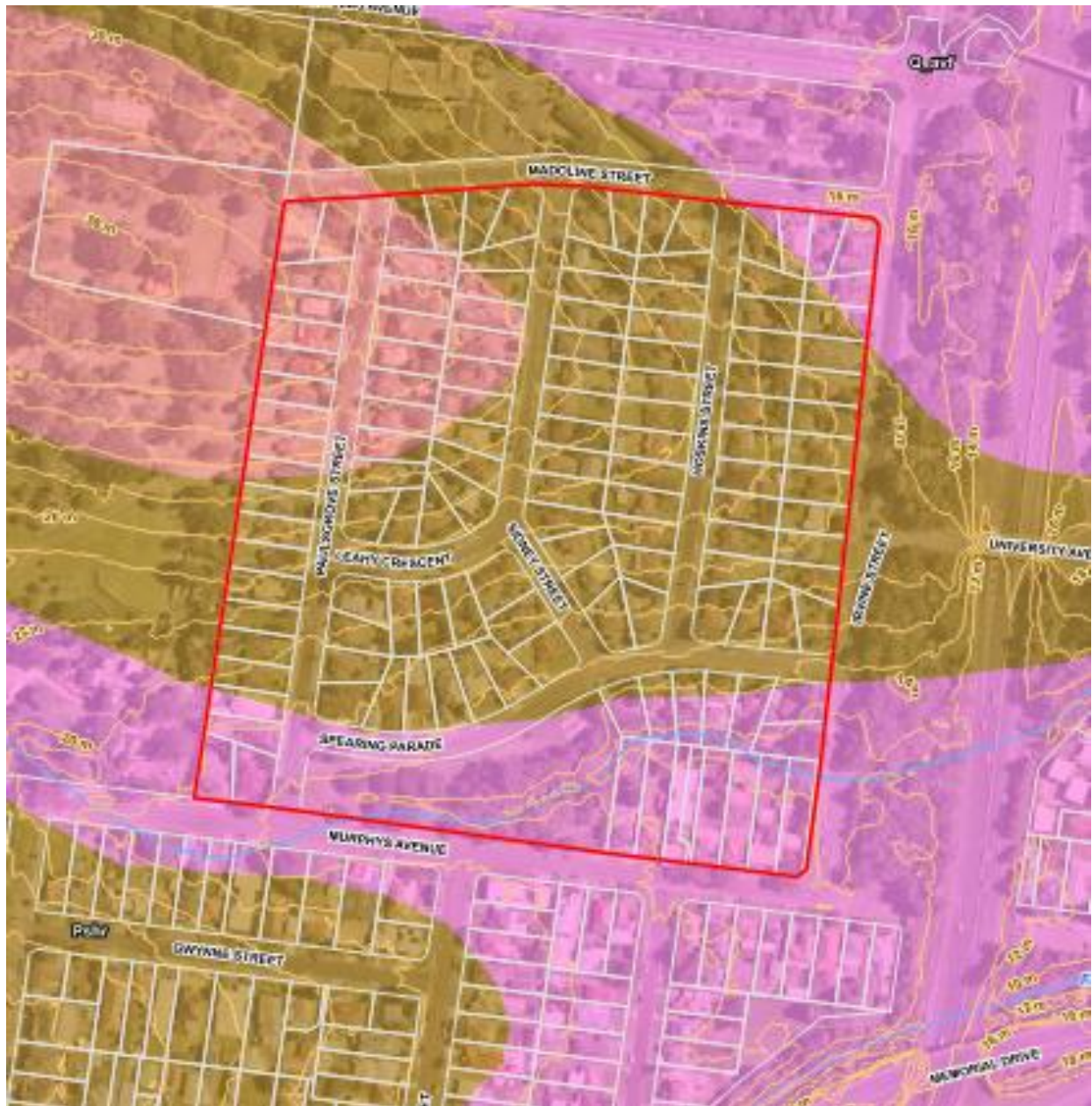


Figure 2-4 Site Geological Map

2.2.3 SOIL LANDSCAPES

Reference to the soil landscape data on spatial website eSPADE (NSW Department of Planning, Industry and Environment, 2023) indicates the site landscape to be foot slopes of the Illawarra Escarpment with isolated rises of the Wollongong Plain.

The soil is characterized as an extreme erosion hazard, with steep slopes, mass movement hazard, and is prone to local flooding. The subsoils are low wet bearing strength clays which are reactive and impermeable. The soils are described as shallow to moderately deep (0.50m to 1.0m) brown podzolic soils and xanthozems on the upper slopes, with lithosols and brown earths occurring on the more shallow and mid-range slopes in the region.

2.2.4 ACID SULFATE SOILS (ASS)

A review of NSW Acid Sulfate Soils risk data map on spatial website eSPADE (NSW Department of Planning, Industry and Environment, 2023) indicates there is no known occurrence of acid sulfate soils on the proposed redevelopment site in Gwynneville.

The risk map for nearby acid sulfate soils deposits is given below in Figure 2-5 below. It shows that there's low probability zones and disturbed terrain present to the east of the proposed redevelopment site.



Figure 2-5 Acid Sulfate Soils Risk Mapping


2.3 WATER COURSES

The proposed redevelopment site is situated adjacent to the Wollongong Botanic Garden, which contains an engineered feature upstream of the area being the duckpond. The duckpond is situated within the Botanic Gardens and outflows through the creek on the southern end of the proposed redevelopment site, which is a tributary connecting to Fairy Creek, located south-east of the site.

2.4 HISTORICAL SATELLITE IMAGERY

A review of historical aerial imagery from (Wollongong City Council, 2023) has been undertaken with a review provided in Table 2-1 below.

Table 2-1 Historical Aerial Imagery Review

Year	Description
1951	<div></div> <p>The black and white aerial imagery shows the site is situated on an open paddock. The creek line is clearly defined on the southern end of the site which flows toward Fairy Creek, south-east of the site. The imagery shows a dwelling situated adjacent to the middle of the site, and dwellings on the south-east side of the site.</p>

1961



The aerial imagery in 1961 shows a large development which utilises most of the site for the purpose of residential housing. The dwellings which were previously situated on the south-east of the site have been demolished and replaced with residential housing. Roads providing access to the residential homes have been carved out and appear unsealed. Princes Motorway construction is slightly evident, adjacent to the eastern side of the site.

1987



Between 1961 and 1987, the adjacent lots to the north-east of the site were utilised to develop more residential homes. The Princes Motorway construction has been completed and the current Wollongong Botanic Garden has been constructed adjacent to the western side of the site.

2006



There are no changes to the site between 1987 and 2006, however, denser vegetation is observed in 2006 compared to 1987 with more larger trees and shrubs growing across the site.

2022



The site evidently shows increased density of larger trees and shrubs when compared to 2006. There are no other current changes in site conditions.

3.0 DISCUSSION AND RECOMMENDATIONS

It is noted that upon review of the updated Master Plan in February 2025, no changes to the outcomes of this report are required. The conclusions and outcomes previously provided remain sufficient and reflect current site conditions.

3.1 GROUNDWATER

The proposed redevelopment site is comprised of alluvial silt, clay, sand and gravel deposits on the southern and north-eastern parts of the site, and the rest of the site mainly comprising of residual silts and clays to bedrock. During heavy rainfall events the creek line may cause saturation of surrounding alluvial soils.

Groundwater is expected to be quite shallow within the vicinity of the creek line at the southern end of the site, typically within the flow path and alluvial soil deposits. Minimal groundwater is anticipated in residual zones where shallow rock is expected.

The expected shallow groundwater at the southern end of the re-development site may prove to be problematic for roadway construction where fill placement works, high trafficability and trenching for underground services may be impacted. Vibration movement and additional overburden loading are likely to raise the water table which may weaken the subsurface soil.

The groundwater table is not expected to be shallow where shallow rock may be encountered, however can prove problematic to the construction of underground structures and elements such as basements and footings if significant groundwater is present.

3.2 EROSION

Based on historic imagery review, assessment of soil and geology maps and site photos, erosion across the site is predominantly encountered through concentrated flows within the vicinity of the creek line. Due to the high density of good vegetation along the creek line, the erosional effects are considered minor and is most likely to occur during heavy rainfall events where the water table is likely to rise. Erosion is not anticipated on the site overall given relatively shallow grade.

3.3 SLOPE STABILITY

The main area to consider would be the south-western end of the site where the creek line is situated, where the topography steepens down into the creek bed at about 11° at the western site of the site and up to as high as 40° on the eastern side. The inflow of the creek line begins at the culvert and flows through the to the south-eastern and of the site. The vicinity of the creek line is densely vegetated. The review of historical imagery from 1951 to 2023 shows there is no clear indication of the creek widening due to erosion or embankment failure, however, should water levels rise during heavy rainfall events, erosion of the embankment may occur and cause stability to be compromised. Given the relatively shallow grade, up to about 5° for the remainder of the site, slope instability is unlikely.

3.4 FOUNDATIONS

Based on the proposed dwelling locations, it is likely they will be underlain by residual soils, overlying shallow siltstone and sandstone bedrock. It is assumed that piles will most likely be required to be drilled into bedrock for the proposed 2 to 3 storey buildings, if any 2 storey or single-story buildings are proposed it is assumed they will likely be on shallow footings.

Alluvial and colluvial soils if encountered may cause founding issues, due to poor strength, possibility of slope movement or creep or excessive settlement. Buildings found on these materials will likely need deep footings subject to detailed investigation. If shallow footings are desirable in these areas various techniques such as pre-loading, soil mixing and bridging layers may provide options to increase suitability of shallow footings.

It is also noted that the alluvial soil may be problematic for subsurface utility installations with regards to bearing capacity and horizontal bearing capacity requirements dependent on the utility type.

3.5 EXCAVATABILITY

It is considered that standard earthworks machinery will be appropriate for excavation into any possible alluvial, colluvial or residual deposits across the site. Rock excavation will likely be more difficult and an accurate assessment would be required via intrusive investigation to confirm excavatability.

It is however noted that deeper excavations and trenching within the alluvial materials may occur and present instability during works, requiring temporary retention systems to ensure constructability.

3.6 ANTICIPATED MATERIAL SUITABILITY FOR REUSE

To confirm if natural materials from excavations during bulk earthworks are suitable for re-use, testing for geotechnical parameters such as silt content and organic matter content is recommended. It is highly likely that any high silt content or organic rich material will not be suitable for reuse. Topsoils and alluvially deposited soils are typically not suitable materials for re-use, these types of material will be predominantly found within the vicinity of the creek line.

4.0 FURTHER GEOTECHNICAL INVESTIGATION

Additional geotechnical investigation will be required across the site to assess the subsurface conditions for the proposed development in the future. This investigation will be proposed based on finalised development plans for the site, including the extent of earthworks and proposed infrastructure such as pavements, subsurface utilities or buildings. The investigation would likely comprise a mixed approach between shallow test pit and deeper borehole investigations.

5.0 CLOSURE

We appreciate the opportunity to work collaboratively with you on this project. Our team looks forward to bringing our high level of expertise to deliver successful outcomes in your future projects.

Your attention is drawn to the appended document titled “*Important Information about this Geotechnical Report*” found in Appendix B. This document is intended to clarify to the reader what the realistic expectations of this report should be, and what is the correct use of the document. Misinterpretation of geotechnical information presents significant risk to projects. The document includes a discussion on general limitations of geotechnical services, which by nature, are based extensively on opinion and judgement.

The statements included in this document are not intended to be exculpatory clauses or to reduce the general responsibility accepted by Stantec, but rather to identify where Stantec and our Client’s responsibilities lie. The statements ensure that all parties that may rely on the report are aware of their respective responsibilities.

For further enquiries, please do not hesitate to contact Stantec on the information supplied.

6.0 REFERENCES

- Anon., 2023. *SIX Maps*. [Online]
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Appendix A SITE PLANS





Site Plan

Gwynneville Estate Planning Proposal
Gwynneville, NSW

Client: Homes NSW
Project Code: 304000956-GS-001
Drawn By: AC, Checked By: SM
Rev: 03
Date: 2024-07-15



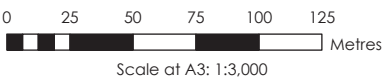
Legend

- Study Area
- Watercourse
- Cadastre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial Imagery Nearmap (March, 2023)
2. Cadastre (NSW SS, 2022)
3. Watercourse (NSW SS)

NOT FOR CONSTRUCTION





Elevation Plan

Gwynneville Estate Planning Proposal
Gwynneville, NSW

Client: Homes NSW
Project Code: 304000956-GS-003
Drawn By: AC, Checked By: SM
Rev: 02
Date: 2024-07-15



Legend

- Study Area
- Watercourse
- 2m Contours
- Cadastre

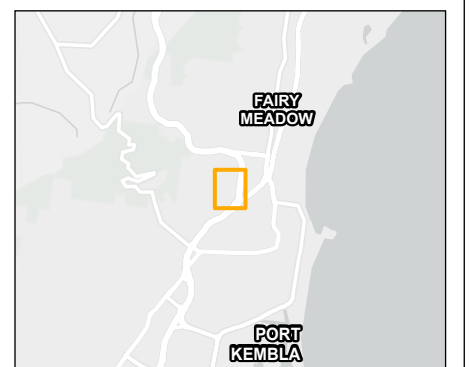
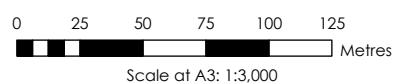
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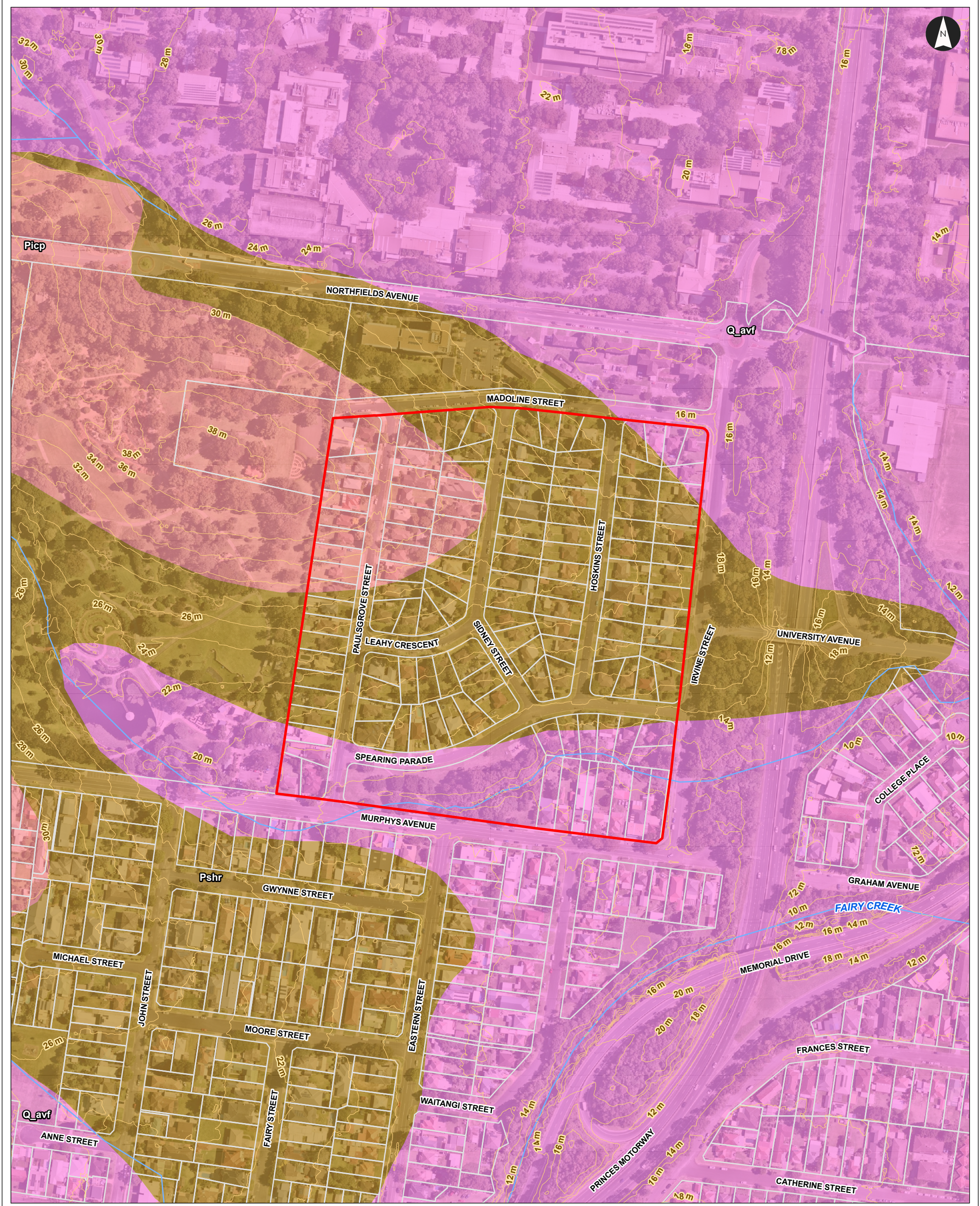
1. Map displayed in GDA2020 MGA Zone 56

References:

- Aerial Imagery Nearmap (March, 2023)
- Cadastre (NSW SS, 2022)
- 2m Contour and Watercourse (NSW SS)

NOT FOR CONSTRUCTION





Geology Plan

Gwynneville Estate Planning Proposal
Gwynneville, NSW

Client: Homes NSW
Project Code: 304000956-GS-002
Drawn By: AC, Checked By: SM
Rev: 02
Date: 2024-07-15

Legend

	Study Area		Q_avf - Alluvial fan deposits
	Watercourse		Picp - Pheasants Nest Formation
	2m Contours		Pshr - Broughton Formation
	Cadastral		

NSW Seamless Geology

Notes:

- Map displayed in GDA2020 MGA Zone 56

References:

- Aerial Imagery Nearmap (March, 2023)
- Cadastral (NSW SS, 2022)
- 2m Contour and Watercourse (NSW SS)
- NSW Seamless Geology (Geological Survey of NSW, 2021)

NOT FOR CONSTRUCTION

0 25 50 75 100 125
Metres
Scale at A3: 1:3,000

Appendix B IMPORTANT INFORMATION



Important Information about this Geotechnical Report

Scope of Work

The purpose of this report and any associated documentation is expressly stated in the document. This document does not form a complete assessment of the site, and no implicit determinations about Stantec's scope can be taken if not specifically referenced. Whilst this report is intended to reduce geotechnical risk, no level of detail or scope of work can entirely eliminate risk.

The nature of geotechnical data typically precludes auxiliary environmental assessment without undertaking specific methods in the investigation. Therefore, unless it is explicitly stated in the scope of work, this report does not provide any contamination or environmental assessment of the site or adjacent sites, nor can it be inferred or implied from any component of the document.

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