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GROUNDWATER IMPACT ASSESSMENT

5-9 Cowan Road,

St Ives NSW

Prepared for

Prosper 5-9 Cowan Road

St Ives Pty Limited

Report No: GS9614/5-A

15th September 2025

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DOCUMENT HISTORY

Document No.	Revision No.	Issue Date	Description
GS9614/5-A	0	15.09.2025	Initial Issue

Approved for release by:

Nima Pirhadi
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Date: 15th September 2025

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APPENDIX A IMPORTANT INFORMATION ABOUT YOUR REPORT

APPENDIX B SITE PLANS

REFERENCES

- GSNE Services Pty Ltd - *Groundwater Seepage Modelling for Drained Basement* (Ref: GS9614/2-A, dated 25th August 2025).

- Acid Sulfate Soils Management Advisory Committee (ASSMAC), 1998, Acid Sulfate Soils Assessment Guidelines. August 1998.

- ANZECC/ARMCANZ, 2000a. National Water Quality Management Strategy Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

- Australian Government Bureau of Meteorology

- Department of Land and Water Conservation, 2002, eSPADE NSW Soil and Land Information, Department of Planning, Industry and Environment.

- New South Whales Planning Portal spatial viewer

- Geotechnical Report prepared by GSNE Services GS 9614-1A, dated 25 August 2025.

- Australian Standard AS 3798-1996, Guidelines on earthworks for commercial and residential developments

- Pells, P.J.N., Mostyn, G., Walker, B.F. (1998), Foundations on Sandstone and Shale in the Sydney Region

EXECUTIVE SUMMARY

GSNE Services Pty Ltd ("GSNE Services") was appointed by Prosper 5-9 Cowan Road St Ives Pty Limited (the "client") to undertake a Groundwater Impact Assessment ("GIA") within the property located at 5-9 Cowan Road, St Ives NSW (the "site").

The proposed works include demolition of existing structures, site preparation works, excavation and construction of the building and associated landscaping works. Specifically, the SSDA seeks development consent for:

- Demolition of the existing row of 10 attached townhouses at the site;
- Construction of an 9-storey residential flat building comprising:
    - 74 new dwellings (62 market residential units and 12 affordable housing units)
    - 3 basement levels for car parking
    - Communal open space at Ground Level and Level 7
- landscaping; and
- associated site works.

A Groundwater Impact Assessment Report was requested by the Client to accompany a detailed State Significant Development Application (SSDA) for a residential development (including in-fill affordable housing) at 5-9 Cowan Road, St Ives within the Ku-ring-gai Local Government Area (LGA).

This report describes the findings of a Groundwater Impact study for assessing short and cumulative long-term impacts associated with Construction dewatering or long-term pumping that could lower groundwater levels and affect surrounding users, ecosystems, or structures

The following was referred as a part of this study:

- Geotechnical Investigation report (GS9614-1A)
- Inflow rate Assessment (GS9614-3A)
- Groundwater Seepage Modelling (GS9614-2A)
- Dewatering monitoring and Management plan Report (GS9614-4A)

Based on the assessment using available geotechnical data and experience on similar ground conditions, and The implementation of the mitigation and management measures outlined in this report, would ensure that the proposal would have a minimal impact on the proposed development site, located at 5-9 Cowan Rd, St Ives is considered suitable for its intended use.

1. INTRODUCTION

GSNE Services Pty Ltd ("GSNE Services") was appointed by Prosper 5-9 Cowan Road St Ives Pty Limited (the "client") to undertake a Groundwater Impact Assessment Report ("GIA") within the property located at 5-9 Cowan Road, St Ives NSW (the "site"). The location of the property is presented in Figure 1 of Appendix B.

The proposed works include demolition of existing structures, site preparation works, excavation and construction of the building and associated landscaping works. Specifically, the SSDA seeks development consent for:

- Demolition of the existing row of 10 attached townhouses at the site;
- Construction of an 9-storey residential flat building comprising:
    - 74 new dwellings (62 market residential units and 12 affordable housing units)
    - 3 basement levels for car parking
    - Communal open space at Ground Level and Level 7
- landscaping; and
- associated site works.

Maximum excavation depths of approximately 10.5m below ground level will be required for the proposed bulk excavation level of RL -161.5-160.5m AHD.

To assist in reading the report, reference should be made to the "*Important Information About Your Geotechnical Report*" attached as Appendix A.

2. AVAILABLE INFORMATION

Prior to preparation of this report, the following information was made available to GSNE Services:

- *Survey Report*, by Rygate & Company Pty Ltd, drawing title: Plan of levels and details at Nos 5-9 Cowan Road, Ref no:80743, Plan No.80743-D.DWG, Date of Survey 16 April 2025.
- Architectural drawings prepared by PBD Architects, project No.2518, Drawing No. DA001-DA003, DA100-110, DA201-204, DA301-304 dated 20th August 2025.
- *Geotechnical Investigation* report by GSNE Services Pty Ltd, GS9614-1A, Rev1.
- *Groundwater Seepage Modelling for Drained Basement* report prepared by GSNE Services Pty Ltd, GS9614/2-A.
- Water NSW General Terms of Approval for Dewatering (Reference 6).
- Water NSW Fact Sheet – Exemption Guidelines for Dewatering (Reference 8).

3. SITE DESCRIPTION

The site is located at 5-9 Cowan Road, St Ives, within the Ku-ring-gai Local Government Area, and is legally described as SP30097. The site has an area of approximately 3,467.7sqm and is rectangular in shape.

The site currently contains a single row of ten, two-storey attached townhouses. The site is defined by large mature trees along the northern, eastern and western boundaries. Vehicular access to the site is provided at the southern boundary of the site from Cowan Road. The site is relatively flat.

The site adjoins St Ives Shopping Village to the north and east. Existing residential development (No. 3 Cowan Road) and St Ives Christ Church border the site to the south. To the west, two storey detached houses are located along Cowan Road.

The site is located 800-metres east of Cowan Creek which is separated from the site by Pymble Golf Club. The site is also located within 105-metres of Emerald Fitness Centre, 245-metres from St Ives Village Green, and 210-metres from St Ives Playground. The building heights in the immediate locality are generally single to two-storeys, with increased heights of up to 5-storeys on Mona Vale Road, opposite St Ives Christ Church. The location of the property and borehole locations are presented in Figure 1 of Appendix B

3.1 Proposed Development

Based on the information provided by the client and the architectural drawings, we understand that the proposed development will comprise:

- Construction of an 9-storey residential flat building comprising:
  - 74 new dwellings (62 market residential units and 12 affordable housing units)
  - 3 basement levels for car parking
  - Communal open space at Ground Level and Level 7

The proposal also incorporates 15% of the total gross floor area for affordable housing and seeks to utilise the incentive controls under Chapter 2, Part 2, Division 1, Section 16 of State Environmental Planning Policy (Housing) 2021 (Housing SEPP) to achieve 30% additional building height and 30% additional floor space ratio (FSR).

3.2 Objectives

The objective of this assessment was to assess the potential impacts to surface water and groundwater during construction.

A qualitative impact assessment was carried out, which included the following:

- Carrying out a desktop review and analysis to characterise the existing environment and identify potential waterway and groundwater risks.
- Analysis of surface water quality and groundwater quality and level monitoring results to support and enhance the findings of the desktop analysis,
- Characterisation of the existing environment including climate, topography, geology, hydrology, water quality and sensitive receiving environments
- Analytical groundwater calculations to predict potential groundwater inflows and radius of influence at specific excavation sites.
- Assessment of potential surface water related impacts to satisfy the minimal impact considerations of the National Water Quality Management Strategy (NWQMS)
- Assessment of potential groundwater related impacts to satisfy the minimal impact considerations of the NSW Aquifer Interference Policy (AIP)

- Recommendations for monitoring and management of identified impacts and risks, including mitigation measures as appropriate

4. EXISTING ENVIRONMENT

4.1 Rainfall

The site is in a region with temperature climate, two nearby Bureau of Meteorology (BOM) weather stations were reviewed for annual rainfall statics these indicated an average rainfall of between two stations, mean monthly rainfall details are presented in table 1.

Table 1: Mean Monthly Rainfall

Location	Distance from Site	Mean Monthly Rainfall(mm) 2023												
		January	February	March	April	May	June	July	August	September	October	November	December	Annual
Gordon Golf Club NSW	4.2km from site by road	125.6	137.5	147.4	117.7	109.0	121.7	87.5	76.5	67.2	81.1	92.1	90.3	1241.1
Wahroonga Ave	6.1km from site	146.5	167.2	209.6	130.1	70.9	129.5	90.1	68.0	62.9	92.8	111.1	103	1437.3

Source: Bureau of Meteorology (BOM)

4.2 Study Area

For the purpose of the Impact Assessment, study area shown in Figure 1, The Site works area currently consists of a mix of commercial and residential areas, The site is bounded by Si Ives Shopping village to northeast, Existing residential development (No. 3 Cowan Road) and St Ives Christ Church border the site to the south. To the west, two storey detached houses are located along Cowan Road.

The proposal study area has the potential to interact with surface water, close by Cowan creek lies approximately 800m from site.

4.3 Topography and Geology

The site shows elevation ranging from RL 169m to RL 171m AHD, sloping gently from the west to east, The nearest watercourse is Cowan Creek to the west which are located approximately 800m of the site. Other sensitive receptors are St Ives Shopping village, Dalrymple Hay Nature Reserve, which is approximately 500m to south.

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 Edition 1, dated 1983, by the Geological Survey of New South Wales, Department of Mineral Resources, indicates the site is underlain by Wianamatta Group of Ashfield Shale (Rwa) comprising black to dark grey shale, and laminite.

4.4 Site Inspection

At the time of Geotechnical investigation, Wednesday 11th June 2025, the site currently contains a single row of ten, two-storey attached townhouses. The site is defined by large mature trees along the northern, eastern and western boundaries. Vehicular access to the site is provided at the southern boundary of the site from Cowan Road.

The field scientist also carried out an inspection to observe and record any visually obvious signs of salinity within the site and surrounding region, including salt tolerant plant species, areas of erosion, or salt deposits, or evidence of salt attack on existing buildings. No such indicators were noted within the site.

4.5 Geotechnical Investigations

The site investigation was carried out on 11th, 12th & 16th June 2025, and concluded material below the surface level presented in table 2.
The ground profile comprises:

1. Topsoil / Fill materials.

2. Soil comprising generally Silty CLAY.
3. Extremely to highly weathered Shale.

Medium Strength Shale Class III.

The subsoil conditions encountered within the boreholes are summarised in Table 2.

Table 2. Summary of Subsurface Conditions (depth)

Unit	Description	BH1	BH2	BH3
Surface levels (m AHD) approximately		**172.0**	**171.0**	**171.0**
FILL / TOPSOIL	Silty Clay with sand, grey, brown	0.0-1.5	0.0-1.2	0.0-0.5
Residual Soil	Silty CLAY, medium to high plasticity, grey, mottled orange, Stiff to Very Stiff, moist	1.5-4.5	1.2-4.5	0.5-3.5
	Silty CLAY, high plasticity, grey, hard, moist	4.5-10	4.5-7.7	3.5-7.5
	Extremely weathered material (shale), pale grey, orange, moist. Soil strength (Hard) to extremely low estimated strength.	10.0-12.7	-	7.5-10.0
Bedrock (2)	SHALE, dark grey extremely weathered, assessed Class V SHALE[1], Very Low Strength	-	-	10.0-11.3
	SHALE, grey, brown with pale grey laminations, developed horizontal beddings, highly weathered assessed Class IV SHALE[1], Low Strength	-	7.7-9.5	-
	SHALE, dark grey with pale grey laminations, moderately weathered horizontal beddings, thinly laminated to laminated, assessed bands of interspersed Class III SHALE[1], Medium Strength	12.7-15.0	9.5-12.15	11.3-13.07

[1] Classified according to Pells P.J.N, Mostyn G. & Walker B.F. Foundations on Sandstone and Shale in the Sydney Region, Australian Geomechanics Journal, 1998 (Reference 2

4.6 Groundwater

GSNE Services undertook a geotechnical investigation on site with the main intention being to obtain groundwater data and additional sub-surface soil and rock information (refer to *Groundwater Seepage Modelling for Drained Basement* in Appendix D).

Groundwater levels were measured by GSNE Services over a two-day period, from 30th July 2025 to 31st July 2025, including measurements in a groundwater wells (piezometer) installed at the time of geotechnical site investigation, ground water levels are presented in table3.

Table 3: Groundwater levels

Borehole/ well	Date and time	Level (m bgl)	Surface Level (m AHD)	Level (m AHD)
BH1/W1	27.06.2025 & 15.07.2025	8.5 & 6.8	172	163.5/165.2
BH2/W2		7.9 & 8.2	171	163.1/162.8
BH3/W3		7.5 & 5.7	171	163.5/165.3

4.7 Estimated Hydraulic conductivity(m/day)

Site estimated hydraulic conductivity data adopted from Inflow Rate Assessment report, presented in table 4.

Table 4. In-situ horizontal hydraulic conductivity values

Borehole/Well	k_h (m/day)	k_v (m/day)	Total Well Depth (m) (bgl)
BH1	0.00198	0.000198	15.0
BH2	0.00200	0.000200	12.15
BH3	0.00203	0.000203	13.07

4.8 Groundwater quality

pH, Conductivity, Suspended Soils, Turbidity, Chromium, Copper, Lead, Nickel and Zinc exceeded the limits, based on the Dewatering Management Plan Report GS9614-4A

4.9 Groundwater Users

Searches of the NSW groundwater map (Water NSW) and the Bureau of Meteorology 'Australian Groundwater Explorer' (both undertaken on 8th September 2025) were carried out to identify registered bores near the proposal area. The search identified 15 bores within 500m radius of the proposal boundary. Registered bores are presented in Dewatering management Plan report.

4.10 Contaminated sites

A search of the EPA register for contaminated sites (9th September 2025) shows no contaminated site listed in the proposal area. However, there were two sites listed within a five-kilometre radius of the proposal area. These are summarised in Table 3

Table 5:Declaration of Significantly contaminated sites in the Local Government area

Search results

Your search for: LGA: KU-RING-GAI COUNCIL
Notice Type: Declaration of Significantly Contaminated Land

Matched 39 notices relating to 5 sites.

Search Again | Refine Search

Suburb	Address	Site Name	Notices related to this site
KILLARA	496 Pacific HIGHWAY	7-Eleven Service Station (Former Mobil)	5 former
KILLARA	692B-694 Pacific HIGHWAY	Former Caltex Service Station	1 former
KILLARA	684-684a, 690, 692 and 696 Pacific HIGHWAY	Land Adjacent to Former Service Station Site	22 former
LINDFIELD	478 Pacific HIGHWAY	Former BP Service Station Lindfield	1 current and 6 former
ST IVES	179-181 Mona Vale ROAD	Shell Service Station	4 former

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4.11 Acid Sulphate Soils

The Preliminary Site Investigation report (ES9614/6) was prepared by GSNE Services, indicating that the Acid Sulphate Soils (ASS) are not present in the site.

4.12 Salinity

Saline soils were not found in the site, Refer to Geotechnical Investigation Report GS9614-1A, Rev1

4.13 Surface water quality

The site is located within Cowan Creek catchment, Runoff from the site enters local watercourse both through the constructed stormwater system and as overland flow. The quality of surface water entering local waterways would largely be a function of contaminants on the roads and adjacent areas.

Typical surface pollutants from the proposal could include:

- Oils and hydrocarbons
- Heavy metals
- Chemicals from spills or inappropriate waste disposal
- Sediments
- Gross pollutants including litter and debris.

4.14 Contaminants Present on the Site

Preliminary Site Investigation Report was prepared by GSNE Services Pty Ltd, dated 25th August 2025, ES9614/6 the report recommendations given below,

The contaminants that may be present in some of these areas were considered to be of low significance in terms of risk to the human and environmental receptors identified. Therefore, it is recommended that a Detailed Site Investigation (DSI) is to be undertaken during design development phase, to provide further confirmation of the presence and extent of contamination on site prior to construction.

It's noted that excavation activities will occur close to potential risk areas, during the construction phase, it impacts on groundwater level due to dewatering would be managed by minimising the number of excavations below groundwater table, minimising time that excavations are left open, minimising size of excavations and siting excavations away from groundwater receptors

5. CONSTRUCTION IMPACT ASSESSMENT

5.1 Surface water drainage

Earthworks have the potential to increase surface runoff, disrupt existing flow paths and to impact surface water quality with the mobilisation of sediments and contaminant laden stormwater.

An assessment of the surface water and groundwater risks and potential impacts associated with the construction of the proposal and measures for their avoidance, mitigation or minimisation is summarised in Dewatering management Plan Report GS 9614-4A, Table4.

5.2 Surface water quality

summary of the potential surface water quality related impacts from construction activities on receiving waterways including cowan creek and storm water inlets, each of the potential impacts outlined in Dewatering management Plan Report GS 9614-4A, Table4.

5.3 Groundwater level impacts

Potential impacts that the site may have on Groundwater conditions during construction. Groundwater may be impacted where construction activities intersect groundwater and/or where construction impacts on the surface water regimes hydraulically connected to shallow groundwater, stormwater drainage and utilities, The following potential impacts to groundwater due to construction have been assessed.

- Potential changes to groundwater levels and flow directions
- Potential changes to baseflow volumes
- Potential impacts to bores, -There are few bores that are near the site area. As such, impacts to bores used for a purpose other than monitoring would not occur. There is a potential that some monitoring bores may require decommissioning if located in areas disturbed by construction.
- Potential changes to groundwater quality, - Changes to groundwater quality during the construction period could occur as follows:

  Groundwater systems could become contaminated if accidental spills or leaks of hazardous materials (such as fuels, lubricants and hydraulic oils) occur during construction or operation.
- Acidification could also occur due to oxidisation as a result of lowered groundwater levels. The acidification could also potentially mobilise heavy metals.
- Groundwater salinity could be increased if groundwater levels increase, and salts are mobilised that have natural accumulated in the soil. This risk of the above occurring is considered very low.

small and localised changes to groundwater levels include the proposals bulk earth works. This could occur if cuts extend below the water table, causing groundwater level reductions. Also, there is a potential for surcharge loading associated with fill placement and the resulting increase in effective stress to cause short-term increases to groundwater levels in areas of fill placement, and/or permanent increases to groundwater levels if the increased stress permanently alters the hydraulic conductivity of the underlying water-bearing ground.

5.4 Groundwater quality

Groundwater quality has potential to be impacted from accidental spills and leaks of substances as a part of normal operation and maintenance activities. Surficial spills are less likely to affect groundwater where the proposal intersects the shale due to the lower rate of recharge and higher rate of runoff that occurs over the weathered bedrock. Should a major spill occur that reaches the water table, there is potential that the contaminated groundwater would slowly migrate towards the local creeks.

Standard industry management techniques and the recommended safeguards such as spill clean-up kits and staff training, the potential for adverse impact to occur to groundwater is considered low. Sufficient flow attenuation is provided in the road stormwater drainage network and treatment systems to allow for spills to be contained and treated through emergency response procedures.

5.5 Groundwater users

Potential impacts on groundwater users during the operational phase of the proposal are considered limited. No dewatering is required during the operation of the proposal and groundwater levels are expected to recover to pre-construction levels upon completion of construction. Impacts to groundwater availability would be negligible as the proposal would not require groundwater extraction during operation and would not inhibit recharge.

5.6 Groundwater Dependent Ecosystems

A desktop assessment was conducted to identify potential GDEs within 2km of the site, where these ecosystems might interact with groundwater that also interacts with the site. The approach to identifying GDEs has relied on published resources such as the Bureau of Meteorology's Groundwater Dependent Ecosystem Atlas and SEED map.

Groundwater discharge can be important in maintaining baseflow in rivers and streams, and ecosystems associated with these discharge areas may have a high dependency on groundwater for their water requirements. It should be noted however that some of these ecosystems rely on perched aquifer systems that are shallow, surficial and are largely not connected to the deep regional groundwater system. All identified GDEs within the vicinity of the site shown in figure1.

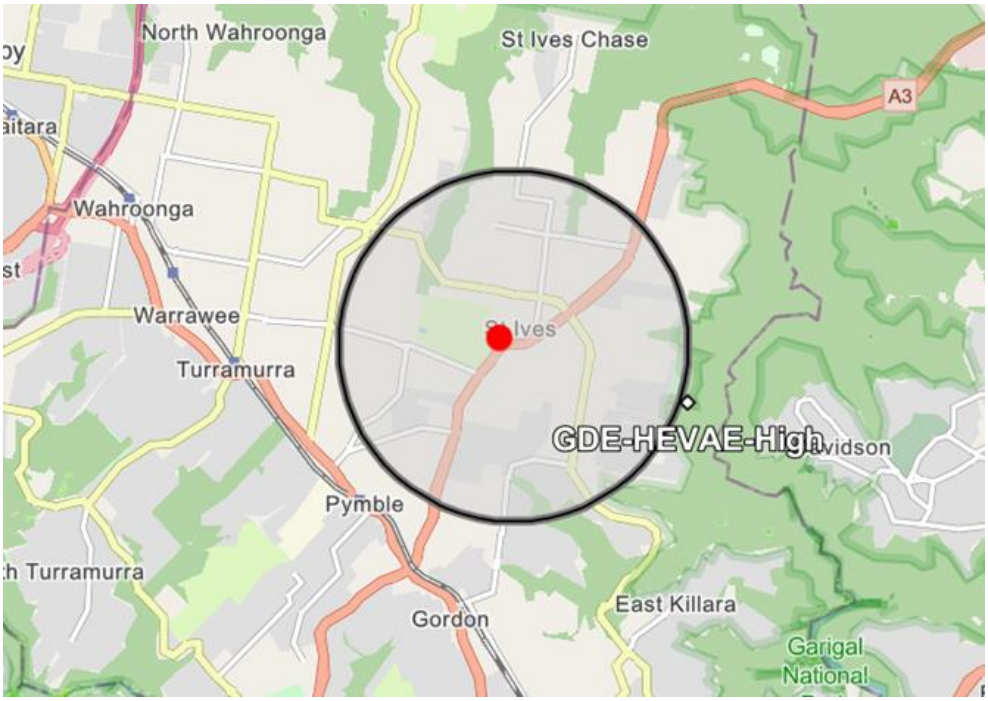

Figure1: Groundwater Dependent Ecosystems

6. POTENTIAL RISK AND MITIGATION MEASURES

Construction Phase:

- The staging of construction to minimise potential impacts
- Separating clean and dirty water and preventing infiltration of impacted surface water into the underlying groundwater system
- Preventing groundwater seepage from contacting potentially contaminating site activities by minimising ponding of water in active areas and making storage facilities impermeable
- Preventing impacted groundwater from entering the surface water management system unless it represents a credible treatment option
- Adequately storing and handling site chemicals
- Impacts on groundwater due to excavations below the groundwater table and associated dewatering should be mitigated by minimising time that excavations are left open, minimising size of excavations and siting excavations away from groundwater receptors where possible. Any dewatered groundwater may be used on-

site for dust suppression or irrigation, with excess water potentially discharged to stormwater. If excess water is to be discharged, then testing is recommended prior to discharge

Operational Phase:

- Minimising impervious areas through measures such as porous of permeable pavements
- Incorporation of water treatment and pollutant capture measures into the drainage system design such as Gross Pollutant Traps, vegetated swale drains and bioretention basins
- Erosion control measures such as soil stabilisation, landscaping, planting native vegetation and mulching.
- the design should ensure that any pollutant traps such as bioretention basins are separated from the groundwater system and that groundwater quality monitoring is conducted to demonstrate that the operational design is not having unacceptable impacts on groundwater quality.
- Emergency response procedures for cleaning up accidents and spills

7. CONCLUSION

This Surface and Groundwater Assessment has been prepared to support the State Significant Development Application (SSDA) for a residential development (including in-fill affordable housing) at 5-9 Cowan Road, St Ives.

Specifically, this report has assessed the potential impacts of construction and operation of the proposal. Potential construction stage impacts include onsite contamination or hydrocarbon spills and increased sediment loads being discharged to downstream systems as a result of runoff from exposed areas.

Construction impacts would be managed through implementation of Soil and Water Management Plan (SWMP)s in accordance with the Blue Book and detailed planning and management of construction sites to avoid impacting overland flow paths without appropriate mitigation.

A Soil and Water Management Plan (SWMP) would be prepared as part of the Construction Environment Management Plan (CEMP). Construction stage impacts on groundwater may occur due to interception of groundwater by excavations associated with construction. These excavations may require dewatering which would result in drawdown in groundwater levels.

Impacts on groundwater level due to dewatering would occur during the construction phase only.
The key potential construction phase impacts include:

- Accidental spills or leaks of substances, during routine operation and maintenance activities, have the potential to contaminate both surface water and groundwater Mitigation and management measures were identified as part of this assessment to address the above impacts.
- Moderate risk areas of saline soils mapped throughout the construction footprint with the potential to impact on surface water, shallow groundwater and constructed structures associated with the proposal, if not managed appropriately
- Accidental spills or leaks of substances (such as fuels, oils, lubricating fluids and seepage from potentially high saline spoil) have the potential to contaminate surface water and groundwater if not appropriately managed.
- Groundwater levels may be impacted where construction activities intersect groundwater and/or where construction impacts surface water regimes that are hydraulically connected to shallow groundwater (eg dewatering)
- Groundwater users may be impacted. Bore water levels may decrease at registered groundwater bores located within the extent of groundwater drawdown due to dewatering required for cuts/excavations that intersect shallow groundwater along the proposal.
- Alteration of existing surface water and groundwater flow pathways due to new infrastructure or modified landforms including piles, embankments, or other closely spaced structures
- Deep cuttings intersecting shallow groundwater and disrupting the existing groundwater flow regime

- The reduced permeability of the substrate beneath embankments may modify the flow direction of shallow groundwater in portions of the alluvium and possibly the saturated portion of weathered bedrock.

A summary of the key impacts and proposed mitigation and monitoring measures are outlined in the table 5.

Table 6: Key Impacts and mitigation measures

Project Phase	Risk	Potential Impacts	Measures to avoid, mitigate or minimise impacts
Construction	Construction activities mobilising sediment due to disturbed soil from excavation and clearing	Pollution of receiving drainage networks and watercourses with sediment	Prepare a soil and water management plan and incorporate in the CEMP. Install sediment and erosion control measures in accordance with the Blue Book (DECC, 2008). Prepare water quality monitoring plan and incorporate in the CEMP
	Chemical or hydrocarbon spill	Contamination of groundwater via seepage or surface water via runoff	Storage of hazardous goods and refuelling activities to take place in bunded areas. Implement water quality monitoring program
	Excess groundwater while excavation / piling works	Pollution of receiving drainage networks and watercourses	Prepare water quality monitoring plan and incorporate in the construction environment management plan
	Interception and dewatering of	Drawdown in groundwater level	Minimise excavations below groundwater table.

	groundwater by excavation		Minimise duration of time that excavations below the water table are open.
Construction	Discharge of Groundwater	discharge of groundwater to the environment has the potential to impact the receiving environment of near Creeks, should there be sediment load, nutrient-rich, low/high pH, salinity or contamination present in the extracted groundwater	By design, the secant piles should be effective in preventing groundwater ingress
Construction	on site contamination-Heavy Metals	The impact of contamination of waterways is that heavy metals can negatively impact on the ecological health of aquatic organisms and may result in population decline which could be toxic to aquatic organisms	A Construction Soils and Water Management Plan (CSWMP) would be developed as a sub plan of the Construction Environmental Management Plan (CEMP), Install sediment and erosion control measures

	on site contamination - concentrations of TRH and PAHs	PAHs can be harmful to your health under some circumstances. Several of the PAHs, including benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-c,d]pyrene, have caused tumors in laboratory animals when they breathed these substances in the air, Health effects from long-term or chronic exposure to PAHs may include decreased immune function, cataracts, kidney and liver damage (e.g. jaundice), breathing problems, asthma-like symptoms, and lung function abnormalities.	Degradation of PAHs in the environment includes: biodegradation, photooxidation, and chemical oxidation adsorption to soil particles, leaching, Each of these processes affects individual PAHs in a different manner.
Construction	on site contamination-	inhalation of its fibres, which can lead to	Develop detailed risk assessments and management

	Asbestos	serious respiratory diseases such as asbestosis, lung cancer, and mesothelioma	plans tailored to the specific site conditions. These plans should outline procedures for safely handling contaminated soil, including protocols for excavation, transport, and disposal, restrict access to contaminated areas and use barriers to prevent unauthorised entry.
Operation	Increase in vehicle movements on the Site/street.	Increase in potential for pollutant generation	Increase in potential for pollutant generation
Operation	Poor stabilisation of soils, inadequate scour protection and failed revegetation	Pollution of receiving drainage networks and watercourses with sediment Erosion around drainage infrastructure	Where practical and space allows, adopt WSUD guidelines for drainage infrastructure (appropriate plant species selection, etc). Adopt adequate erosion and scour protection measures in the drainage design
	Interception of groundwater by permanent excavations (stormwater basins)	Drawdown in groundwater level	Install impermeable liners or redesign to shallower depth stormwater basins where they may intercept groundwater

The implementation of the mitigation and management measures outlined in this report, would ensure that the proposal would have a minimal impact.

8. LIMITATIONS

Conclusions and recommendations are based on information that existed at the time of the production of the document. The passage of time can affect the information and assessment provided in this document. It is understood that the services provided allowed GSNE Services to form no more than an opinion of the actual conditions of the site at the time of the visit and cannot be used to assess the effect of any subsequent changes in the quality of the site or its surroundings or any laws or regulations.

Where information supplied by the Client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted for incomplete or inaccurate data supplied by others.

This report and associated documentation and the information herein have been prepared solely for the use of **Prosper 5-9 Cowan Rd, St Ives Pty Ltd**, any reliance assumed by third parties on this report shall be at such parties' own risk. Any ensuing liability resulting from use of the report by third parties cannot be transferred to GSNE Services, directors or employees.

Thank you for the opportunity to undertake this work. We would be pleased to provide further information on any aspects of this report.

For and on behalf of

GSNE Services Pty Ltd

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Murali. P

Murali Pamu

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Appendix A

Important Information about your Geotechnical Report

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include the general nature of the structure involved, its size and configuration, the location of the structure on the site and its orientation, physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program.

To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should NOT be used:*

- when the nature of the proposed structure is changed: for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an un-refrigerated one,
- when the size or configuration of the proposed structure is altered,
- when the location or orientation of the proposed structure is modified,
- when there is a change of ownership, or

for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

Geotechnical reports present the results of investigations carried out for a specific project and usually for a specific phase of the project. The report may not be relevant for other phases of the project, or where project details change.

The advice herein relates only to this project and the scope of works provided by the Client.

Soil and Rock Descriptions are based on AS1726-1993, using visual and tactile assessment except at discrete locations where field and/or laboratory tests have been carried out. Refer to the attached terms and symbols sheets for definitions.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how

qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact. For this reason, most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions, and thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

Subsurface conditions can change with time and can vary between test locations. Construction activities at or adjacent to the site and natural events such as flood, earthquake or groundwater fluctuations can also affect the subsurface conditions.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems.
No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professional develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

The interpretation of the discussion and recommendations contained in this report are based on extrapolation/interpretation from data obtained at discrete locations. Actual conditions in areas not sampled or investigated may differ from those predicted

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings because drafters may commit errors or omissions in the

transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimise the likelihood of boring log misinterpretation, give contractors ready access in the complete geotechnical engineering report prepared or authorized for their use. Those who do not provide such access may proceed under mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are not exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

FURTHER GENERAL NOTES

Groundwater levels indicated on the logs are taken at the time of measurement and may not reflect the actual groundwater levels at those specific locations. It should be noted that groundwater levels can fluctuate due to seasonal and tidal activities.

SITE LOCALITY MAP

sw.gov.au/

PROJECT DETAILS		DRAWING DETAILS			
Project Title	Geotechnical Site Investigation	**Figure No.**	1	**Rev No.**	0
Project No.	GS9614-1A	**Scale**	As above	**Size**	A4
Client	GROWTHBUILT	**Drawn by**	DB	**Date**	11.06.2025
Site Address	5-9 Cowan Road, St. Ives NSW	**Approved by**	MP	**Date**	11.06.2025

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