
Groundwater Inflow Assessment

Sports and Aquatic Centre

**84, 86 and 90-98 The Bouldevarde,
Strathfield NSW**

Prepared for Santa Sabina College

Project 224188.09

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Report on Groundwater Inflow Assessment

Sports and Aquatic Centre

84, 86 and 90-98 The Bouldevarde, Strathfield NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a Groundwater Inflow Assessment undertaken for the Santa Sabina College at 84, 86 and 90-98 The Bouldevarde, Strathfield NSW (the site). The investigation was commissioned by email instructing to proceed dated 21 November 2024 from Eleanor Hassell of Pier Property Group (PPC) on behalf of Santa Sabina College and was undertaken in accordance with Douglas' proposal dated 6 November 2024.

It is understood that an inflow assessment is required as a part of the State Significant Development Application (SSD- 68054209) for the disposal of any groundwater into Council's stormwater system during construction. This report responds to the matters raised by the NSW Department of Climate Change, Energy, the Environment and Water referral letter dated 14 October 2024.

This report provides reference to recent investigations carried out within the site by Douglas. Reference has also been made to the NSW Aquifer Interference Policy (AIP) prepared by NSW Office of Water, dated September 2012 and the NSW DPE minimum requirements for groundwater investigation and reporting (NSW DPE, 2021).

This report includes an inflow and groundwater impact assessment for any incidental water accumulating in any excavations during construction. Douglas notes that the inflow and impact assessment provided herein will be required for submission to Department of Climate Change, Energy, the Environment and Water (DCCEEW) as part of the SSD application.

2. Proposed development

Douglas understand that the project comprises the construction of a sport centre (with single level basement) and aquatic centre.

It is understood that the proposed sports centre sits on gently sloping ground that needs to be retained by the basement carpark structure. The basement level is understood to have a finished floor level of RL 16.6 m, relative to the Australian Height Datum (AHD), where maximum basement excavation depths will be approximately 3 m. Further excavation will likely be required for footings, service pits, lift pits etc.

The proposed aquatic centre will have an inground swimming pool which is understood to have a finished level of RL 18.8 (AHD), where maximum excavation depths of approximately 2.8 m will be required.

3. Site description

The proposed site is located within the Santa Sabina College – Senior Campus, located to the east of The Boulevarde, Strathfield. The overall site is a near-rectangular shaped area of approximately 9,000 m² and is bounded by residential developments to the north, residential developments and Jersey Road to the south, Wentworth Road to the east and The Boulevarde to the west. An aerial photograph of the site detailing the development footprint is shown in Drawing 1, in Appendix B.

The site was accessible via an asphalt driveway that connects to Jersey Road on the southern side of the school. To the south of the investigation area, within the school property, was a swimming pool with change room and brick building. The south-eastern section of the investigation area was occupied by an on-grade carpark and two small buildings. The northern portion of the investigation area was occupied by an open space playing field and tennis courts. These areas are relatively level which may indicate previous cut and fill to create a level surface. The existing school buildings are typically one to two storeys and are constructed of brick. The 1994 VAT building comprises a lower-level basement. The recent investigations confirmed the presence of fill in these areas.

4. Hydrogeological setting

4.1 Topography

The ground surface across the site gently slopes downwards in a north to north-easterly direction, with levels typically ranging between about RL 18 m and RL 16 m AHD. There are several abrupt changes in slope associated with retaining walls and batter slopes across the site to accommodate changes in levels around the existing buildings. This area appeared to follow the regional topography (sloping downwards to the north).

4.2 Geology

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the development site is underlain by Ashfield Shale. The Ashfield Shale typically comprises dark grey shale, laminite and siltstone which usually weathers to form a moderately deep residual clay profile. The predominantly shaly rock is typically closely bedded and contains an orthogonal pair of steeply dipping (70° to 90°) joint sets typically striking NNE and ESE and spaced at 0.5 m to 5 m. Randomly oriented, 30° to 45° dipping slickensided joints are also ubiquitous.

The results of the recent field work for the present investigation were consistent with the published geological mapping.

4.3 Soil Landscape

Reference to the Sydney 1:100,000 Soils Landscape Sheet indicates that bedrock at the development site is overlain by residual soils of the Blacktown group. These typically comprise shallow to moderately deep, moderately reactive clay soils. The results of the field work indicated that filling is present across much of the development site, with natural clay soils present between the filling and bedrock, at the borehole locations.

4.4 Hydrogeology

The geology and topography of the development site suggests that the regional groundwater table is in the underlying rock.

Ephemeral seepage from perched water would be expected from along the top of the clay and bedrock and through joints and bedding planes within the rock itself. Seepage volume would be expected to be low and vary with climatic events.

4.5 Hydrology

There are no surface water bodies within or near the vicinity of the site.

4.6 Groundwater receptors

No registered groundwater bores are located within 1 km of the development site. The nearest bores are for monitoring purposes. The nearest surface water body is Powells Creek, parts of which are culverted. Powells Creek is located approximately 650 m north-west of the development site and connects to the Parramatta River at Homebush Bay. Based on the geology and topography of the development site, surface and groundwater are expected to flow in a northerly direction, possibly toward Powells Creek.

A review of the Bureau of Meteorology Groundwater Dependant Ecosystems Atlas indicates that there are no aquatic, subterranean or terrestrial GDEs within 1 km of the development site. The closest GDE to the development site is approximately 5 km west which comprises a moderate potential for terrestrial GDE (Cumberland Shale Plains Woodland, vegetation).

5. Investigation results

5.1 Geotechnical

Information used to develop the conceptual groundwater model was obtained from the geotechnical investigation undertaken by Douglas at the subject site, "Report on Geotechnical investigation: Sports and Aquatic Centre, 84, 86 and 90-98 The Boulevard, Strathfield NSW" (Project number 224188.00.R.001.Rev3 dated August 2024).

Details of the subsurface conditions encountered are given in the borehole logs within the above-mentioned geotechnical report. The test locations are shown in Drawing 1 (Appendix B).

Based on the results of the site investigation, the sequence of subsurface materials encountered at the site, in increasing depth order, is summarised below.

- **FILL:** gravelly / silty / clayey sand, silty clay and clay varying in depths of between 0.4 m and 1.7 m with varying proportions of rootlets, ash and sandstone gravel. It should be noted that refusal occurred within fill (on concrete) at locations BH03 to BH05, possibly due to encased services;
- **RESIDUAL:** stiff to hard silty clay / clay to depths of between 1.2 m and 2.5 m; and
- **BEDROCK:** generally very low to low strength shale becoming low to medium strength below depths of between 5.5 m and 5.8 m. Medium strength, slightly fractured, slightly

weathered to fresh shale was typically encountered from depths of between 6.3 m and 8.0 m to the base of the boreholes.

5.2 Groundwater levels

No free groundwater was encountered during auger drilling through the soil profile of the boreholes. The use of water for rotary drilling and coring prevented observations of groundwater within the rock at BH12 to BH14 and BH16. No major water loss was noted during rock drilling.

The groundwater monitoring wells installed within BH12, BH13 and BH16 were purged immediately after installation, and the groundwater levels measured at the completion of the investigation. Notably BH13 was dry following purging. A summary of the measured groundwater levels from this investigation are provided in Table 1.

Table 1: Summary of Groundwater Measurements

Well ID	Surface RL (AHD)	Screen Depths (m)	Screened Lithology	Measured Groundwater Depth (m)	Approximate Groundwater RL (AHD)
BH12 ⁽¹⁾⁽²⁾⁽⁵⁾	17.2	1.5-5.0	Clay and Shale	3.37 ⁽³⁾	13.83 ⁽³⁾
BH13 ⁽¹⁾	17.1	1.5-5.0	Clay and Shale	4.72 ⁽⁴⁾	12.4 ⁽⁴⁾
BH16 ⁽¹⁾⁽²⁾	20.6	2.5-6.0	Clay and Shale	2.76 ⁽³⁾	17.84 ⁽³⁾
				2.54 ⁽⁴⁾	18.1 ⁽⁴⁾

Notes to Table:

- (1) Well was purged on 25 October 2023
- (2) Rising head test carried out using a data logger, following purging, on 31 October 2023
- (3) Standing water levels were measured using a dip meter on 31 October 2023, at completion of rising head test
- (4) Standing water levels were measured using a dip meter on 29 November 2024.
- (5) Groundwater levels could not be determined on 29 November 2024, as the well could not be located.

It is expected that the measured water levels are likely associated with perched seepage flows and that the regional groundwater table is relatively deep in the underlying rock. Seepage from perched groundwater is expected to occur along the soil and rock interface and may also occur through fractured zones and joints in the rock. Seepage is likely to increase following periods of extended wet weather. It should be noted that groundwater levels are transient and water levels are likely to fluctuate following periods of extended wet weather.

5.3 Hydraulic conductivity testing

Rising head permeability tests were carried out in the wells of BH12 and BH16 on 31 October 2023. This was carried out by purging the well then measuring the rise in water level at regular time intervals using a data logger. Permeability results are summarised in Table 2. The detailed results of the permeability tests are attached in Appendix C.

Table 2: Interpreted Permeability Results

Well ID	Material Types within Screen Interval	Calculated Permeability (m/s)
BH12	Clay and underlying weathered shale	2.2×10^{-7}
BH16	Clay and underlying weathered shale	7.1×10^{-9}

6. Conceptual hydrogeological model

The site is predominantly underlain by Ashfield Shale and Laminite. The hydrogeology at the site can be characterised by the following:

- Ephemeral seepage or 'perched' groundwater, expected to occur within the fill, higher permeability layers within the natural soils (e.g., clayey sand), and along the top of rock, particularly following periods of rainfall or due to human influences such as stormwater runoff and irrigation. Some ephemeral seepage may also migrate through defects within the rock; and
- Groundwater sources at the subject site are considered to be from water flowing downslope through the weathered rock profile from areas of higher topography. These sources are expected to respond to climatic and weather variations, which would be expected to be reflected by natural fluctuations in groundwater levels.

It should also be noted that fractured zones (i.e., sheared zones, faulting and fragmented rock) have been encountered within the laminite at varying depths and may lead to zones of higher permeability rock than indicated by the permeability test results.

7. Groundwater inflow assessment

7.1 Numerical modelling methodology

Seepage modelling was undertaken to assess the potential inflow rates into the proposed excavations during and after construction, as well as induced groundwater level changes in adjacent and surrounding areas.

A 2-dimensional (2D) numerical groundwater model was developed. The modelling was carried out using the 2D finite element hydrogeological software SEEP / W (a component of GeoStudio) developed by GEOSLOPE International Ltd. The transient conditions due to construction dewatering of the excavation were modelled in the analysis.

7.2 Model geometry and layers

A cross-section was selected across the proposed sports centre basement and aquatic centre excavations. Its location is shown on Figure 1.

The subsurface aquifer system surrounding and beneath the proposed development was simulated as a multi-layered numerical model, to represent the site subsurface conditions based on site investigation data and to allow simulation of the vertical flow components.

The model boundaries were extended 100 m from the northern edge of the sports centre basement and the southern edge of the aquatic centre excavation.

The SEEP/W results are based on a 2D model, which assumes the excavation is much longer than its width and provide seepage rates per unit metre. For the analysis, the excavation was assumed to have an approximately rectangular configuration with an effective width of about 61 m (B) and a length of about 35 m (L) for the sports centre basement and an effective width of 26 m (B) and a length of about 24 m (L) for the aquatic centre pool.

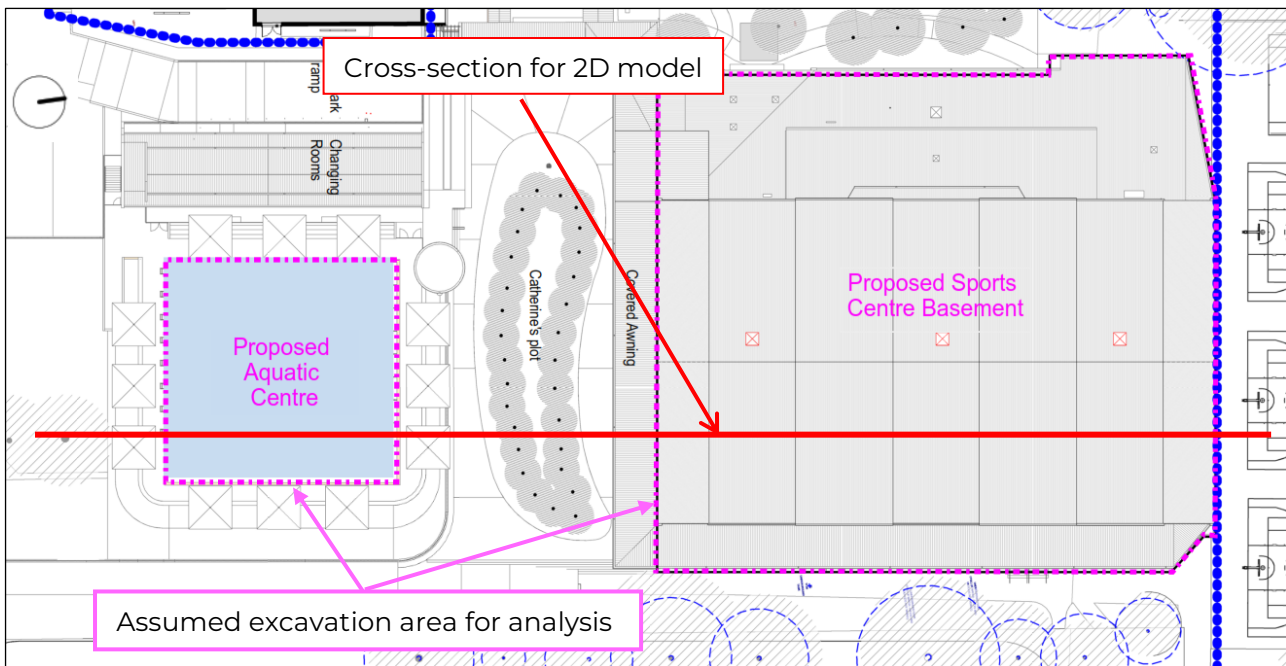


Figure 1: Cross-section for 2D modelling

The hydrogeological units were simulated as two layers. Adopted hydraulic properties (base case) are presented in Table 3. Parameters were selected based on the results of the hydraulic conductivity testing (Section 4.3), ranges of values documented in the available literature for similar lithologies (e.g., Fetter 1994 and Hoek & Bray 1981) and previous experience with similar materials.

Table 3: Model layers and adopted hydraulic properties (base case)

Layer	Material	Saturated Kh (m/s)	Anisotropy ratio (Kv/Kh)	Effective porosity (%)	Material model adopted
1	Fill / Residual clay	1×10^{-7}	1.0	30	Unsaturated / saturated
2	Shale	1×10^{-7}	1.0	10	Unsaturated / saturated

Notes to table:

Kh: Horizontal hydraulic conductivity

Kv: Vertical hydraulic conductivity

7.3 Initial groundwater elevation and boundary conditions

7.3.1 Initial groundwater elevation and boundary conditions

The model adopted an upstream constant head boundary at RL 21 AHD and a downstream constant head boundary at RL 10 m AHD. These boundary conditions were selected to replicate groundwater levels observed below the site. The model boundaries were extended 100 m from the northern edge of the sports centre basement and the southern edge of the aquatic centre.

As the proposed development is located within a residential setting with limited vegetated areas and clayey soil profile, a net rainfall infiltration rate of 1% was assigned as water influx over the ground surface.

Recharge could also possibly be occurring from anthropogenic sources, such as seepage from leaking water mains. Loss of water from the aquifer may be occurring due to extraction activities from nearby properties, together with natural discharge into water bodies. Water loss from the aquifer to the atmosphere through evapotranspiration (e.g., from vegetation at the surface, above the aquifer) is considered and combined with the effective recharge value adopted.

7.3.2 Design and dewatering

The proposed excavation faces were simulated as 'Seepage Faces' in SEEP / W with zero hydraulic pressure head along the full height i.e. a drained basement. The subsoil drainage and the sump were simulated by a horizontal boundary condition of 'zero hydraulic pressure head'.

The deepest proposed floor finished level (FFL) for the proposed excavation is approximately RL 16.6 for the sports centre basement. Douglas has assumed the bulk excavation level will be approximately RL 16 for the basement and RL 17.7 for the aquatic centre. The model set-up is presented in Figure 2 below.

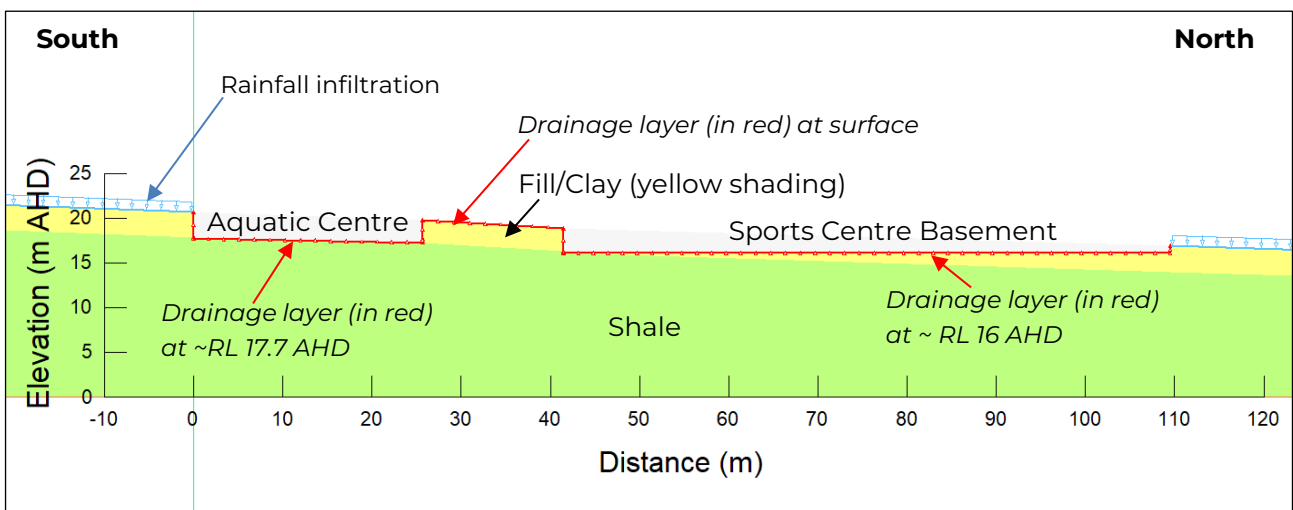


Figure 2: Model geometry and geological units

7.4 Simulation

To simulate the temporary dewatering required during construction, transient flow conditions were modelled in the analysis. For the purpose of the analysis, excavation was undertaken in a single stage (i.e., instantaneously) and the subsequent temporary dewatering period was assumed to be up to one year, subdivided into multiple time intervals.

The analysis was also run under 'steady state' conditions to assess long-term groundwater inflows (i.e., assuming permanent drained conditions, after construction).

7.5 Sensitivity analyses

Two sensitivity analyses were run to assess groundwater inflows under higher hydraulic conductivity and higher groundwater level conditions:

- Sensitivity 1: The hydraulic conductivity of Layer 2 (i.e., Shale as defined in the geotechnical model) was increased to 1×10^{-6} m/s; and
- Sensitivity 2: The water table is 1 m higher than under base case conditions.

7.6 Groundwater modelling results

7.6.1 Predicted groundwater inflow

The inflow rates obtained from the modelling represent the estimated total rate of groundwater flowing into the excavation and the volume (per unit time) requiring extraction via the dewatering system, in order to dewater the basement and aquatic centre excavation during and after construction.

The estimated inflows from the analysis for the first year (i.e., during construction) and long term are summarised in:

- Table 4, for the base case scenarios as detailed in previous sections; and
- Table 5, for the sensitivity analysis.

Table 4: Simulated inflow results for baseline cases

Elapsed time	Baseline case – predicted inflow			
	Aquatic Centre		Sports Centre	
	L/day	Cumulated (ML)	L/day	Cumulated (ML)
1 day	1,960	0.00	2,660	0.00
3 days	1,358	0.01	1,843	0.01
6 days	1,117	0.01	1,517	0.01
11 days	919	0.01	1,247	0.02
21 days	697	0.02	946	0.03
37 days	515	0.03	699	0.04
67 days	364	0.05	494	0.06
118 days	280	0.06	379	0.08
207 days	215	0.08	292	0.11
365 days	170	0.11	231	0.15
Long term	L/day	ML/year	L/day	ML/year
	102	0.04	139	0.05

Table 5: Simulated long term inflow results for sensitivity cases

Long term inflow	Aquatic Centre				Sports Centre			
	Higher k		Higher GWL		Higher k		Higher GWL	
	L/day	ML/year	L/day	ML/year	L/day	ML/year	L/day	ML/year
	499	0.18	141	0.05	677	0.25	192	0.07

Notes to table:

k: permeability

GWL: groundwater level

The results of the groundwater inflow analysis indicate that under both baseline and sensitivity hydrogeological conditions, inflows are predicted to be very low. It is noted that the precision to which the results are presented does not represent the accuracy of the predictions, the level of precision is provided to allow comparison of scenarios, the accuracy will be lower because of the inherent variability in key parameters such as hydraulic conductivity and recharge and results could range up to an order of magnitude, in which instance the flows would still be well less than 3 ML/year.

It should be noted that these volumes are 'estimates' of the average inflows. It is possible that localised zones of higher permeability may be present within the site, through which the rate of inflow could be higher, and considering the subsurface heterogeneity and fractured aquifer system, a safety margin for application in the field should be considered. Accordingly, it is recommended that a 'factor of safety' of at least 2 be applied to these values for design purposes and that inflow rates be monitored during excavation and construction.

It should be noted that the simulated dewatering rates and drawdown are dependent on the dewatering scheme adopted for the site. If the depth of excavation levels and dewatering systems were to change then the currently predicted dewatering rates may change, in which case further modelling would be required.

7.6.2 Drawdown

Based on the results of the geotechnical investigation, the groundwater drawdown is expected to occur mostly within the bedrock. Due to the stiffness of the rock, settlements on adjacent structures due to the drawdown in such rock would be expected to be negligible. Similarly, drawdown on any nearby GDEs would also be negligible.

8. Potential risks associated with dewatering

8.1 Aquifer interference policy consideration

The NSW Aquifer Interference Policy (AIP) indicates that the term "aquifer" is commonly understood to mean a groundwater system that is sufficiently permeable to allow water to move within it, and which can yield productive volumes of groundwater. A groundwater system is defined as any type of saturated geological formation that can yield low or high volumes of water. However, for the purpose of the AIP, the term aquifer has the same meaning as groundwater system and includes low yielding and saline systems.

Table 1 in Section 3.2.1 of the AIP outlines minimal impact considerations. The AIP indicates that “if predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable”. The following minimal impact considerations are outlined for less productive porous and fractured rock groundwater sources:

- Less than or equal to 10% cumulative variation in water table 40 m from any high priority GDE or high priority culturally significant site;
- A cumulative pressure head decline of no more than a 2 m at any water supply work; and
- Any change in groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.

8.2 Risk assessment

An assessment of the potential effects of dewatering on neighbouring properties and groundwater receptors has been summarised in Table 6.

Table 6: Assessment of potential impacts of dewatering

Item	Comment
Impacts on potential GDEs	There are no potential GDEs mapped within 500 m of the site. Impacts are therefore considered unlikely.
Water supply losses by neighbouring groundwater users	A review of registered bores within a 500 m radius to the surrounding site was undertaken. The search identified no groundwater bores for domestic use (Section 3.6).
Potential subsidence of neighbouring structures	Groundwater drawdown is predicted to mostly occur within the rock units. Therefore, risk of subsidence due to lowering of the water table is expected to be negligible.
Mounding of water upgradient of structure	As the basement and aquatic centre is proposed to be drained, mounding of groundwater is not expected upgradient of the site.

9. Conclusion

The geotechnical investigation identified that the site is underlain by fill and clay over relatively shallow very low to low strength shale to medium strength moderately weathered to fresh shale at greater depths.

The proposed FFL of the basement is approximately at RL 16.6 and RL 18.18 for the aquatic centre pool. It is therefore expected that the excavation will intersect the water table, only marginally. The measured groundwater is expected to be associated with perched seepage which may increase during wet periods and may reduce, or not exist at shallow depths during dry periods.

Groundwater modelling undertaken for the project predicts that groundwater inflow rates during construction will be low (probably about 0.3 ML/year). It is estimated to be approximately 0.12 ML per year for drained conditions in the long term but potentially reaching flows of up to an equivalent of 0.3 ML per year at times. This prediction is an estimate based on the information available; actual flow rates may vary from these and will only be known once the excavation is complete and inflow rates can be measured.

Given that the predicted temporary and long-term inflow is less than 3 ML/year, and the purpose of dewatering is for construction and ongoing drainage, the proposed excavations are expected to be eligible for a Water Access Licence exemption, subject to the ongoing measurement and reporting required to claim the exemption.

From a geotechnical point of view, it is considered that drained basements are feasible without any significant impact to surrounding properties. In addition, the use of a drained basement is not considered likely to influence any GDEs or groundwater supply works in accordance with the AIP minimal impact considerations.

Construction of a drained basement will be subject to review and approval from the relevant authorities.

10. References

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia New Zealand Environment Conservation Council.

ANZECC. (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australia and New Zealand Environment and Conservation Council.

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Canberra, ACT: Australian and New Zealand Governments and Australian state and territory governments.

Hvorslev, M. J. (1951). *Time Lag and Soil Permeability in Groundwater Observations*. Bulletin No 36, Vicksburg, Mississippi: Waterways Experiment Station, Corps of Engineers, US Army.

LandCom. (2004). *Managing Urban Stormwater: Soils and Construction, Volume 1 ("Blue Book")*. 4th Edition, March 2004: LandCom, New South Wales Government.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NHMRC. (2008). *Guidelines for Managing Risks In Recreational Water*.

NHMRC, NRMMC. (2022). *Australian Drinking Water Guidelines 6 2011, Version 3.7*. Canberra: National Health and Medical Research Council, National Resource Management Ministerial Council.

Wilson, G. M. (1983). *Sydney 1:100,000 Geology Sheet*. NSW, Australia: NSW Department of Mines.

11. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 84, 86 and 90-98 The Bouldevarde, Strathfield NSW in line with Douglas' proposal dated 6 November 2024 and acceptance received from Eleanor Hassell of Peir Property Corporation on behalf of Santa Sabina College dated 21 November 2024. The work was carried out under Douglas' Engagement Terms. This report is provided for the exclusive use of Santa Sabina College for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and / or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and / or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and / or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical and groundwater components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Notes About This Report

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at

the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Drawings



LEGEND

- Cored Borehole and Ground Water Monitoring Well
- Borehole
- Test Pit
- Cored Borehole
- Cross Section
- Approximate Site Boundary
- Proposed Aquatic Centre
- Proposed Basement
- Proposed Car Park Ramp
- Proposed Changing Rooms
- Proposed Sports Centre

REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
0	INITIAL ISSUE	21.01.2025	MN/EC

SCALE: 1:1500 @ A3

Douglas
PARTNERS

OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02)9809 0666

CLIENT:
Santa Sabina College

NOTE:
1: Basemap from metromap (Dated 20.09.2024)
2: Proposed outlines from M3architecture, Drawing No's. 22009/sd A-200001/1 & 23009/sd A-040001/2(Dated 26.06.2023 & 10.12.2023)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 56

PROJECT NAME:
Sports and Aquatic Centre

PROJECT ADDRESS:
84, 86 and 90-98 The Boulevard, Strathfield

DRAWING TITLE:
TEST LOCATION PLAN

PROJECT NO:
224188.00

DRAWING NO:
1

REVISION:
0

Appendix C

Hydraulic Conductivity Results

Permeability Testing - Rising Head Test Report

[illegible]

Permeability Testing - Rising Head Test Report

[illegible]