

24 December 2021

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The Registrar
PLANNING AND ENVIRONMENT COURT

HOFFMANN v GOLD COAST CITY COUNCIL & ORS P&E COURT APPEAL No 137 OF 2020 GROUNDWATER REPORT

1 INTRODUCTION

- 1 On 24 April 2018, Michel Group acting on behalf of Graeme Hoffmann and Chuda Kaewmongkhon as trustee for the Hoffmann Drilling Pty Ltd Superannuation Fund [**Hoffmann**] made application to Gold Coast City Council [**Council**] for a Development Permit for Material Change of Use for Extractive Industry (Commercial groundwater extraction) on land located at 263 Repeater Station Road, Springbrook. The land is described more particularly as Lot 36 on SP 139816.
- 2 By Decision Notice dated 12 December 2019, Council refused the development application, citing a number of reasons for refusal, including the following which are relevant to groundwater hydrology:
 - 1 ***The development does not support and promote the Strategic framework in that:***
 - a ***The potential short and long term impacts associated with the proposed use have not been adequately demonstrated. Therefore, the potential for the proposed use to significantly impact upon the environmental features of this area and natural processes cannot be determined at this stage.***
 - 2 ***The development does not achieve the Purpose, Overall outcomes and Performance outcomes of the Environmental significance overlay code in that:***
 - a ***The proposed use does not comply with the Purpose 8.2.6.2(1) of the Environmental significance overlay code as it has not been adequately demonstrated that the proposed use will not impact upon matters of environmental significance.***
 - e ***The proposed use does not comply with Performance outcome 13 and 17 of the Environmental significance overlay code as the short and long term environmental impacts of the proposed groundwater extraction have been unable to be adequately established. It is consequently unknown if the proposal will impact downstream environments including koala trees.***
 - 3 ***The development does not comply with PO5 of the Water resource catchment overlay code. The potential impacts on environmental features and natural processes, including riparian vegetation, have not been adequately demonstrated.***

Therefore it cannot be determined that the proposal provides for the protection, maintenance, management and rehabilitation of riparian areas adjacent to waterways.

6 The development does not achieve the Purpose, Overall outcomes and Performance outcomes of the Extractive industry development code in that:

a The proposed use is not considered to comply with the purpose and performance outcome 1 of the Extractive industry use code. As the potential short and long term impacts of the proposed use on matters of environmental significance have been unable to be accurately established, it is unknown if the proposed use minimises environmental impacts on the site and surrounding areas.

While these reasons for refusal are broad, they were summarised as follows in the groundwater Joint Experts Report (JER) prepared in October 2020 in relation to this matter:

- Council alleges that the potential environmental effects of the proposed groundwater extraction have not been suitably considered and accurately determined in the technical information submitted in support of the application. Relevant matters which could be affected by the extraction include the ecology of the local area (more specifically any flora which may be groundwater dependent) and surface flows within the two water supply catchments in the area, namely the Nerang River and Little Nerang Creek.

3 Thynne Macartney Lawyers, acting on behalf of Hoffmann, lodged a Notice of Appeal with the Planning & Environment Court on 17 January 2020 (No 137 of 2020), seeking the refusal to be overturned.

4 Following the lodgement of the Notice of Appeal, Catherine Ash, the Australian Rainforest Conservation Society [ARCS], Gecko Environmental Council Association Inc, Bernie Winter and Gina Winter, and Charles Orsini all elected to become Co-respondents to the Appeal, having been submitters to the application.

5 Thynne Macartney subsequently appointed Dr Trevor Johnson of SLR Consulting to provide relevant water engineering advice to the Court in relation to this matter on behalf of Hoffmann.

6 I state that I am a civil engineer with over 44 years of experience in the fields of urban development, hydraulics, water quality and engineering infrastructure. I hold the degrees of Bachelor of Engineering (Honours), Master of Engineering Science and Doctor of Philosophy, all in civil engineering from the University of Queensland. I am a Fellow of the Institution of Engineers Australia as well as a Registered Professional Engineer Queensland (RPEQ) and an Adjunct Associate Professor in the School of Civil Engineering at the University of Queensland. From 1996 to 2015, I was a Director of the international consulting engineering company Cardno Ltd. I am currently employed as a Technical Director with SLR Consulting. My Curriculum Vitae is attached in Appendix A for the Court's review.

7 In preparing this report, I have relied on the following information:

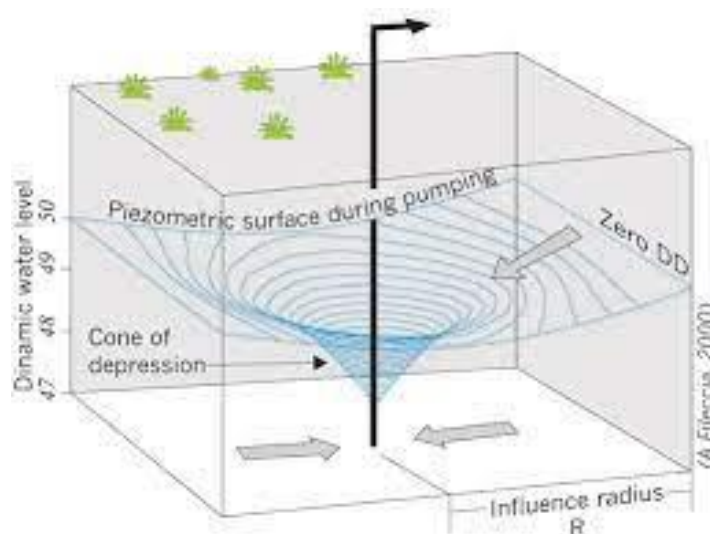
- Site inspection completed in October 2020
- Briefing information provided by Thynne Macartney
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8 In accordance with the requirements of Rule 33 of the Planning and Environment Court Rules 2018 and Rule 428 of the Uniform Civil Procedures Rules 1999, I declare that:

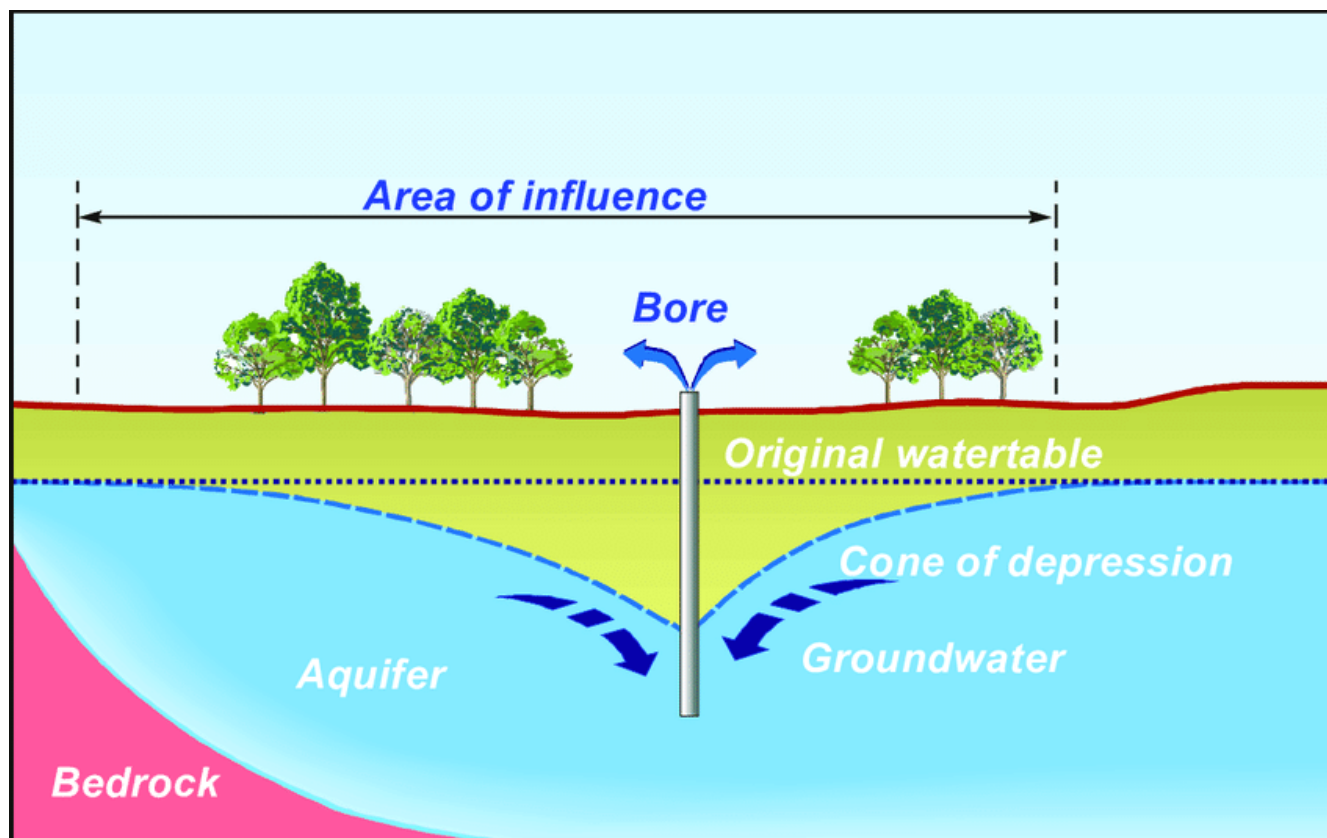
- I have not been given, or accepted, any instructions to reject or adopt any particular opinion in preparing this report.
- The factual matters stated in this report are true to the best of my knowledge.
- I have made all inquiries which I believe to be appropriate,
- The opinions stated in the report are genuinely held by me
- No matters of significance which I regard as relevant have, in my knowledge, been withheld from the court.
- I have been instructed on an expert's duty to the Court, understand that duty, and have discharged it in the preparation of this report.

2 THE JOINT EXPERTS REPORT

- 9 A relevant Joint Experts Report (JER) on groundwater issues was prepared by me, Tony McAlister of Water Technology (acting for Council) and Dr Matthew Currell of RMIT (acting for the Australian Rainfall Conservation Society) in October 2020. The JER was characterised more by the number of Points of Disagreement than any other matter. In my opinion, these Points mostly related to the stated expectation of the other two experts that a much more detailed and comprehensive groundwater investigation was required to determine the likely impacts of the proposed development. I do not agree with this premise and will explain why in the following sections.
- 10 The application here is not an academic exercise to determine all of the likely parametric behaviours of an existing aquifer. It is the responsibility of the applicant to complete sufficient investigations on all matters to demonstrate that the proposed water extraction will not have unacceptable adverse impacts. It is neither required nor necessary that this investigation extend beyond what is required to adequately prove this point.
- 11 In that respect, I initially caused a water balance investigation to be undertaken to estimate the likely impact of the extraction of water on the total aquifer underlying the extraction point. There is agreement between the experts that the aquifer that Hoffmann is extracting water from has a top level of about 830 m AHD. It is noted that subsequent ecological investigations carried out on site showed the presence of groundwater dependent plant species at around this level on the subject site. It is clear from the precinct geology and from previous investigations for other water extraction sites nearby that the aquifer is founded in fractured vesicular volcanic basalt. I acknowledge that the productivity of aquifers founded in fractured rock strata will be dependent upon the extent of the fracture planes and connectivity of cracks, and that this aquifer is significantly more likely to be composed of a large number of localised precincts rather than being contiguous in a permeability sense.
- 12 Notwithstanding this fact, it remains my view that the water balance analysis demonstrated that the volume of proposed water extraction represented only a very minor proportion of the total volume of water likely to be held in the aquifer, and further, that the extraction would produce virtually undetectable changes in water level in the broader aquifer (ie other than in close proximity to the extraction point). In that regard, I provide the following sketch which shows how pumping extraction impacts on the phreatic surface which is the upper surface of the aquifer.



- 13 The extraction forms what is known as a cone of depression. The deviation of the surface of the cone (designated as the pumped piezometric surface in the above sketch) from the pre-extraction horizontal phreatic surface represents the rate of extraction from the aquifer. The higher the rate of extraction, the greater the drawdown level at the bore site, and the greater the radius of the cone. With increasing distance from the bore (ie increasing radius of the cone), the phreatic surface approaches the original watertable level asymptotically until, at some point, the two lines are indistinguishable from each other. This point defines the area of influence of the bore, such that outside this area, there is no impact on the pre-pumping watertable level.



- 14 In effect, the bore is drawing in water from the maximum radius of the cone such that the reduction in watertable level at the extent of influence is insignificant. Outside of the zone of influence, the only impact of bore extraction is low (and decreasing with further distance from the bore as the zone of extraction gets larger) velocity flow radially towards the bore. Provided that the long-term extraction rate is below the recharge rate to the aquifer (which was demonstrated by the water balance modelling), then there will be no long-term reduction in water level in the aquifer outside of the area of influence. There will of course be diurnal, monthly and annual variation in the level of the aquifer based on rainfall and climate impacts.
- 15 Consequently, if it can be demonstrated by measurement of groundwater level that the area of influence is restricted to the property itself, then there can be no adverse impact on any external user. However, there will be impacts within the property which may be relevant in the context of environmental use, and particularly the presence of groundwater dependent ecosystems (GDEs).

- 16 On this basis, I then directed that a bore pump test should be undertaken on site, and the impact on groundwater levels measured by continuous monitoring. This work was carried out by Douglas Partners which had contributed relevant technical support and information to the original development application in relation to groundwater. The pumping rate was 0.5 L/s, which is the proposed extraction rate specified in the development application.
- 17 Continuous level recorders were placed in the extraction bores, and in monitoring bores located north and south of the extraction point. The results of this modelling were outlined in my letter of 5 May 2021 to Thynne Macartney which is attached in Appendix B to this report. The location of the pumping and monitoring bores are shown on the following plan.

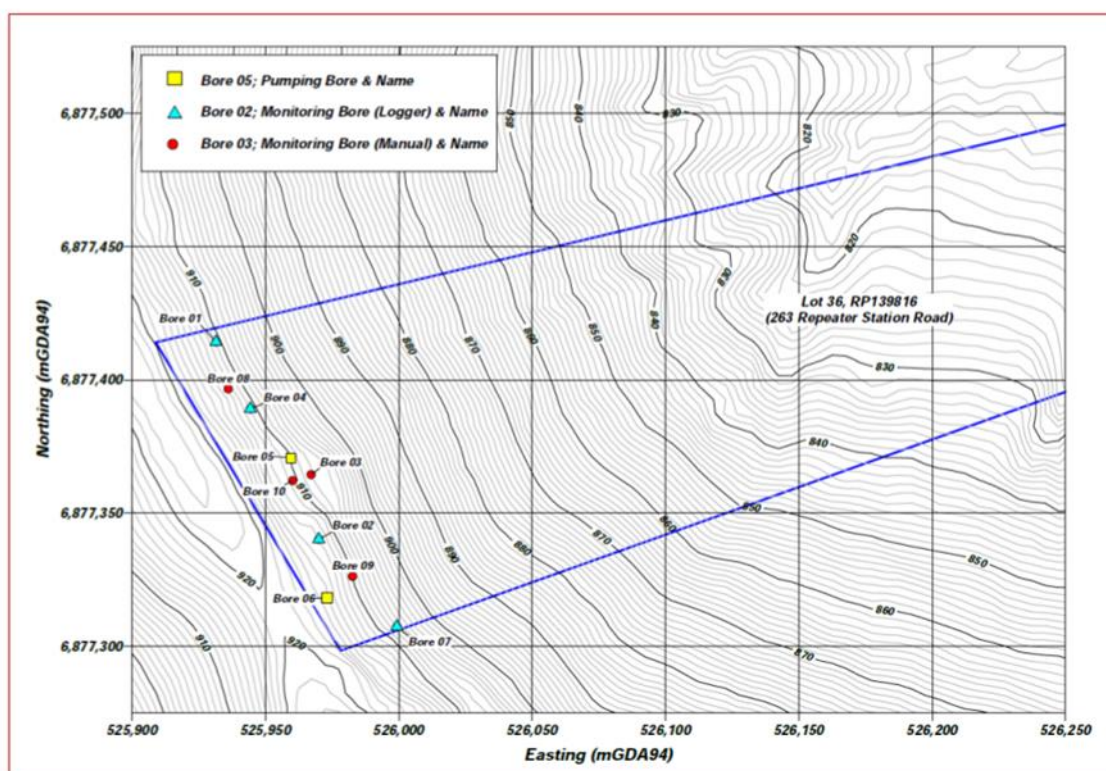


Figure 1: Locations of Production (Pumping) and Monitoring Bores at 263 Repeater Road

- 18 The results from the pump test are shown in the following graph. Over the first two days of pumping, extraction from the pumping bores resulting in virtually no change in water level at monitoring locations Bore 01 (at the northern boundary of the site) and Bore 07 (at the southern boundary of the site). Rainfall then interfered with the test, causing an increase in the groundwater level on the site. However, the results during the rainfall period are still instructive. As I had stated in my original report on the water balance modelling, and based on experiences on other nearby sites, it was expected that there could be quite significant increases in groundwater level following rainfall. This is evident in the results from Bores 01 and 05. However, the other monitoring bores showed only slight increases.

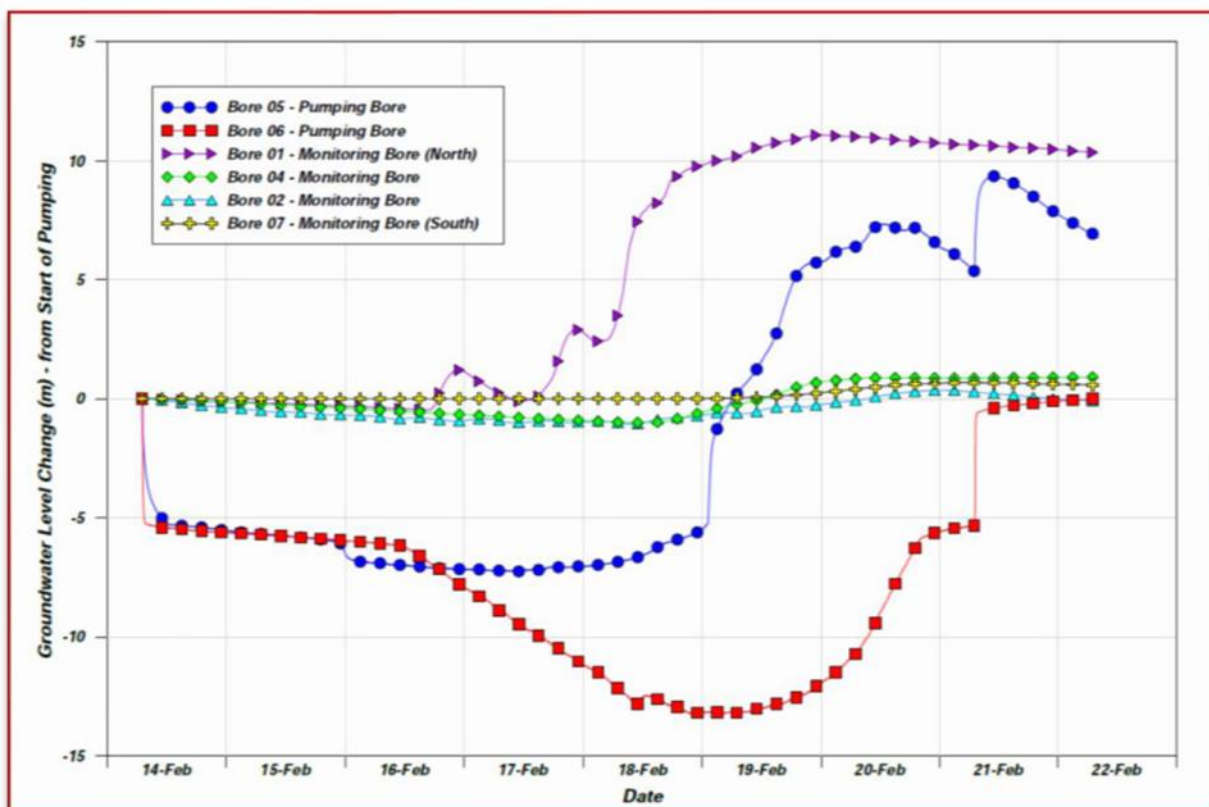
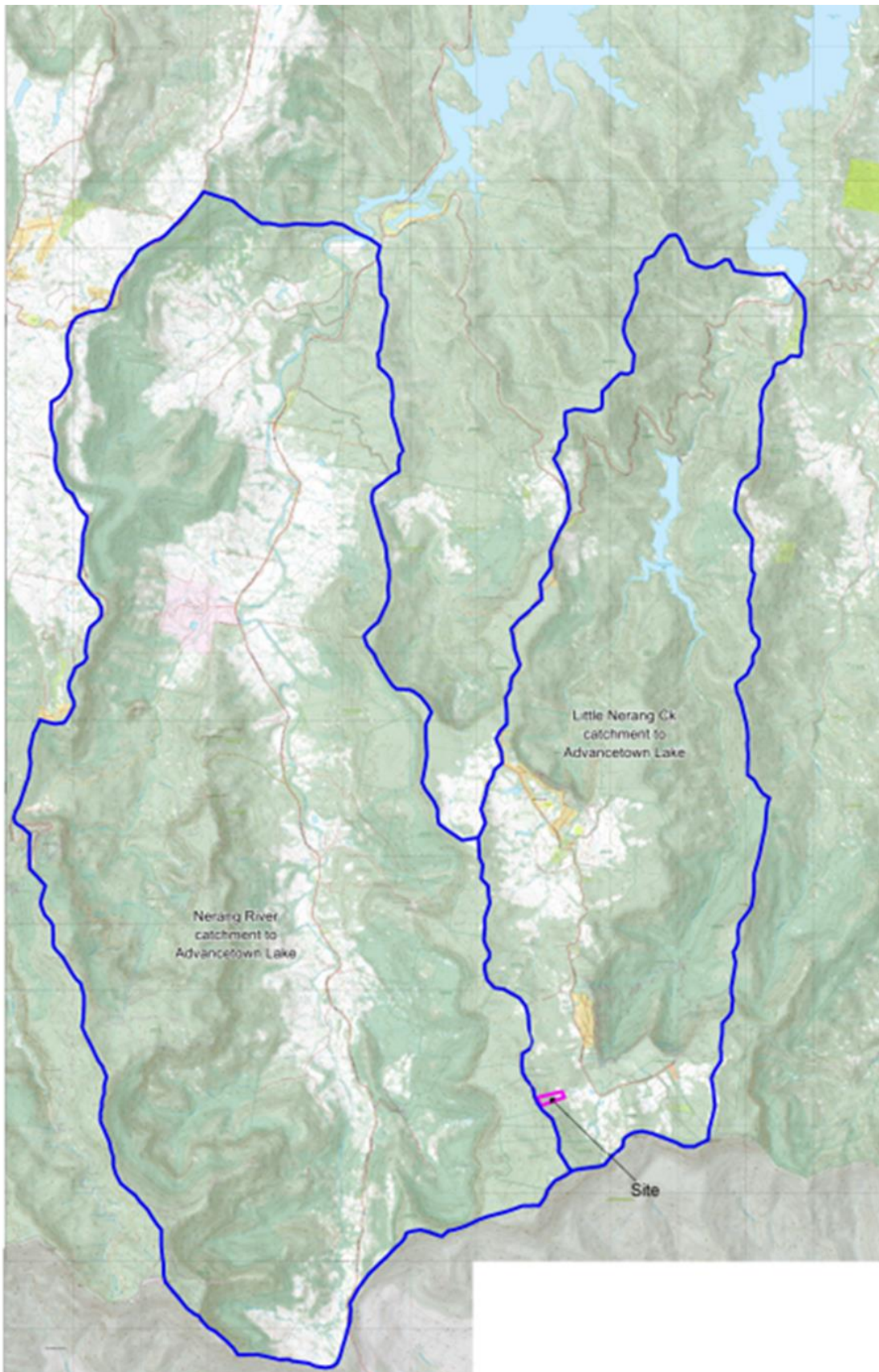


Figure 2: Groundwater Levels recorded in Production (Pumping) and Monitoring Bores over the Period 14 to 22 February (inclusive).

- 20 This is indicative of significant compartmentalisation within the aquifer, which is again expected in a fractured rock aquifer. It is likely on the basis of this information that the extraction on this site is occurring from localised zones which are connected peripherally to the extents of the wider aquifer. As water is extracted from the localised zones, it is replenished slowly from the surrounding aquifer, but is much more likely to be replenished regularly from rainfall occurring on the site itself. In that respect, the proposed operation is mostly extracting seepage from rainfall which falls directly on the site. The site has an area of 41,520 m². Assuming (conservatively) that the annual rainfall on this site is 2,500 mm, the total volume of precipitation falling on the site is about 100 ML/annum. Assuming (conservatively) that only 20% of this rainfall presents as seepage, the flow to the aquifer on this site alone is 20 ML/annum. In comparison, the extraction rate is 16 ML/annum. The operation is therefore sustainable on this site on a water balance basis.
- 21 As I have noted in the letter of 5 May 2021, there is no requirement to study the aquifer system in detail over a period of years to determine whether the proposed extraction is acceptable or not. On the basis that the extraction causes no significant change in water level in the aquifer at the northern and southern boundaries of the site, it can reasonably be concluded that there will be no unacceptable impacts on groundwater external to the site.

- 22 On the basis of the pump test, it is likely that the area of influence from the extraction bore has a radius of significantly less than 100 m. It is my understanding from Wayne Moffitt, expert ecologist acting on behalf of Hoffmann, that any groundwater dependent ecosystems on this site are located at around the 830 m AHD contour line, which is more than 100 m east of the extraction location. I was on site with Mr Moffitt when he identified the GDE location at around that ground level on the eastern part of the land. Consequently, I believe that I can reasonably conclude that water from the aquifer will continue to be available to the nominated GDEs at the same level if extraction pumping is undertaken.
- 23 Importantly, I note that any approval for this development application will include detailed groundwater level monitoring requirements. With the addition of one further monitoring location (downslope of the extraction location at around the 830 m AHD level), I consider that the existing monitoring bore locations will be adequate to allow immediate determination of whether pumped extraction is having any unacceptable adverse impacts on watertable levels. A requirement to continuously monitor the groundwater level on the site will provide detailed real-time information as to the aquifer behaviour. If long-term extraction creates any adverse impacts, they will be readily detected and actionable.
- 24 Finally, I note that the approach of the other groundwater experts on this matter is summarised by their opinions that the proposed extraction of water from this aquifer will have significant adverse impacts on ecology, spring behaviour and environmental flows to the Nerang River and Little Nerang Creek. In my opinion, this is a simple matter which has been sought by others to be made unnecessarily complicated. I have already demonstrated that:
- The annual volume of water to be extracted from the aquifer is less than the average volume of seepage taking place on this site alone.
 - Extraction at the rate proposed has no adverse impact on existing (pre-pumping) groundwater levels at the northern and southern boundaries of the site, and the cone of depression has a radius of significantly less than 100 m. Hence there is unlikely to be any measurable change in groundwater level in the vicinity of the 830 m AHD ground level where the aquifer has some surface expression, and supports a number of GDEs. There will be no impacts on groundwater levels and behaviour external to the site.
 - There is no requirement to consider cumulative impact since it is clear that the effects of this extraction proposal do not manifest beyond the boundaries of the site.
- 25 A map of the catchment areas of the surface streams in this locality is presented following. The location and size of the lot on which extraction is proposed is shown in the southern half of the map. Local extraction has been shown to have no adverse impacts external to the subject site. The subject site is clearly an insignificant proportion of the catchment areas, and will have no measurable impact on the available water volume yield from those catchments.



3 CONCLUSIONS

- 26 In its refusal of this application, Council has contended that the operation of the water extraction business on this site would have adverse impacts on ecology, riparian vegetation and the hydrology of those catchments which flow to Hinze Dam. In reality, the application is for the extraction of a relatively minor volume of water from a major aquifer system in the wettest part of south-east Queensland.
- 27 It is obviously important and necessary that any proposal of this type is able to demonstrate that extraction of water does not cause any unacceptable adverse impacts, particularly on the wider environment external to the extraction site. However, it is not necessary that major long-term groundwater investigations be undertaken to achieve this outcome if lesser analyses can satisfactorily yield an acceptable outcome.
- 28 In this case, from the engineering point of view, the only relevant issue is whether extraction at the nominated rate will produce a lowering of groundwater levels which could then impact on either ecology or other users external to the site, including hydrologic environmental demand. Consequently, measurement of groundwater levels in monitoring bores during a pump test is a recognised and cost-effective way to predict impact without needing to understand the academic intricacies of a complex aquifer system.
- 29 Pumping from an unconfined aquifer produces a cone of depression with decreasing reduction in groundwater level with increasing radial distance from the pump, until the point is reached where the pumping is shown to cause no lowering of the pre-pumping phreatic surface. At this point, the bore is drawing from such a large circumference that there is no detectable change in the aquifer outside of the cone of influence other than a slow velocity towards the extraction point.
- 30 The pump and monitoring test undertaken on this site has demonstrated that the cone of influence has a radius significantly less than 100 m, and that there will be no impacts from extraction external to the property itself. Further, the annual volume of extraction is less than the volume of seepage into the aquifer on this site alone., so the extraction will not have any long term non-sustainability impacts. Lastly, there will be no measurable change in groundwater level at the 830 m AHD ground contour level where GDEs have been noted.
- 31 It can reasonably be concluded that the development will not cause the unacceptable adverse impacts alleged by Council in its reasons for refusal. There is no hydrologic reason why the development should not be approved.

Yours sincerely

A handwritten signature in black ink, appearing to read 'T. Johnson', is positioned between two horizontal green lines.

DR TREVOR JOHNSON
Technical Director

CURRICULUM VITAE



DR TREVOR JOHNSON

TECHNICAL DIRECTOR

Water Advisory, Asia Pacific

QUALIFICATIONS

BE (Hons)

Bachelor of Engineering (Hons)

MEngSc

Master of Engineering Science

PhD

Doctor of Philosophy

EXPERTISE

- Urban Development
- Hydraulic Analysis and Design
- Environmental Assessment Preparation
- Flood Management
- Urban Water Quality
- Engineering Infrastructure
- Expert Witness Services

Trevor Johnson is a specialist civil engineer with over 42 years of experience in the fields of urban development, hydraulics, water quality and engineering infrastructure. He holds the degrees of Bachelor of Engineering (Honours), Master of Engineering Science and Doctor of Philosophy, all in civil engineering from the University of Queensland. Trevor is a Fellow of the Institution of Engineers Australia as well as a Registered Professional Engineer Queensland (RPEQ) and an Adjunct Associate Professor in the School of Civil Engineering at the University of Queensland. From 1996 to 2015, he was a Principal Engineer and Executive Director of the international consulting engineering firm Cardno. In his role as a General Manager within the group, Trevor was responsible for technical development within the entire Cardno operation, which at its peak, had over 8,000 staff worldwide and a turnover in excess of \$1 billion.

Since his retirement from Cardno, he has operated as an independent civil engineering expert providing advice to clients in both the public and private sectors. For the past 30 years, Trevor has been one of the foremost civil engineering experts in the Queensland legal system, where he has been commissioned on more than 500 separate occasions to provide expert testimony in the Planning and Environment Court, the Land Court and the Supreme Court. He has also worked on several occasions in the NSW Land and Environment Court.

PROJECTS

Pembroke Mine

Land Court Appeal in Respect of Impacts of Coal Mine on Water Resources

Twin Waters West

Development Application and Court Action for Major Urban Development Project

Wellcamp Airport

Wellcamp Airport Infrastructure Charging Appeal in Toowoomba

Ballina Cumbalum Ridge

Court Action for Ballina Shire Council re Major Urban Development Approval

TradeCoast

Compensation Claim re Gateway Motorway Resumptions

Abbott Point Coal Terminal

Queensland Government Environmental Prosecution

Parklake Central

Development Application for a Master Planned Lake Development in Sunshine Coast

Skennars Head

Court Action for Ballina Shire Council

Brisbane Valley Rail Trail

Queensland Government Defence against Compensation Claim

Palm Lakes Ballina	Court Action for Ballina Shire Council
Yarralea Contaminated Water	Action for Compensation re Agricultural Water Contamination
Cooloolum Surf Park	Development Application for Kelly Slater Surf Park on the Sunshine Coast
Willowbend	Development Application for Master Planned Development in Townsville
Wynnum Manly Club	Flood Studies and Approval for Proposed Expansion of Leagues Club in Brisbane
Fairfield Central Flooding	Assessment of Flood Impacts in Townsville for 2019 Flood
Glencore Resumption	Flood Studies for Compensation Case re Resumptions for Townsville Port Road
Homeworld Helensvale	Shopping Centre Expansion Flood Studies and Court Action
Lantrak	Act for Queensland Government re Major Landfill Project in Ipswich
Cleanaway	Act for Queensland Government re Major Landfill Project in Ipswich
Austin BMI	Act for Queensland Government re Major Landfill Project in Ipswich
Yeerongpilly Green	Appeal against Infrastructure Charges
North Harbour Holdings	Appeal in respect of Master Planned Urban Development in Moreton Bay
Aurizon Property	Compensation Claim in respect of Port Road Resumptions in Townsville
Twin Waters	Twin Waters urban development project in Maroochydhore
Anzac Square	Determine Claim for Compensation re Burst Water Main
North East Business Park	North East Business Park Court Action
Horton Park Golf Club	Horton Park Golf Club relocation in Sunshine Coast
QLD Floods Commission	Provision of Services to the Queensland Floods Commission
Rainbow Shores	Rainbow Shores urban development project in Cooloolool
Pelican Waters	Pelican Waters Northern and Southern Lakes
UKI Urban Development	UKI Urban Village in northern New South Wales
Metroplex Westgate	Metroplex Westgate sewerage and drainage studies
Sippy Downs & Palmview	Sippy Downs and Palmview urban development project in Maroochy Shire
Bluewater Canal	Bluewater Canal Development in Cairns
Ripley Valley	Ripley Valley Master Plan
SALT	SALT urban development project in northern New South Wales
Casuarina Beach	Casuarina Beach urban development project in northern New South Wales

Tweed River	Tweed River Entrance Sand Bypassing Project
Seaside City	Seaside City urban development project in northern New South Wales
Isles of Newport Lake	Isles of Newport Lake Development in Redcliffe City
Hangzhou Ring Road	Environmental review of the Hangzhou Ring Road project in China
Peregian Springs	Peregian Springs urban development water quality analysis
Waterway Based Projects	EIS, water quality analysis and urban design for major urban waterway based projects throughout Queensland including sites at Maroochydore, Caloundra, Noosa, Bribie Island, Hope Island, Jacobs Well, Cairns, Innisfail, Gold Coast and Townsville
Technical Reports	Technical reports and investigations for public clients such as the Queensland Government and every local authority in the south-east corner of the state, as well as major development companies, and community groups and individuals
Railway Towns	Railway Towns Wastewater Treatment Strategy for Caloundra City Council.
MEMBERSHIPS	
Member	Registered Professional Engineer Queensland (RPEQ)
Fellow	Institution of Engineers Australia (FIEAust)
Member	CPEng
Member	Graduate of the Australian Institute of Company Directors Course (GAICD)
Member	Member SIA
Member	WEF
Member	Queensland Environmental Law Association