TECHNICAL MEMORANDUM

PROJECT NO.: WGA252149
DOCUMENT NO.: WGA252149-MM-HG-0001_B
DATE: 6 MARCH 2026

COMPANY NAME	Swordfish Projects Limited
ATTENTION	Briar Belgrave Barker and Associates
SUBJECT	Outline of Hydrogeological Assessment for Fast Track

1. PROJECT DESCRIPTION

The project for which a fast track application is being applied involves the consenting and construction of the proposed Awanui Links development

Awanui Links is a relatively flat, regular shaped section of land of approximately 116 hectares located within the Waikato District, adjacent to State Highway 1B and Holland Road.

Awanui Links is a comprehensively master planned, mixed-use development in the Waikato region that combines high end tourism, lifestyle living, retirement accommodation, and employment generating industrial land uses within a rural setting. Anchored by an 18 hole golf course, the development includes extensive visitor infrastructure, such as a clubhouse, pro shop, virtual golf centre, driving range, wellness centre, fine dining venue, hotel and event centre, and a café. Accommodation offerings comprise 10 large and 52 small luxury villas. The residential component includes 63 rural residential lots and a retirement village with a dedicated care facility. The project also features nine light industrial lots, a solar farm, landscaped open spaces, wetlands, and integrated infrastructure, delivering a destination that supports regional growth, tourism, housing diversity, and environmental resilience (Figure 1).

Figure 1: Awanui Links High-Level Masterplan

2. INTRODUCTION

The hydrogeological assessment is for the following activities at the Awanui Links site:

- General construction for excavations below the water table.
- The construction and ongoing operation of the stormwater management infrastructure.
- General construction activities involving excavations below the water table.
- The construction and ongoing operation of wastewater treatment and disposal infrastructure.
- The operation of production bores to supply domestic water, dust suppression, and firefighting for the development.

The site is underlain by a shallow groundwater table that is hydraulically connected to nearby surface water features, including streams and artificial drains on and around the site. As a result, a detailed hydrogeological assessment is necessary to ensure the potential effects of the proposed activities are appropriately understood and managed. Table 1 outlines the types of activities associated with infrastructure development that may impact groundwater and hydraulically connected surface water bodies.

The proposed activities are relatively standard for land development projects in the Hamilton area. Commonly used monitoring and mitigation measures could be used at the site, such as groundwater monitoring bores, changes to drainage methods, reductions in pumping rates, and reductions in hydraulic connections to reduce potential effects in sensitive areas.

Table 1: Activities which Require Resource Consent and Affect Hydrogeology

ACTIVITY	TECHNICAL ASSESSMENTS REQUIRED	INDICATIVE CONSENTS
Water Supply		
Abstraction of Groundwater for potable supply, dust suppression and firefighting	Groundwater/hydrogeology, including effects on surface waterbodies/wetlands, and other groundwater users.	Controlled activity under WRP Rule Section 3.
Stormwater Management Infrastructure		
Temporary and permanent diversion of surface water	Groundwater/hydrogeology, including effects on wetlands and settlement	Discretionary Activity under WRP Rule 3.6.4.13 Discretionary Activity under Regulation 54 of the NESFW
Permanent damming and diversion of groundwater (changes to groundwater flows resulting from the creation of the stormwater infrastructure)	Groundwater/hydrogeology, including effects on surface water bodies/wetlands, other groundwater users, mobilisation of contaminants, and settlement. The stormwater infrastructure may permanently lower the local water table, therefore requiring consent for a groundwater diversion.	Discretionary Activity under WRP Rule 3.6.4.13 Discretionary Activity under Regulation 54 of the NESFW
Temporary water takes during construction for dewatering/lowering of the groundwater table	Dewatering during construction to lower the groundwater table or maintain a dry environment within excavations may be undertaken using spears. The take will be classified as a groundwater take and will require an assessment of the effects on aquifer sustainability, other bore users, and surface water bodies (including wetlands), mobilisation of contaminants, and ecological and cultural effects.	Controlled activity under WRP Rule 3.8.4.7 (drilling) Discretionary Activity under WRP Rule 3.3.4.24 (groundwater take)

ACTIVITY	TECHNICAL ASSESSMENTS REQUIRED	INDICATIVE CONSENTS
Construction of specified infrastructure, including earthworks and clean fill disposal	Groundwater/hydrogeology, including effects on wetlands.	Discretionary Activity under Regulation 54 of the NESFW
Geotechnical and groundwater investigations	There will be a need to facilitate further groundwater and geotechnical investigation and monitoring to obtain additional information and to monitor the impact of the works on groundwater levels. This will occur prior to work, during work, and post-work.	Controlled Activity under WRP Rule 3.8.4.7 (drilling) Discretionary Activity under WRP Rule 3.3.4.24 (groundwater take) Controlled Activity under WRP Rule 3.6.8.2 (well and aquifer testing discharges)
Wastewater Treatment and Disposal Infrastructure		
Permanent damming and diversion of groundwater (changes to groundwater flows resulting from the creation of the wastewater treatment and disposal infrastructure)	Groundwater/hydrogeology, including effects on surface water bodies/wetlands, other groundwater users, mobilisation of contaminants, and settlement. The stormwater infrastructure may permanently lower the local water table, therefore requiring consent for a groundwater diversion.	Discretionary Activity under WRP Rule 3.6.4.13 Discretionary Activity under Regulation 54 of the NESFW
Temporary water takes during construction for dewatering/lowering of the groundwater table	Dewatering during construction to lower the groundwater table or maintain a dry environment within excavations may be undertaken using spears. The take will be classified as a groundwater take and will require an assessment of the effects on aquifer sustainability, other bore users, and surface water bodies (including wetlands), mobilisation of contaminants, and ecological and cultural effects.	Controlled activity under WRP Rule 3.8.4.7 (drilling) Discretionary Activity under WRP Rule 3.3.4.24 (groundwater take)
Construction of specified infrastructure, including earthworks and clean fill disposal	Groundwater/hydrogeology, including effects on wetlands.	Discretionary Activity under Regulation 54 of the NESFW
Treatment and disposal of wastewater	The potential effects of discharging treated wastewater will need to be assessed. This required assessment will need to assess effects on surface water bodies/wetlands and other groundwater users.	Controlled Activity under WRP Rule 3.5.7.5

3. HYDROGEOLOGICAL BACKGROUND

Awanui Links is located within the Hamilton Basin, a large tectonic basin centered on Hamilton City with an area of approximately 2,000 km^2 and traversed by the Waikato River. The basin is infilled with Tauranga Group alluvial sediments dating from the Pliocene to the middle Holocene, overlain by late Holocene unconsolidated alluvial and colluvial sediments.

The Tauranga Group sediments are up to 300 m thick and include gravels, sands, silts, muds and peats of fluvial, lacustrine and distal ignimbritic origin. The Hinuera Formation of the Tauranga Group underlies much of the Hamilton basin. This formation was deposited by braided river systems of the Waikato River, initiated by the supply of large volumes of sediment from volcanism in the Taupo Volcanic Zone (Petch, 1987). Underlying the low hills are older ignimbrites, tephra fall deposits and alluvium (Lowe, 2010). The Hinuera Formation contains the aquifers used most extensively for water supplies across the Hamilton Basin. Within this formation, the most productive aquifers consist of well sorted coarse sands and gravels. Discontinuous sequences of rhyolitic and pumiceous gravelly sands and gravels are interspersed with pumiceous silt, clay and peat layers. Lithological variability generally results in a number of zones of higher permeability within the formation rather than a single, continuous aquifer (Scholfield, 1972).

Regionally, the water table generally mirrors the topography of the basin, and groundwater flow is directed towards the Waikato and Waipa rivers. Groundwater discharges via incision into streams and rivers, which ultimately flow into these two major river systems before they exit the basin.

3.1 Local Hydrogeology

Available site data from the New Zealand Geotechnical databases is concentrated on neighbouring properties to the south of the site and within the rail corridor. These investigations included trial pits reaching depths of up to 1 m and CPTs to approximately 20 m. The CPTs indicated the water table was between 0.42 m below ground level (bgl) to 0.92 m bgl.

According to the Waikato Regional Council database, there are two bores on the Awanui Links site, reference numbers 69_1399 and 72_4357, which were drilled in 1982 and 2008, respectively. It appears that the newer bore (72_4357) has replaced the older bore (69_1399). The lithological log for 72_4357 is included in Appendix A and indicates that at the time of drilling, the static water level in the bore was 6 m bgl. According to the log, the underlying lithology of this area from the surface consists of peat to 1.3 m, which is underlain by silt to approximately 18 m where 6 m of pumice is encountered. Below the pumice are layers of silt and sand to the full depth of the bore at 42 m. The bore is screened in a sand layer between 35 m and 42 m bgl.

The site is within the Hamilton Basin North Aquifer Management Zone, and there is a consent to take up to 53.4 m^3/day of water associated with the current on site bore.

3.2 Nearby Water Users

Data obtained from the WRC bore database indicates the presence of multiple bores in the area surrounding the development. Nearby bores range in depth from 2.48 m to 246 m. Several of these bores are linked to active resource consents for groundwater abstraction used for agriculture, primarily to support dairy farming activities. Nearby consented volumes range from 23 m^3/day to 178 m^3/day.

3.3 Surface Water Bodies

The site and wider area are part of the Waikato Central Drainage Scheme and, as such, have a number of small artificial drains on site and a larger drain between the site and the rail line. Eco-Solutions have classified all these drains on site as artificial watercourses in accordance with definition in the Waikato Regional Plan (Ecological Solutions, 2025).

3.4 Wetlands

Two small wetland areas have been identified by Eco-Solutions (Ecological Solutions, 2025). These are fragmented areas of putative wetland within paddocks that could meet the RMA definition of a ‘wetland’. Eco-Solutions have indicated these wetlands have been modified and degraded through past activities on the site. Given the location of these wetlands within paddocks, it is likely these are areas perched above discontinuous low permeability sediments and are unlikely to be connected to the regional groundwater in the area.

4. KEY EFFECTS TO BE ASSESSED

The hydrogeological assessment considers the following potential effects on groundwater arising from the proposed development activities:

Water Supply Options from Groundwater

- Potential exploration drilling for a decentralised water supply system.
- Assessment of drawdown effects from any proposed take on nearby bores and surface water bodies.

Earthworks and Stormwater Infrastructure

- Groundwater seepage into temporary excavations and associated dewatering requirements.
- Localised groundwater drawdown resulting from dewatering, with potential effects on existing road infrastructure and sensitive environments such as wetlands (i.e. reduced groundwater levels affecting wetland hydrology).
- Management and potential effects of discharging dewatered groundwater.
- Groundwater mounding beneath soakage systems or constructed wetlands, which may alter local groundwater gradients.

Onsite Wastewater Treatment and Disposal

- Groundwater ingress into any temporary excavations and associated dewatering activities.
- Potential effects from the infiltration or land application of treated wastewater.

5. METHODOLOGY FOR THE ASSESSMENT

WGA understands that further geotechnical investigations will be undertaken at the site. WGA proposes close collaboration with geotechnical specialists to ensure geotechnical investigations can also be used to inform understanding of the site's hydrogeology.

WGA have been involved in modelling groundwater effects for the recent excavations for nearby residential developments, Rotokauri Greenway and Gordonton Retirement Village. The information gained at these nearby sites will be applied to the assessment. In addition, WGA staff have been heavily involved in reviewing the groundwater effects of the recently completed Waikato Expressway Hamilton section.

5.1 Water Supply

WGA has undertaken a high level initial desktop assessment on possibilities for bore water supply to the development area, together with comments on potential issues, constraints, and opportunities.

Our initial desktop assessment concluded that new water supply bores on site can provide drinking water during the development of the land parcels. Other bores in the area have achieved sufficiently high abstraction rates to satisfy the requirements of the development. For example, Dairy NZ, approximately 2 km from the development, is abstracting 1768 m^3/day from a 101 m deep bore. Shallower bores nearby have lower abstraction rates, and it's likely that a similarly shallow bore to the one currently used on site (<60 m deep) would not be able to provide sufficient water for the development without potentially affecting nearby bores. By targeting a deeper aquifer, drawdown at nearby shallow bores would be minimized by vertical separation of the takes. WGA notes that water quality testing would be essential during exploration drilling, as water quality issues such as high salinity have arisen in some water bores previously tested in the area.

WGA also understand that some water may be required during the construction phase for dust suppression and other construction related activities. For this purpose, the existing bore on site may be able to serve as a temporary water supply.

If a new production bore is required to supply groundwater for the development, WGA proposes to use the following workflow:

Gather Background Site Information

- Carry out a desktop survey of the site to establish local lithological information and identify any factors that may affect, or be affected by, the proposed groundwater takes.

Drill Pilot Bore

- Drill a 100 mm pilot bore to inform the precise depth that the test bore and production bore will target.
- Collect and record underlying lithology.
- Determine from the underlying stratigraphy if the site is suitable or if another location is needed.

Construct Test Bore

- Construct a 100 mm test bore and carry out a production test.
- Collect a water sample during the production test and have it analysed.
- Decide if the target aquifer can provide the desired water volumes and quality or if the bore needs to be drilled into a deeper aquifer.

Construct Production Bore

- Drill and construct a production bore close to the test bore. The diameter of the production bore will be determined based on pump and water requirements.
- Undertake a stepped rate and constant rate pumping test on the production bore.
- Analyse the pumping test data and carry out forward projections to assess the effects of operating the production bore.

5.2 Earthworks and Stormwater Network

WGA proposes collaborating closely with geotechnical specialists and design engineers to build upon current groundwater knowledge and provide guidance for additional testing of the local hydraulic properties. Once the underlying local soil hydraulic properties are ascertained, WGA will then be able to assess the potential mounding effects of any planned soakage systems within the stormwater management network. Given the high groundwater levels and expected low permeability of the shallow soils, WGA proposes using the MOUNDSOLV software package, developed by HydroSOLVE, to assess potential groundwater mounding effects of the planned soakage systems.

Additionally, once local soil hydraulic properties are ascertained, the potential dewatering effects of any construction activities that require excavations below the water table can be assessed. WGA proposes to use a combination of analytical tools, such as trench models and pit models, to assess temporary and long-term groundwater drawdown as a result of any construction activities that require excavations below the water table. Additionally, WGA can build upon these models to undertake 2D finite element groundwater modelling if deemed required for excavations conducted in sensitive areas.

Once the mounding and groundwater drawdown risk has been analysed, WGA propose that a monitoring plan will be developed to ensure any potential groundwater drawdown or mounding linked to potentially significant impacts can be detected and mitigated before these impacts arise.

Building upon this monitoring plan, mitigation measures will be developed and documented so that they may be put in place to reduce any calculated groundwater drawdown at the site both during the construction period and following completion of the earthworks, including, for example:

- Design, installation, and monitoring of groundwater level measurement systems.
- Options to modify dewatering systems to reduce the magnitude and extent of groundwater drawdown.
- Optimize pumping rates and incorporate transient adjustments in pumping rates.
- Returning pumped water to the ground in areas where drawdown may lead to excessive ground settlement or other impacts.
- Reduction in hydraulic connections between groundwater and surface water bodies to reduce the effects of drawdown in sensitive areas.

5.3 Onsite Wastewater Treatment and Disposal Infrastructure

WGA proposes to assess the effects of the planned wastewater treatment and discharge facilities by undertaking attenuation modelling using microbial removal rates documented in Pang (2009). WGA proposes to use *E.coli* and rotavirus in the attenuation modelling as these are less likely to be removed by natural attenuation compared to other pathogens.

Once the groundwater quality risk from the wastewater treatment and discharge facilities has been assessed, WGA propose that a monitoring plan will be developed to ensure groundwater is not affected by any wastewater discharge.

If excavations below the water table are required for the construction and operation of the wastewater treatment and disposal infrastructure, WGA will assess these using the same methods proposed for the dewatering associated with the stormwater infrastructure and detailed in Section 5.2. WGA propose that a similar groundwater monitoring plan will be developed to ensure any potential groundwater drawdown or mounding linked to potentially significant impacts can be detected and mitigated before these impacts arise.

6. CONCLUSION

Based on WGA's experience and the information available to date, including regional hydrogeological data, site-specific assessments, and comparable nearby developments, there is no indication of any significant constraints that would prevent the proposed development from proceeding under a fast track consenting process.

The potential effects on groundwater, such as drawdown during construction dewatering, mounding from soakage systems, and impacts from on-site wastewater discharge, are generally understood and can be appropriately managed.

WGA considers that the potential adverse effects on the surrounding groundwater and surface water environment can be managed to an acceptable level.

7. QUALIFICATIONS AND EXPERIENCE

7.1 Clare Houlbrooke – Principal Hydrogeologist, Project Director

Clare is a Principal Hydrogeologist (BSc, MSc (Hons) Earth Sciences) with more than 20 years' experience in hydrological resource investigations. Clare's focus is sustainable management of groundwater resources and connected surface water systems. Clare has worked in two regional councils as a Groundwater Scientist over a nine-year period, and as a consultant has continued to support regional councils with the review of groundwater-related resource consent applications, including reviewing the groundwater effects of the recently completed Waikato Expressway. Clare has been based in the Waikato for 11 years and has in-depth knowledge of the local hydrogeological conditions. She has prepared and presented evidence in regional council resource consent hearings and in Environment Court as an expert witness.

7.2 Brett Sinclair – Senior Principal Hydrogeologist, Project Reviewer

Brett is a Principal Hydrogeologist (BSc, MSc Geology) with more than 30 years' experience in hydrogeology, geology, water management, water quality assessment and environmental effects mitigation. He specialises in the evaluation, utilisation, management, and protection of groundwater resources and groundwater-dependent surface water resources. Brett provides specialist hydrogeological support for geotechnical assessments, including major civil infrastructure projects. He has undertaken numerous peer reviews of applications for site dewatering and infrastructure construction projects on behalf of regulatory authorities.

7.3 Catherine Howell – Senior Hydrogeologist, Project Lead/Technical Assessments

Catherine is a Hydrogeologist with a Masters in Groundwater Studies and over 15 years of experience in the United Kingdom, Australia and New Zealand. Catherine has gained experience in hydrogeological investigations through roles in both regulatory bodies and consultancy. Her hydrogeological assessment experience includes pump test analysis, regional-scale water assessments, water quality monitoring, and project management. Catherine has prepared a technical assessment of effects for other nearby construction works within the Rotokauri development area, including effects of dewatering and soakage.

8. REFERENCES

EcoLogical Solutions. (2025). Awanui Links Fast Track Referral Application – Ecology. Letter prepared for Swordfish Projects Limited. Dated 12 November 2025.

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Pang, L. (2009). Microbial removal rates in subsurface media estimated from published studies of field experiments and large intact soil cores. Journal of Environmental Quality. 38, American Society of Agronomy, Crop Science Society of America, Soil Science Society pp. 1531–1559.

Petch RA. (1987). Water Resources of the Mangaonua Catchment. In: Mangaonua Catchment Management Plan. Waikato Valley Authority Technical Publication N0.30.

Schofield JC. (1972). Groundwater of the Hamilton Lowland. New Zealand Geological Survey Bulletin No.89.

Yours Sincerely

Catherine Howell
Senior Hydrogeologist
WALLBRIDGE GILBERT AZTEC

APPENDIX A
LITHOLOGICAL LOG BORE 72_4357

Council well number : 72_4357
Well name : Bore 72 - Station 4357
Drilling company : Benton & Son Limited
Drilling date : 05/06/2008
Drilling method : -
Locality : -
Total depth drilled : 42m
NZTM : 1808663 : 5820242