TECHNICAL MEMORANDUM

PROJECT NO.: s 9(2)(b)(ii)

DOCUMENT NO.: s 9(2)(b)(ii)

DATE: 13 NOVEMBER 2025

COMPANY NAME	Ōhaupō Land LP and Chinamans Hill Ltd
ATTENTION	s 9(2)(a)
SUBJECT	Outline of Hydrogeological Assessment for Fast track

1. PROJECT DESCRIPTION

The project for which a fast-track application is being applied for is the consenting and construction of the proposed Southern Links Stage 1 (SL1) Houchens Road Block, a residential and industrial development.

WGA understands that the SL1 project is to provide a range of differing housing types and land tenure opportunities to provide affordable housing and to boost the industrial capability of the region. The entire SL1 site is approximately 440 ha in size and is situated between the established Hamilton suburbs of Dinsdale, Frankton, Deanwell and Glenview to the northeast, and rural land within Waipa to the southwest. The SL1 site is currently zoned rural under the Waipa District Plan and comprises pasture, rural lifestyle, equine industry and peri-industrial use. The SL1 development will consist of both residential and industrial areas with green spaces scattered throughout the development. Stormwater at the site will be managed by naturalised streams, rain gardens and constructed wetlands. WGA understands the surface water take applied for by the wider SL1 project will provide the water supply to the development (WGA 2025) and that wastewater will be treated and disposed of on site. A groundwater bore is expected to provide water to the retirement village at a rate of approximately 177 m^3/day.

The SL1 Houchens Development is a combined residential and industrial development that comprises circa 145 hectares, which will be split into a mix of residential densities and industrial development. The residential component comprises circa 55 ha of net residential, including 1,300 residential units of varying typologies (including single detached, duplex, terraced apartment), a 400-unit retirement village, along with two supporting mixed-use neighbourhood centres, open spaces, waterbodies and infrastructure devices including wetlands. The SL1 Houchens Development includes a net 25 ha of industrial, generating between 24 – 47 industrial-sized lots for industrial activities.

The residential development is underpinned by a series of design principles, which focus on creating a well-connected, legible, and diverse community on Hamilton City's urban fringe. The proposed transport network, with a 30-metre-wide spine road running north-to-south, is supported by existing and proposed local roads, cycle connections and pedestrian pathways to create an accessible and legible development. As aforementioned, a range of housing typologies and densities are proposed to meet the growing and changing needs of the housing market to ensure there are options for future residents. Each typology has been thoughtfully located, based on opportunities and constraints, with density ranging from terraced, duplex and detached dwellings to ensure integration with the adjoining urban footprint.

Located on the eastern and central portions of the Houchens Development are neighbourhood centres that will provide a range of amenities and services to support the residential and industrial developments. This neighbourhood centre will likely include commercial properties, childcare, cafés, and a local superette.

Sitting at the lower, southern point of the site is a retirement village that comprises approximately 15 hectares and provides 400 units of varying typologies, including traditional villa and apartment typologies. This will be serviced by its own private transport network, infrastructure, and high amenity open spaces.

On the north-western edge is strategic industrial land that provides key connectivity to the potential Southern Links Houchens interchange, a Road of National Significance (RONs).

The wider SL1 Houchens Development integrates throughout a number of open spaces, waterbodies and wetlands that are well distributed to create a high amenity community that will be a pleasant and enjoyable place to live for future residents. These open spaces, waterbodies and wetlands support ecological restoration through the retention of a number of natural species and riparian revegetation and support broader cultural biodiversity outcomes within SL1 Houchens Development.

The SL1 Houchens Development includes a proposed Water Reservoir to provide the ability for a long-term strategic water asset for Hamilton City Council (HCC) to be designated.

The development will be appropriately serviced via a robust infrastructure strategy, which includes the addition of a water reservoir to accompany the one already existing, utilisation of existing services and stormwater artificial wetlands

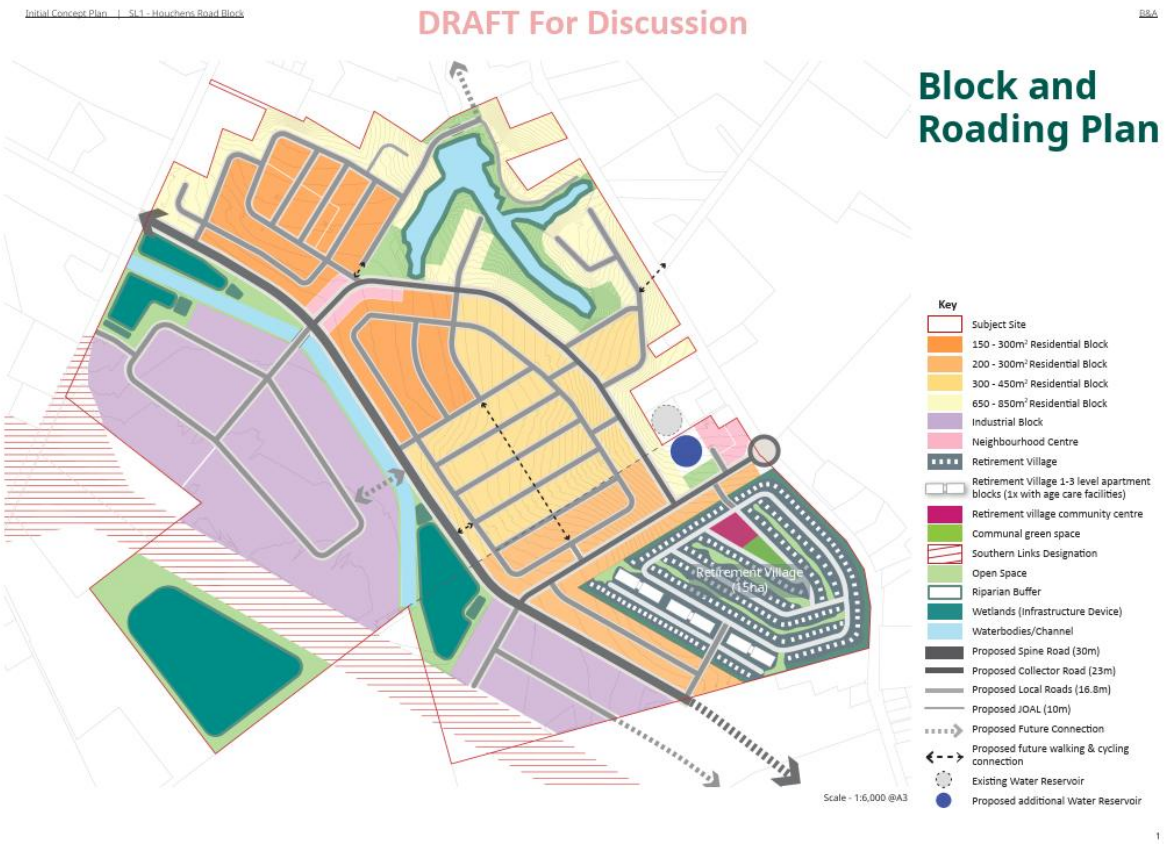

Figure 1: Houchens Development Conceptual Plan Reproduced from Barker and Associates (2025)

2. HYDROGEOLOGY INTRODUCTION

The hydrogeological assessment is for the following activities at the Houchens site:

- The construction and ongoing effects of the stormwater management infrastructure
- General construction for excavations below the water table
- The construction and ongoing effects of wastewater treatment and disposal infrastructure
- The operation of a production bore to supply domestic water for the development

Some areas of the site have a shallow groundwater table that is connected to existing surface water bodies (i.e., wetlands and streams). Therefore, a detailed assessment is required to ensure that the effects of the proposed urban development are acceptable. The types of activities required to establish the necessary infrastructure for the development that may result in effects on groundwater and connected wetlands are listed in Table 1.

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	CONSENTS
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 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, 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.
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 works, during works, and post-works.	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 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.

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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.
Drinking Water Infrastructure		
Abstraction of Groundwater for domestic water supply	Groundwater/hydrogeology, including effects on surface waterbodies/wetlands, and other groundwater users.	Controlled activity under WRP Rule Section 3.

3. HYDROGEOLOGICAL BACKGROUND

The SL1 site 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, silt, 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). Overlying the Hinuera Formation sediments in the Mangakotukutuku area is peat of the Rukuhia Bog. 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).

The geotechnical desktop review of the SL1 Houchens Development by CMW Geosciences (2025) states that within the low-lying areas of the site wetlands and alluvial plains are characterised by shallow groundwater levels from surface to 14.5 m below the ground surface. The reported extent of the peatland is currently uncertain, but it has been encountered throughout the site to depths of up to 5 m at the SL1 Houchens Development.

According to the WRC database, there are approximately 36 bores within one kilometre of the SL1 Houchens Development. Bore details are provided in The lithological log for bore 70_603, which, according to the WRC database, is within the site boundary, indicates there is brown clay underlying the site to a depth of 13.7 m.

Table 2. In agreement with CMW Geosciences (2025), groundwater levels within the vicinity of the SL1 Houchens Development site can be relatively close to the surface or deeper, depending on the screened aquifer. The lithological log for bore 70_603, which, according to the WRC database, is within the site boundary, indicates there is brown clay underlying the site to a depth of 13.7 m.

Table 2: Nearby Bore Details from WRC Database

BORE NUMBER	DEPTH (m)	STATIC WATER LEVEL (m)	SCREENED DEPTH (m bgl)	SCREENED GEOLOGY
62_137	60.9	Unknown	Unknown	Unknown
70_449	42.67	Unknown	Unknown	Unknown
69_350	34.5	Unknown	Unknown	Unknown
70_363	8.2	Unknown	6.7-8.2	Sands, pumice
70_643	46	12.5	Unknown	Unknown
70_512	34	Unknown	32-34	Sands, brown gravelly
70_603	60.3	35.9	Unknown	Unknown
70_511	93.8	10	64.6-66.6	Peat-wood, pumice and silt
62_145	78	Unknown	67-78	Gravels, pumice and sand
70_769	60.3	Unknown	Unknown	Unknown
70_476	9.09	Unknown	Unknown	Unknown
72_192	76.7	11	64.6-76.7	Unknown
62_86	60.9	Unknown	Unknown	Unknown
70_871	60.3	Unknown	Unknown	Unknown
72_517	66	17.8	Unknown	Unknown
70_1226	53.6	Unknown	Unknown	Unknown
70_736	36	Unknown	Unknown	Unknown
72_858	54.2	17.6	57-54.2	Sand
72_4049	40	2.65	31.5-39.5	Pumice and gravel
72_7144	65.4	26.4	49.2-65.4	Gravel and sand
72_9107	72	9	Unknown	Unknown
72_9658	64	22	Unknown	Unknown
72_10442	72	Unknown	Unknown	Unknown
72_10434	114	Unknown	Unknown	Unknown
72_5045	78	Unknown	56-78	Pumice
72_10785	77	26	63-77	Silt and sand
70_348	83.82	Unknown	Unknown	Unknown
72_5291	6	Unknown	Unknown	Unknown
72_5292	6	Unknown	Unknown	Unknown
72_5293	6	Unknown	Unknown	Unknown
72_6446	24	Unknown	Unknown	Unknown
72_11515	54.7	21.5	43-54.7	Unknown
72_11875	Unknown	Unknown	Unknown	Unknown
72_11738	Unknown	Unknown	Unknown	Unknown
72_11780	Unknown	Unknown	Unknown	Unknown
72_12280	74	13	65-74	Cemented gravel, pumice sand, possible fracturing
72_12386	56.5	22	50.5-56.5	Coarse gravel

3.1 Surface Water Bodies

The primary surface water feature on the site is an unnamed gully feature that conveys water in a northerly direction from a gully feature in the north-eastern portion of the site. This gully system flows into a tributary of the Waikato River. The Masterplan indicates that the gully feature will be maintained in the design of the site.

4. KEY HYDROGEOLOGICAL EFFECTS TO BE ASSESSED

The key groundwater effects to be considered in the hydrogeological assessment include:

Earthworks and Stormwater Network

- Groundwater seepage inflows into any temporary work excavations and any associated dewatering activities.
- Groundwater drawdown effects from the works, including potential effects on existing road infrastructure and wetlands (i.e., lowering the water table in the vicinity of a wetland can impact the wetland hydrology).
- Effects from the disposal of the pumped groundwater.
- Potential groundwater mounding effects of any soakage system or constructed wetland.

Onsite Wastewater Treatment and Disposal

- Groundwater seepage inflows into any temporary work excavations and dewatering activities
- Effects from the disposal of treated wastewater

Effects of Groundwater Abstraction

- Effects of the proposed take for the Retirement Village water supply

5. METHODOLOGY FOR THE GROUNDWATER ASSESSMENT

WGA have been involved in modelling groundwater effects for the recent excavations for nearby residential developments, Rotokauri Rise and Rotokauri Greenway. The information gained at these nearby sites will be applied to the assessment. In addition, WGA staff have been highly involved in reviewing the groundwater effects of the Waikato Expressway – Hamilton Section.

5.1 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 analyzed, 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 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.

5.2 Onsite Wastewater Treatment and Disposal Infrastructure

WGA understands that the preferred long-term solution for wastewater treatment and disposal infrastructure is to connect the development to the HCC wastewater reticulation network.

If the connection to HCC's network is not feasible or delayed, the development will construct its own temporary Centralized Wastewater Treatment and Discharge Facility (CWTDF). This facility would handle treatment and disposal onsite until integration with the city network becomes viable. Treated sludge will be disposed of at an approved landfill off-site.

If the development proceeds with a CWTDF, 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 5.1. 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.

5.3 Onsite Water Supply Options

WGA has undertaken a high-level initial desktop assessment on possibilities for bore water supply to a potential suburban 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, there is a bore approximately 1 km from the development, which has a consented water take for up to 1,200 m^3/day. Shallower bores nearby have lower abstraction rates, and it's likely that a shallow bore (<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.

In order to construct the required groundwater supply bores for the development, WGA proposes to use the following workflow for each of the bores outlined on the following page.

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 75 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

- Drill 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.

6. CONCLUSION

Based on WGA's experience and the information that has been received and known to date, WGA can see no reason why the following development could not proceed under a fast-track application, as the effects on the environment can be managed with suitable conditions.

7. QUALIFICATIONS AND EXPERIENCE

s 9(2)(a) **– Principal Hydrogeologist, Project Lead**

s 9(2)(a) is a Principal Hydrogeologist (BSc, MSc (Hons) Earth Sciences) with more than 20 years' experience in hydrological resource investigations. s 9(2)(a) focus is sustainable management of groundwater resources and connected surface water systems. s 9(2)(a) 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. s 9(2)(a) 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 the Environment Court as an expert witness.

s 9(2)(a) **– Senior Principal Hydrogeologist, Project Reviewer**

s 9(2)(a) 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. s 9(2)(a) 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.

Catherine Howell – Senior Hydrogeologist, Technical Assessments

s 9(2)(a) is a Hydrogeologist with a Masters in Groundwater Studies and over 15 years of experience in the United Kingdom, Australia and New Zealand. s 9(2)(a) 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. s 9(2)(a) 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

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Yours Sincerely

s 9(2)(a)

Principal Hydrogeologist
WALLBRIDGE GILBERT AZTEC