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WATER & LAND ADVISORY

[redacted]

Memo

To	FHLD	Date	3 August 2026
From	Jon Williamson	**Project No**	WWLA1603
Copy	Jon Williamson		
Subject	**Milldale Stage 14-17 – Groundwater Dewatering Assessment**		

Statement of Qualifications and Experience

The qualifications and experience of the author and technical director/reviewer of this report are summarised below. We confirm that we have read the Code of Conduct for Expert Witnesses Contained in the Environment Court of New Zealand Practice Note 2023 and we agree to comply with it. We confirm that the issues addressed in this report are within our area of expertise, except where we state that we are relying on the evidence or advice of another person. We have not omitted to consider material facts known to us that might alter or detract from the opinions expressed in this report.

Report Author

My full name is Atakan Durmus.

I am an Experienced Graduate Hydrogeologist who has been employed at WWLA since February 2026. My expertise includes groundwater monitoring, hydrogeological assessments, numerical groundwater modelling, geological interpretation, GIS and spatial analysis, and environmental data interpretation.

My qualifications include a Bachelor of Science in Geological Engineering from Middle East Technical University (METU), Turkey, completed in 2023. Prior to joining WWLA, I gained 2 years professional experience in the natural gas and petroleum, geotechnical consulting, and mineral exploration sectors, undertaking geological investigations, site characterisation, geological logging, and subsurface data interpretation.

Signed: _____ **Date:** 3 August 2026

Report Reviewer

My full name is Jonathan (Jon) Lindsay Williamson.

I am the Managing Director at Williamson Water & Land Advisory. I hold the qualifications of Bachelor of Science, and Master of Science and Technology (Earth Science) from the University of Waikato and have over 30 years' professional experience in the field of hydrology and hydrogeology. My experience includes professional consultancy with experience in research and assessment of environmental impacts for a wide range of projects. My experience includes appearances at Council, Environment Court, Board of Enquiry, and EPA Fast-track Legislation Hearings, along with involvement in joint witness processes.

Signed: _____ **Date:** 3 August 2026

1. Introduction

This report has been prepared in support of the substantive application for the Milldale Stages 14-17 Project under the Fast-track Approvals Act 2024 (FTAA).

The Project relates to approximately 231ha of land centred around Wainui Road in Wainui, Auckland. The proposal provides for a comprehensively planned urban development including residential neighbourhoods, a supporting commercial node, transport and servicing infrastructure, open space, wetland restoration, an ecological restoration area and associated enabling works.

The application seeks approvals necessary to facilitate the staged development of the Project, including a suite of resource consents required under the FTAA framework.

The substantive application is supported by a comprehensive set of technical assessments and plans addressing the environmental, servicing and infrastructure matters associated with the proposal. This report should be read alongside the Planning Report and the appended technical reports and drawings lodged in support of the substantive application.

1.1 Purpose and Scope of this Report

This memorandum presents a hydrogeological and dewatering assessment for the Milldale development, encompassing Stages 14 to 17 within the Fast-Track Consent Area (Figure 1). The primary objective is to evaluate potential interactions between the proposed earthworks design and the local groundwater regime to establish construction and operational dewatering requirements and the environmental effects thereof (if any).

This assessment is based on the baseline piezometer monitoring network and civil design packages prepared by Woods (Civil Drawings P25-609-02-1200-EW through 1204-EW and 2000-RD through 2004-RD, and 2100-RD). These datasets provide the basis for assessing potential interactions between the proposed earthworks, major infrastructure, and the interpreted groundwater surface across the development area. This assessment was additionally informed by the corresponding native CAD design files underlying the above drawing set, as supplied by Woods.

This report has been prepared having regard to the relevant statutory and technical framework applicable to the proposal, including the Auckland Unitary Plan (AUP).

1.2 Site Description

The site comprises approximately 231ha of land located to the north of the existing Milldale development. The site comprises two distinct areas:

- Residential subdivision area to the south of the Ōrewa river (shown in red in **Figure 1**); and
- Te Korowai o Maraeariki to the north of the Ōrewa river (shown in orange in **Figure 1**).

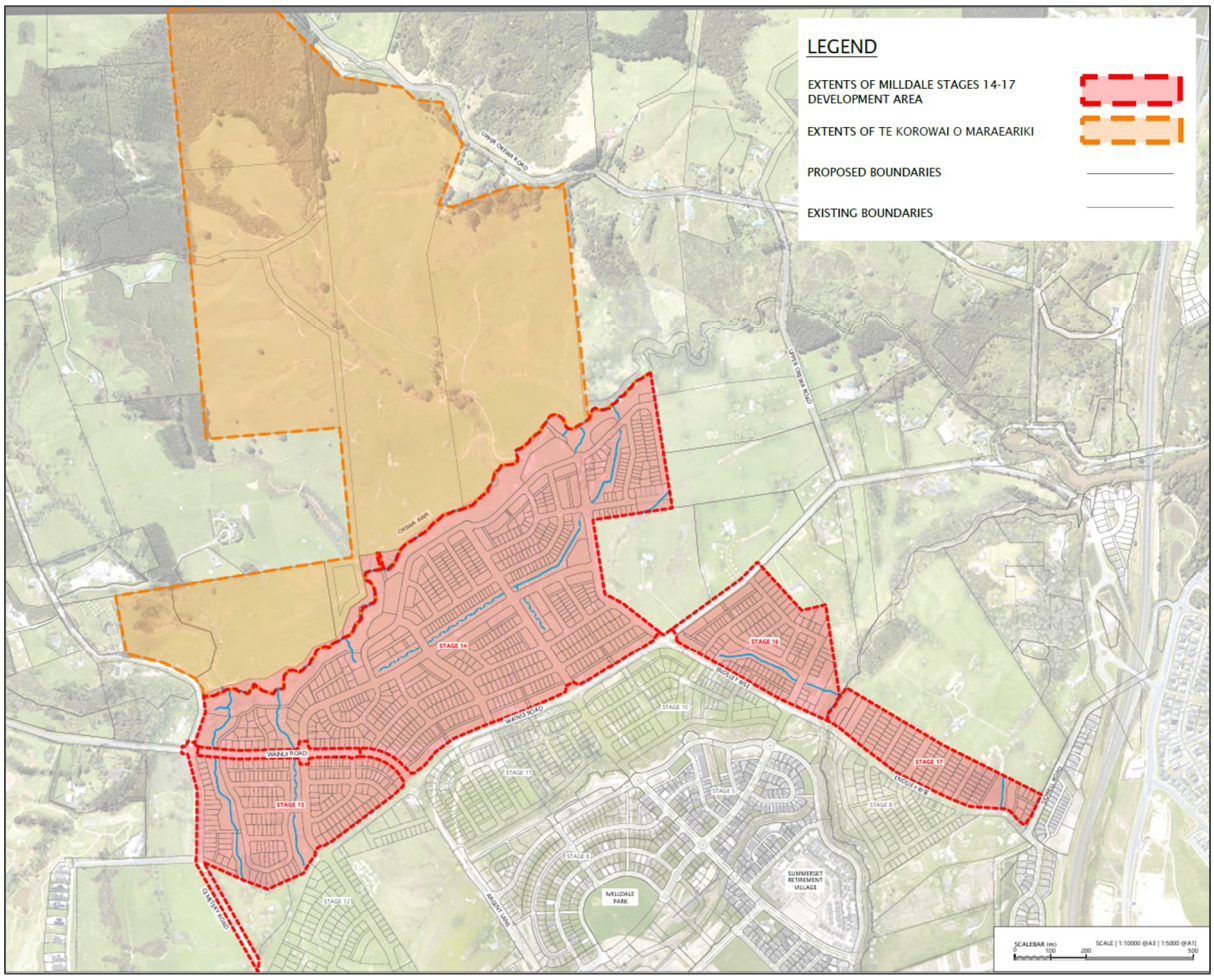


Figure 1. Site Location Plan.

The proposed residential subdivision area is located within the Future Urban Zone under the AUP. This part of the site is characterised by gently undulating to rolling pasture, with several streams, natural wetlands, constructed ponds and artificial drains traversing the area.

Te Korowai o Maraeariki is located to the north of the Ōrewa River and is zoned Rural Production under the AUP. This area is characterised by more undulating to steep terrain, with a series of ridgelines separated by incised gullies extending from the Ōrewa River. The land is predominantly managed pasture interspersed with streams and natural wetlands, together with pine plantations, exotic vegetation and gorse scrub. Relatively large areas of indigenous vegetation are also present, including a Significant Ecological Area – Terrestrial Overlay in the north-western portion of the site.

There is existing water, stormwater and wastewater infrastructure surrounding the site as a result of the extensive development within previous Milldale Stages. However, the site itself is not currently serviced in terms of supply and infrastructure. The surrounding roading network has been progressively developed in accordance with the staging of the Milldale development.

The surrounding area is now substantially developed. Milldale Stages 1 to 6 are complete, while Stage 7 is well advanced, with subdivision completed for Stages 7A–7C and construction of Stage 7D anticipated to commence in early 2027. Separate consents for the Stage 8 and 9 enabling works and subdivision were granted in 2024, with the associated offset and construction works now complete. The Milldale Local Centre has also been constructed, together with associated roads, accessways and drainage reserves. Community infrastructure within the surrounding area

includes Ahutoetoe Primary School, two early childhood education centres and the Summerset retirement village. Beyond the urban extent of Milldale, the site adjoins a number of rural residential properties.

Further detail regarding the site, surrounding environment and planning framework is provided within the Planning Report and technical reports appended to the application.

2. Description of the Proposal

The Milldale Stages 14-17 project seeks approvals for an urban development on the site. The proposal provides for up to 1,425 dwellings across a range of housing typologies and densities. In addition, the proposal includes provision for a small commercial area, transport infrastructure, servicing and stormwater infrastructure, subdivision, earthworks, stream works, and neighbourhood parks.

To the north of the Ōrewa river within Te Korowai o Maraeariki, the project includes private water and wastewater infrastructure if required, ecological restoration, as well as walking and cycling trails to enhance recreation and amenity.

Development of the Project will require a suite of approvals under the FTAA, including resource consents associated with subdivision, land use activities, bulk earthworks, infrastructure works, stream works, water take, diversion and discharge; along with NES for contamination and freshwater.

The aspects of the proposal relevant to this report include the bulk earthworks and civil design across Stages 14-17, the proposed Water Reservoir and Wastewater Treatment Plant, and the associated stream corridor works, insofar as these components may interact with the local groundwater regime. These aspects are discussed in further detail in the **Section 4** below.

A full description of the proposal is provided in the Planning Report and technical reports and drawings appended to the substantive application, and should be read in conjunction with this report.

3. Methodology

The hydrogeological evaluation was undertaken by comparing the natural-state (baseline) and post-development groundwater regimes using a three-dimensional numerical groundwater model developed in MODFLOW via the GMS interface. The model was calibrated against the piezometer monitoring network and other available site data to represent existing (baseline) groundwater conditions across the development area.

Post-development changes to the finished ground surface and to the stream/river network were incorporated into the calibrated model as updated surface and boundary conditions, from which the post-development groundwater surface was derived. This post-development groundwater surface was subsequently compared against the proposed finished design surface elevations to assess the interaction between groundwater levels and the proposed cut areas.

This spatial analysis was undertaken as follows:

- ***Natural State Baseline:*** Groundwater equipotential contours (**Figure 4**) were established at 1 m intervals based on groundwater level measurements collected from the monitoring piezometers listed in **Table 1**. Piezometers representative of the shallow aquifer were used to calibrate the numerical groundwater model, while those identified as reflecting perched soil water (including MH04-22) were retained for reference, rather than to calibrate, the model.

- ***Post-Development Groundwater Surface:*** Post-development groundwater levels were derived from the calibrated groundwater model, updated to reflect the post-development

finished surface and revised stream/river configuration, and presented as 1 m groundwater elevation contours (**Figure 5**).

- ***Groundwater Level Change:*** Post-development groundwater level change contours at 0.1 m intervals (**Figure 6**) were derived by calculating the spatial difference between the natural state (**Figure 4**) and post-development (**Figure 5**) groundwater surfaces, with negative values indicating a predicted rise in groundwater level and positive values indicating a predicted fall.

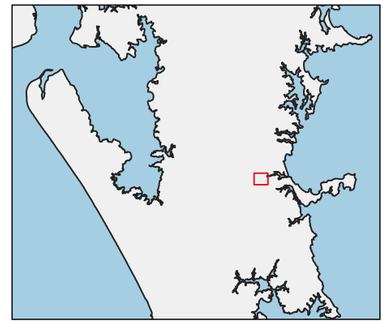
Table 1. Piezometer monitoring network and groundwater calibration data.

Piezometer ID	Elevation (mAMSL)	Depth to Groundwater (mBGL)	Groundwater Level (mAMSL)	Source	Comments
BH_141957	19.61	0.1	19.51	NZGD	Shallow Aquifer
BH_168392	19.85	0.585	19.265	NZGD	Shallow Aquifer
MH01-22	44.45	1.5	42.95	Fulton Hogan	Shallow Aquifer
MH02-22	54.46	3	51.46	Fulton Hogan	Perched
MH03-22	44.95	1.5	43.45	Fulton Hogan	Shallow Aquifer
MH04-22	61.09	4.5	56.59	Fulton Hogan	Perched
WWLA_BH1	50.03	1.58	48.45	WWLA	Shallow Aquifer
WWLA_BH2	51.31	-0.67	51.98	WWLA	Perched
WWLA_BH3	48.3	0.62	47.68	WWLA	Shallow Aquifer
WWLA_BH4	36.2	1.55	34.65	WWLA	Shallow Aquifer
WWLA_HA1	22.3	0.55	21.75	WWLA	Perched
WWLA_HA2	33.2	0.43	32.77	WWLA	Perched
MH01-26	51.34	1.11	50.23*	Fulton Hogan	Shallow Aquifer
MH02-26	36.72	3.7	33.02*	Fulton Hogan	Shallow Aquifer
MH05-26	37.31	1	36.31*	Fulton Hogan	Shallow Aquifer
MH06-26	29.8	2.35	27.45*	Fulton Hogan	Shallow Aquifer
Notes: *designates perched groundwater and/or undeveloped piezometer.					

Map Title:
Overview Map

Project:
Milldale North Stage 14-17 Groundwater Assessment

Client:
Fulton Hogan Land Development Ltd.



Legend

- Roads
- Proposed Stream Network
- Existing Stream Network
- Block boundry
- Milldale North cut and fill area
- Milldale North boundary
- Extents of Milldale stages 14-17 development area

Data Provenance
Google Satellite Background Imagery

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Figure 2.

4. Assessment

4.1 Site Layout & Civil Earthworks Profile

The Milldale Stages 14 to 17 development is located directly along the northern and northeastern margins of previously developed stages. Stage 14 (north of Wainui Road) and Stage 15 (south of Wainui Road) form the western footprint. Stage 16 and Stage 17 extend eastward along Endsley Rise to Sidwell Road (**Figure 2**).

Civil earthworks cut and fill depth variations across the development area range from approximately -11 m cut to +7 m fill[1] (**Figure 3**):

Wainui Road Retaining Walls (Stages 14-16): Primary structural cuts of 7 m to 9 m are concentrated along Wainui Road in association with proposed retaining walls (shown in purple in **Figure 3**). Surrounding residential platforms are generally within ±3 m.

Stage 17 Corridor: Stage 17 is predominantly low-disturbance (-2 m cut to +3 m fill), with a localised deeper cut pocket of approximately 4 m to 6 m near the Wainui Road / Lysnar Road intersection.

Proposed Water Reservoir: Civil Plan P25-609-02-1202- EW-CUT FILL PLAN shows a 30,311 m^2 footprint involving an excavation down to base elevation 16.91 metres above mean sea level (mAMSL). Total earthworks require 122,002 m^3 of cut and 6,838 m^3 of fill, with a net surplus of cut materials of 115,164 m^3.

Wastewater Treatment Plant: Civil Plan P25-609-02-1201-EW-CUT FILL PLAN shows the WWTP is situated on a 23,927 m^2 footprint adjacent to Orewa River. This area is an engineering fill platform requiring 20,899 m^3 of fill and minor surface cut (645 m^3).

[1] Woods (2026). Milldale Stages 14–17 FT – Earthworks Methodology Report

N

Gervin Road

Wainui Road

Cemetery Road

Argent Lane

Lysnar Road

Upper Orewa Road

Kowhai Road

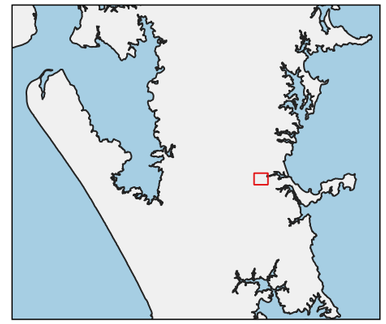
Sidwell Road

0 0.5 1 km

Map Title:
Cut and Fill Plans

Project:
Milldale North Stage 14-17 Groundwater Assessment

Client:
Fulton Hogan Land Development Ltd.



Legend

- Roads
- Proposed Stream Network
- Existing Stream Network
- Proposed Retaining Wall
- Proposed RE Slopes
- Milldale North boundary

Cut and Fill Depth Variations (m)

10

-10

Cut and Fill Depth Contours (m)

-9	-1
-8	0
-7	1
-6	2
-5	3
-4	4
-3	5
-2	6

Data Provenance
Google Satellite Background Imagery

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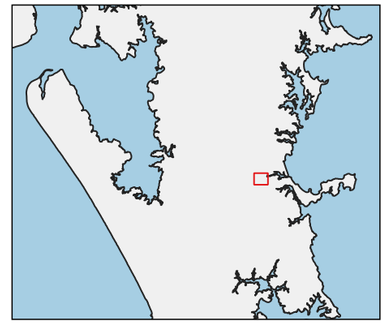
Figure 3.

Map Title:
Naural State Groundwater Level Surface

Project:
Milldale North Stage 14-17 Groundwater Assessment

Client:
Fulton Hogan Land Development Ltd.



Legend

- Milldale North cut and fill area
- Milldale North boundary
- Proposed Stream Network
- Existing Stream Network
- Natural State Groundwater Level
- Piezometers

Data Provenance
Google Satellite Background Imagery

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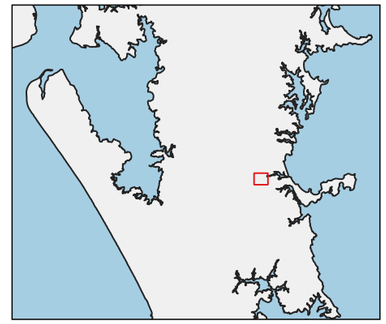
Figure 4.

Map Title:
Post Development Groundwater Level Surface

Project:
Milldale North Stage 14-17 Groundwater Assessment

Client:
Fulton Hogan Land Development Ltd.



Legend

- Milldale North cut and fill area
- Milldale North boundary
- Proposed Stream Network
- Existing Stream Network
- Post Development Groundwater Level (1m)
- Piezometers

Data Provenance
Google Satellite Background Imagery

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Figure 5.

4.2 Groundwater Dewatering Assessment

Interpolated post-development groundwater level contours across the development area, as shown in **Figure 5,** range from a low of 4-5 mAMSL to 38 mAMSL in the south of Stage 15.

Groundwater level change (i.e. reduction is drawdown, and rise is mounding) is evaluated in **Figure 6**.

Evaluating the post-development groundwater level changes against finished earthworks levels indicates the following:

Wastewater Treatment Plant: Comparison of finished platform elevations (20-24 mAMSL) with interpreted groundwater levels (13-19 mAMSL) indicates a vertical clearance of approximately 2-10 m (**Figure 5**), greatest along the elevated southern margin and least along the northern watercourse boundary. Groundwater remains below the finished design platform surfaces across the footprint.

Primary Cut Zones & Retaining Walls: Structural cuts of up to approximately 9 m are not expected to intersect groundwater based on the available groundwater model and interpolated post-development groundwater surface (**Figure 5**).

Proposed Water Reservoir Base Excavation: Across the reservoir footprint, groundwater is interpreted to reside within the footprint of the reservoir with inundation depths between 1 m in the southeastern corner and 6.5 m in the northwestern corner. The geotechnical testing of the reservoir indicated extremely low permeability clay in the range of 10^{-9} to 10^{-10} m/s within the unsaturated zone (Gibb Ritchie Geotechnical Engineers, 2026[2]), whereas for context this is 1.5 orders of magnitude lower than the vertical hydraulic conductivity for the shallow aquifer in the model of 5.8×10^{-8} m/s. The implication of such natural low permeabilities is that:

- the reservoir will not require a synthetic liner and instead will have a natural clay liner; and
- only very limited groundwater exchange between the reservoir and the shallow aquifer will occur. For example, calculations using Darcy's Law indicate that when the reservoir is nearing empty, the maximum gain from groundwater is approximately 2 m^3/day, and when the reservoir is full, the loss from the reservoir to groundwater is approximately 3.5 m^3/day.

Temporary dewatering of groundwater at these low flow rates (if any) is authorised under the provisions of Table E7.4.1(A14) of the Auckland Unitary Plan which stipulate that the 'Taking and use of groundwater up to 5 m^3/day when averaged over any consecutive 20-day period' is classified as a Permitted Activity[3]. For reference the anticipated dewatering requirements in this instance would comprise sump pumping using a trash pump, with discharge into the nearby Orewa River after sediment control (if necessary). The operation is considered non-consumptive because the groundwater is discharging to the location immediately downgradient where it would seep naturally.

Stream Corridors & Wetland Areas: Comparison of the post-development groundwater level (**Figure 4**) against the proposed design surface (**Figure 2**) indicates that no significant change in groundwater levels is predicted within the retained and proposed stream corridors across Stages 14–17. The groundwater table remains consistent with the existing shallow groundwater conditions in these areas, reflecting the intended function of the proposed ecological stream design. The predicted groundwater conditions do not indicate a requirement for active dewatering or groundwater take associated with the stream corridors, residential platforms, or roading areas.

[2] *Gibb Ritchie Geotechnical Engineers (2026). Geotechnical Investigation Report, Milldale Stages 14–17, AK26-027AB Rev 1. Prepared by Gibb Ritchie Geotechnical Engineers, dated 24 July 2026*
[3] Auckland Unitary Plan - Chapter E7

Stage 17 Eastern Boundary (Sidwell Road): Elevated natural-state groundwater levels in this area (**Figure 3**) reflect pre-development baseline conditions rather than a development-induced effect; groundwater level change mapping (**Figure 6**) does not indicate a material change in this area. Placement of engineering fill increases the vertical separation between the finished development surface and the underlying groundwater table (**Figure 3** and **Figure 5**).

Wainui Road Retaining Wall Corridor: Groundwater level change mapping (**Figure 6**) identifies two localised zones within the Wainui Road retaining wall corridor where a predicted groundwater level rise (mounding) of up to approximately 0.6-0.7 m is modelled. These zones coincide with locations where an existing watercourse is reclaimed without an immediate replacement, such that groundwater mounding or a rise in groundwater results. Ultimately, the rise in groundwater has no environment effect as groundwater discharge to the downgradient natural stream network is maintained.

Realigned Watercourse Areas: Groundwater level change mapping (**Figure 6**) identifies a very small 180 m^2 area of localised drawdown of up to approximately 0.4 m at one location where an existing watercourse is realigned. The realignment intersects groundwater 80 m upgradient of its natural flow path to the same downgradient receptor, hence overall there are no environmental effects.

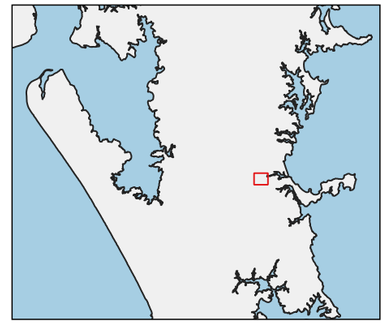
Overall, comparison of the interpreted groundwater surface with the proposed earthworks indicates that groundwater interaction is generally confined to existing and proposed stream corridors and the proposed Water Reservoir excavation. Elsewhere across the development footprint, the available groundwater model indicates sufficient vertical separation between the groundwater table and proposed finished ground levels such that widespread construction dewatering is not anticipated.

In conclusion, the effects on groundwater from all earthwork activities from the Milldale Stage 14-17 development are considered no more than minor.

Map Title:
Groundwater Level Change

Project:
Milldale North Stage 14-17 Groundwater Assessment

Client:
Fulton Hogan Land Development Ltd.



Legend

- **Roads**
- **Proposed Stream Network**
- **Existing Stream Network**
- **Proposed Retaining Wall**
- **Proposed RE Slopes**

Groundwater Level Change
(Negative = Rise)

0.7
-0.7

Groundwater Level Change Contours (m)
(Negative = Rise)

- **-0.7 - -0.6**
- **-0.6 - -0.5**
- **-0.5 - -0.4**
- **-0.4 - -0.3**
- **-0.3 - -0.2**
- **-0.2 - -0.1**
- **0 - 0.1**
- **0.1 - 0.2**
- **0.3 - 0.4**

Data Provenance
Google Satellite Background Imagery

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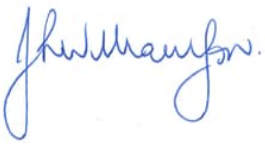
Figure 6.

5. Conclusion

The groundwater assessment indicates that permanent regional active dewatering is not required across the operational phase of the Milldale Stages 14-17 development. Minor passive or operational drainage management across infrastructure will rely on standard engineering slope drains, subsoil drainage networks, and underfill drainage installed at the direction of the Engineer.

During the construction phase, based on the current design and interpreted groundwater conditions, temporary localised dewatering may be required in specific, targeted areas. These include bulk excavation for the Proposed Water Reservoir base, stream corridor realignments and drainage works across Stages 14-17, service trenching near the eastern Stage 17 (Sidwell Road) boundary, areas of predicted groundwater level rise within the Wainui Road retaining wall corridor requiring monitoring during excavation and localised deep cut zones where geological heterogeneity or perched groundwater may be encountered. However, these activities will meet the permitted activity threshold, and overall effects are considered to be no more than minor.

Yours sincerely,



Jon Williamson
Managing Director
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Atakan Durmus
Experienced Graduate Hydrogeologist
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