TECHNICAL MEMORANDUM

PROJECT NO.: WGA221352
DATE: 26 JANUARY 2023

COMPANY NAME	Barker Associates
ATTENTION	Fraser McNutt
SUBJECT	Rotokauri Greenway - Potential Groundwater Drawdown Effect on Natural Wetlands

1. INTRODUCTION

WGA has prepared this brief statement outlining our current understanding of the groundwater regime at the Rotokauri Greenway site and the potential impacts of Greenway dewatering on nearby natural wetlands. WGA's assessment and modelling of the Greenway is ongoing, so the following information may be subject to modification as our assessment progresses.

2. HYDROGEOLOGICAL SETTING

The site occupies a broad shallow basin underlain by a series of alluvial sand, gravel, silt and clay layers, which were deposited at various stages through the Quaternary period by the Waikato River. The older deposits generally consist of lower permeability silts and sands belonging to the Walton Subgroup. The Walton Subgroup is present at the surface along the low hills along Exelby Road to the west of the proposed Greenway and in patches between the Greenway and the Waikato River. The lower permeability of the older Walton Subgroup sediments, which surrounds the basin will limit the extent of any drawdown effects from the Greenway.

The more permeable sand and gravel layers are present in the more recently deposited and re-worked sediments underlying the south-eastern areas of the proposed Greenway. There are some locations underlain by deep "paleo channels", which comprise sand and gravel deposits. These "paleo channels" are areas where the Waikato River reworked the local sediments to deposit channels of sand and gravel. These features are not uniform and consistent (homogenous) across a layer, but rather are elongated and have a limited width.

There appear to be three types of natural wetlands potentially affected by the proposed Greenway.

- **Low-Lying Wetlands**

  Wetlands that are developed on top of younger Quaternary sediments close to the Greenway. These wetlands may be hydraulically separated from the underlying sand layers within the Hinuera Formation by a layer of fine-grained sediment. However, there is potential for some of the wetlands located close to the proposed Greenway to be significantly impacted by drawdown if they have a hydraulic connection to the shallow sand layers underlying the Greenway development. The drawdown effect on these wetlands will be assessed on an individual basis during the groundwater assessment. The Low-lying Wetlands located further from the Greenway appear to have low permeability sediments underlying them and are unlikely to be affected. However these more distant wetlands will also be assessed individually.

- **Hill-Fed Wetlands**

  Wetlands that are developed in shallow valley inverts along the edge of the elevated low-permeability Walton Subgroup ridgelines. These wetlands are predominantly supported by groundwater discharges from the Walton Subgroup sediments, which are unlikely to be significantly impacted by any drawdown arising from the Greenway development. Therefore, development of the Greenway will not influence the groundwater discharges that support these wetlands.

- **Lake-Edge Wetlands:**

  Wetlands that are developed along the edges of the two lakes connected to the Greenway. Water levels in these wetlands are controlled by water levels in the adjacent lakes. Therefore, these wetlands are unlikely to be impacted by any drawdown arising from the Greenway development.

Each existing natural wetland identified by EcoLogical Solutions near the proposed Greenway has been classified by WGA in terms of its hydrogeological setting, as outlined above (Figure 1). The classification is based on mapped topography and the underlying mapped geological units. The Hill-Fed Wetlands are considered to be unaffected by any potential Greenway drawdown due to their predominant water source. The Low-Lying Wetlands, including those also associated with a component of Hill-Fed, will be assessed individually during the project based on the local geology and hydraulic test results (approximately 7.7 ha in total area). In addition, some existing natural Low-Lying Wetlands are located within the immediate Greenway construction area (and planned stormwater wetland areas) so are considered to be impacted by the proposal (approximately 3 ha in total).

3. GROUNDWATER MODELLING

A groundwater model of the site has been developed over a number of years using on-site testing data and groundwater level responses to previous developments. WGA has conducted a preliminary review of the Beca groundwater model report (Beca 2022, Rotokauri – Hydrogeological interpretative report, 2022 revision, prepared for Hamilton City Council). The model documented in this report has been updated from a previous version developed in 2016 and calibrated based on groundwater drawdown and flow monitoring data associated with the Te Wetini dewatering. Details of the updated calibration have not been provided in the report.

The Beca model indicates that drawdown induced by excavation of the Greenway could extend up to 2.2 km from the Greenway within a confined aquifer underlying the site. This **modelled** confined aquifer is separated from the overlying unconfined (water table) aquifer by a considerable simulated thickness of low permeability sediments. This would limit the drawdown effect to a layer below the shallowest groundwater, which is connected to the existing wetlands.

The Beca modelled drawdown was used to provide guidance with respect to the area for assessing the location of nearby wetlands, as shown on Figure 1. However, the actual drawdown effect is considered to be either limited to deeper aquifers not connected to the wetlands, or much more localised in an unconfined aquifer in the vicinity of the Greenway. In either case the extent of surficial drawdown is considerably less than indicated by the extent of the confined aquifer drawdown shown in the Beca modelling report. The drawdown effect will be revised through local analytical groundwater modelling based on the parameters from on-site testing.

The lower permeability of the older Walton Subgroup surrounding the basin will limit the extent of any drawdown effects from the Greenway. In addition, our initial review of the Beca report identified several technical issues with the model, which could lead to a substantial exaggeration of the area of predicted drawdown.

WGA has conducted an initial analysis of the available drawdown data from the Te Wetini excavation which was carried out over the last two years. The excavation required dewatering to a depth greater than 5.2 m below the groundwater table, which is substantially deeper than the proposed excavation for the Greenway. Our analysis indicates that the induced Te Wetini drawdown extended approximately 600 to 800 m from the excavation. We are therefore confident that the potential drawdown of 2 m induced by the Greenway excavations would result in a smaller radius of influence than the Te Wetini excavation. This contrasts with the documented Beca model drawdown results, which indicate a radius of influence exceeding 2 km.

4. SUMMARY

In summary, the area of predicted groundwater drawdown arising from development of the Greenway is likely to be substantially less than that presented in the Beca report. However, further analysis will be required to confirm potential drawdowns along the length of the Greenway based on our on-going data collection and analysis. The Hill-Fed Wetlands are considered to be unaffected by any projected drawdown. The effects of drawdown on Low-Lying Wetlands (including those also associated with a component of Hill-Fed) will be assessed individually as the project progresses, based on the local geology and hydraulic test results.

Yours Sincerely

Clare Houlbrooke
Principal Hydrogeologist
WALLBRIDGE GILBERT AZTEC

APPENDIX A MAP OF WETLAND HYDROGEOLOGY

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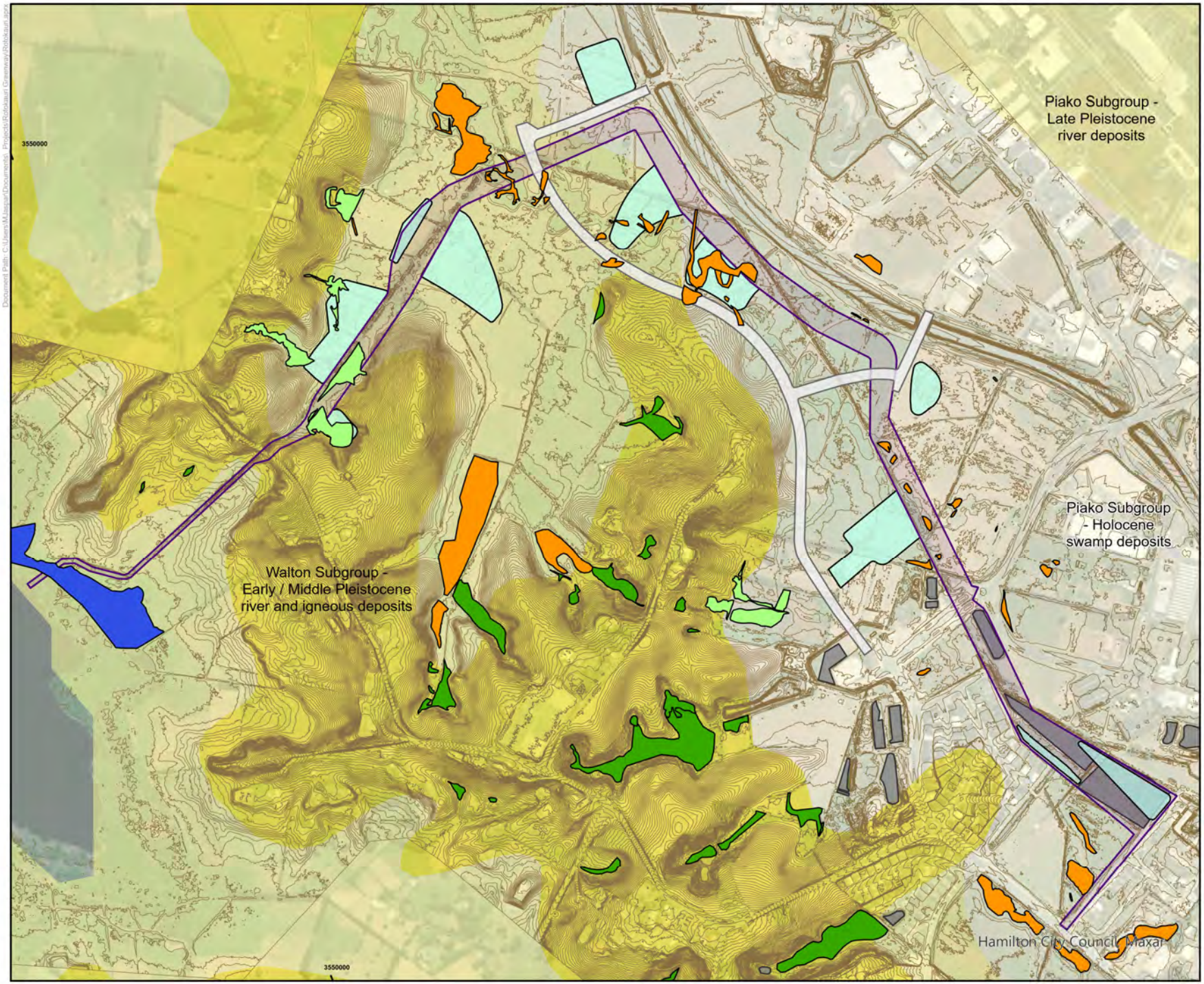
MAP OF WETLAND HYDROGEOLOGY



LEGEND

- Contours (0.1 m)
- Proposed Greenway
- Minor Arterial Route
- Artificial Wetlands - Existing
- Artificial Wetlands - Proposed

Wetlands

- Low-Lying Wetlands
- Hill-Fed & Low-Lying Wetlands
- Hill-Fed Wetlands
- Lake-Edge Wetlands

N

0 100 200 300 400 m

Scale 1:12,500 @ A4

Coordinate System: NZGD 2000 New Zealand Transverse Mercator

WGA

Figure **1**

Rotokauri Greenway

Wetland Hydrogeology