From: Xenia Meier <xenia.meier@water.co.nz>
Sent: Monday, 26 May 2025 6:54 pm
To: Thomas Trevilla <thomas.trevilla@slrconsulting.com>
Subject: Section 92 Request - WAT60444605 Queen Street, Auckland Central 1010

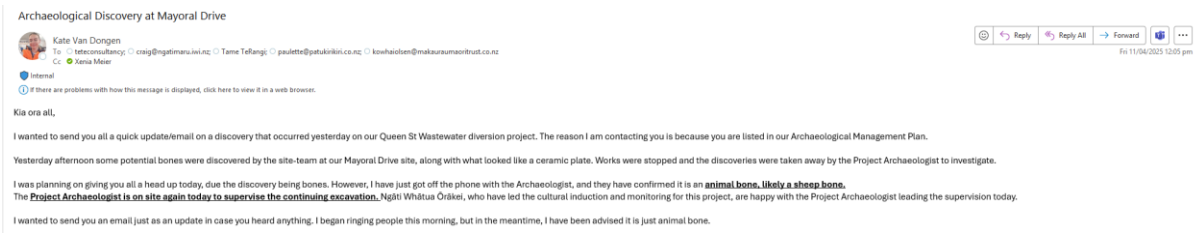
Hi Thomas

Thanks for that.

Re: iwi engagement – not specifically for Marmion Shaft consent but we have regular communications with the team as and when required. For instance, we sent them a notification of a possible find on 10 April at our Mayoral Drive shaft (see snip below - turned out to be sheep bones) and Ngāti Whātua Ōrakei have undertaken cultural monitoring for us. Once the consent has been granted, we'll load it on our website and let Ngāti Whātua Ōrākei, Ngāti Maru, Te Ākitai Waiohua, Ngaati Whanaunga, Te Rūnanga o Ngāti Whatua, and Te Patukirikiri kaitiaki know.

We haven't received any further commentary on the application itself.

Bests. Xenia



Archaeological Discovery at Mayoral Drive

Kate Van Dongen
To: teteconsultancy; craig@ngatimaru.iwi.nz; Tame TeRangi; paulette@patukirikiri.co.nz; kowhaiolsen@makauraumaoritrust.co.nz
Cc: Xenia Meier

Reply | Reply All | Forward
Fri 11/04/2025 12:05 pm

Internal

If there are problems with how this message is displayed, click here to view it in a web browser.

Kia ora all,

I wanted to send you all a quick update/email on a discovery that occurred yesterday on our Queen St Wastewater diversion project. The reason I am contacting you is because you are listed in our Archaeological Management Plan.

Yesterday afternoon some potential bones were discovered by the site-team at our Mayoral Drive site, along with what looked like a ceramic plate. Works were stopped and the discoveries were taken away by the Project Archaeologist to investigate.

I was planning on giving you all a head up today, due the discovery being bones. However, I have just got off the phone with the Archaeologist, and they have confirmed it is an **animal bone, likely a sheep bone.**
The **Project Archaeologist is on site again today to supervise the continuing excavation.** Ngāti Whātua Ōrākei, who have led the cultural induction and monitoring for this project, are happy with the Project Archaeologist leading the supervision today.

I wanted to send you an email just as an update in case you heard anything. I began ringing people this morning, but in the meantime, I have been advised it is just animal bone.

From: Thomas Trevilla <thomas.trevilla@slrconsulting.com>
Sent: Monday, 26 May 2025 4:40 pm
To: Xenia Meier <xenia.meier@water.co.nz>
Subject: RE: Section 92 Request - WAT60444605 Queen Street, Auckland Central 1010

Hi Xenia,

FYI that arborist has confirmed that they're satisfied with Memo / PA confirmation. Just wondering, have you had any further updates regarding iwi engagement for me to note?

Ngā mihi nui,

From: Thomas Trevilla <thomas.trevilla@slrconsulting.com>
Sent: Tuesday, 20 May 2025 12:01 pm
To: Xenia Meier <Xenia.Meier@water.co.nz>
Subject: RE: Section 92 Request - WAT60444605 Queen Street, Auckland Central 1010

Hi Xenia,

See response from GW:

The response to our s92 query is partially satisfactory

1. *Table 5 in the draft GSMCP is not clear – Alert Level No. 1 and Alert Level No.2 are not given. Please provide a sketch of the standpipe piezometer showing the proposed excavation level, the proposed Alert Levels No.s 1 and 2 in both m bgl and mRL and updated Table 5 accordingly.*
2. *There are two ground settlement pins labelled G4 on the monitoring plan, please update the plan with G3 and G4*
3. *In Section 5.5 of the draft GSMCP (last paragraph) we note that alert and alarm trigger levels are given for the "monitoring of services" however the monitoring plan does not show any settlement monitoring markers. The total and differential settlement between ground markers is given in Table 6. Please provide clarification.*
4. *The approximate extent of the frontage of the building that are to have detailed condition surveys, pre-and-post construction is to be shown on the monitoring plan.*
5. *The approximate extent of the public services that are to have CCTV survey, pre-and-post construction is to be shown on the monitoring plan.*

In addition:

Pending receipt of a satisfactory response to the s92 queries on the draft GSMCP – attached is a set of draft conditions please share these with the Applicant.

Arborist aims to get back to me by end of week.

Ngā mihi nui,

Public

Watercare Services Limited
Groundwater and Settlement Monitoring and Contingency Plan

Queen Street Wastewater Diversion Programme: Part 3 - Part 6 Link Project

11 June 2025

W-SL001.04

Groundwater and Settlement Monitoring and Contingency Plan

Queen Street Wastewater Diversion Programme: Part 3 - Part 6 Link Project

Watercare Services Limited

WSP
Auckland
Level 3 The Westhaven
100 Beaumont St
Auckland 1010, New Zealand
+64 9 355 9500
wsp.com/nz

REV	DATE	DETAILS
0	19 Mar 2025	Draft for client review
1	19 April 2025	Draft including changes required by client
2	13 May 2025	Final draft for submission.
3	11 June 2025	Updated following Council review

	NAME	DATE
Prepared by:	Louise Soltau, Eric van Nieuwkerk	11 June 2025
Reviewed by:	Vassilis Houssiadas	11 June 2025
Approved by:	Philip McFarlane	12 June 2025

TABLE OF CONTENTS

ABBREVIATIONS AND DEFINITIONS

AC	Auckland Council
AEE	Assessment of Environmental Effects
Alarm Level	Monitoring level where potential damage could result, that requires immediate action as described in the relevant conditions to reduce ground deformation.
Alert Level	Monitoring level that approaches the level where potential damage could occur, that requires action as described in the relevant conditions.
AUP	Auckland Unitary Plan
Damage	Includes aesthetic, serviceability and structural damage based on the Burland (1995) building damage classification. No actions are required for negligible and very slight aesthetic damage.
Deep Excavation	Typically, a man-made cavity that exceeds 4.5 m in depth.
Dewatering	Removing (taking or diversion of) water from an excavation to allow for a dry work surface.
GSMCP	Groundwater and Settlement Monitoring and Contingency Plan
Monitoring piezometer	A vertical pipe in the ground with a slotted screen that is used to measure the groundwater level

1 INTRODUCTION

1.1 PROPOSED DEVELOPMENT

Watercare are proposing to upgrade the existing wastewater network of the upper (southern) catchment of Auckland City Centre. The current network has insufficient capacity to meet the future needs based on increased development in the area. The wider programme of works has been split into separate parts for the purpose of design, consenting and construction. This Groundwater and Settlement Monitoring and Contingency Plan (GSMCP) applies to the Part 3-6 Link Project of the Queen Street Wastewater Diversion.

The Part 3 – Part 6 Link Project involves the construction of a wastewater pipeline from the Part 3 Mayoral Shaft to a new shaft at the intersection of Queen Street and Marmion Street (hereinafter referred to as the 'Marmion Shaft'). The Project will be constructed using a combination of trenchless pilot bore to construct the wastewater pipeline tunnel, and secant piling to construct the temporary shaft. Dewatering will be required during the excavation of the Marmion Shaft to maintain workable and stable conditions.

1.2 PURPOSE

The purpose of this document is to support the resource consent application to dewater during the construction of Part 3-6 Link of the Queen Street Wastewater Diversion. This GSMCP is based on, and must therefore be read in conjunction with, the following technical reports prepared by WSP for the project:

- Dewatering and Settlement Assessment: Queen Street Wastewater Diversion Programme: Part 3 – Part 6 Link Project, R2 - updated 19 February 2025.
- Fulton Hogan, 2024, Part 3-6 High-Level Construction Methodology (Appendix A)

The GSMCP provides a guide to managing potential settlement generated by groundwater drawdown and deflections caused by temporary excavations on buildings and services adjacent to the Part 3-6 Link works and provides proposed groundwater level and settlement trigger levels.

This GSMCP is not valid if the temporary works design and construction methodology differs from that assumed in this plan. Changes to the temporary works design or construction methodology may warrant a change of conditions of the resource consent, and as a consequence the GSMCP is required to be updated accordingly. It is the Contractor's responsibility to confirm if changes to the temporary works design or construction methodology are within scope of the resource consent and of the GSMCP, and if changes in either or both are required.

The Contractor is responsible for implementation of this GSMCP, including undertaking the monitoring works and implementing any mitigation measures. If there are any changes to temporary design and/or construction methodology, the Contractor will notify WSP so the plan can be updated and resubmitted to AC for recertification.

1.3 SCOPE OF QUEEN STREET WASTEWATER DIVERSION PROGRAMME COVERED BY THIS GSMCP

This GSMCP sets out:

- The at-risk buildings and other infrastructure as a result of the dewatering and excavation activities.
- Recommended maximum levels for groundwater drawdown and trigger levels for settlement of buildings and other infrastructure associated with the Part 3-6 Link works.
- Recommended measures to mitigate adverse effects (including cumulative effects) as a result of the dewatering and excavation activities involved in the early works.
- Proposes contingency measures to be implemented should the alert or alarm levels be exceeded.

1.4 LIMITATIONS

This plan ('Plan') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Watercare Services Limited ('Client') in relation to the monitoring of dewatering effects along the Part 3-6 Link alignment of the Queen Street Wastewater Diversion, for consenting purposes ('Purpose') and in accordance with TO-WSP-65 signed 3 December 2024 ('Agreement'). This plan is provided to support a resource consent application only. WSP accepts no liability whatsoever for any use or reliance on this Plan, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Plan by any third party.

2 PROPOSED CONSTRUCTION METHODOLOGY

The temporary shaft opposite Marmion Street will be used as a reception pit for the Pilot Guided Boring Machine. The shaft outside diameter will be 6.4 m constructed using 900 mm piles around the perimeter, with 200 mm thick in-situ shotcrete lining, providing a 4 m internal diameter shaft that will be excavated down to 17 m depth. The shaft will be constructed as follows:

1. A shallow trench is excavated, and a guide wall formed at ground level to guide the placement of the secant piles.
2. Soft piles are drilled initially leaving a gap between subsequent soft piles to avoid damage to newly adjacent piles in which the concrete is curing.
3. Later on, the gaps between the soft piles are drilled and soft piles constructed in those to form a continuous ring around the perimeter of the pit.
4. Hard piles are then drilled through the soft piles creating a continuous retaining wall

Once the shaft has been excavated to approximately 1 m below the invert, a 300-500 mm thick concrete base will be poured. This base creates a level working platform while also preventing groundwater flow from below. Once the base has been constructed this shaft is considered to be effectively sealed, and any ingress should be managed through sealing of any leaks into the excavation.

The shaft will be lined using shotcrete in approximately 2 m lifts to the depth of the shaft. The shaft lining and secant piles will remain in place and form part of the permanent works.

3 OVERVIEW OF MONITORING REQUIREMENTS

This section provides an overview of the monitoring and reporting required for the excavation and construction works in accordance with the conditions that are likely included in the consent to dewater.

Temporary works, ground settlement, building and structure deflections, and groundwater drawdown monitoring during the construction works will be undertaken to monitor whether the response of the surrounding buildings and structures remain within design tolerances and estimated range of settlement effects. This process allows for the geotechnical effects to be monitored and are to be used as an indication if mitigation measures are required.

3.1 MONITORING AND REPORTING REQUIREMENTS

In general, monitoring is subdivided into three separate stages reflecting the separate periods of construction works. These are summarised in Table 1.

Table 1: Summary of Monitoring Stages

Pre-construction monitoring	This monitoring phase will provide baseline data against which effects resulting from the construction works can be assessed. The outcomes will form part of the input for the construction phase assessments. Pre-construction monitoring is to include: • Condition surveys and visual inspections of selected nearby buildings (refer to section 5.3.1), including photographs of nearby buildings, to define existing condition of the buildings. • CCTV surveys of stormwater assets • Building and ground monitoring survey points to establish a settlement baseline. • Groundwater level monitoring to establish baseline levels.
During construction monitoring	Monitoring during the construction phase is carried out to compare settlements against the set Alert and Alarm levels and enable the implementation of countermeasures in advance of potential adverse impacts occurring. Mitigation options set out in Section 6 of this GSMCP, may also be required to be implemented.
Post-construction monitoring	Where specified in the Consent, monitoring will occur until the various stages of works are completed (excavation, dewatering and construction). Post-construction measurements will be completed, if required, for six months after completion of dewatering or until the position markers are found to have stabilised and approval is given in writing by AC.

The monitoring required during each stage is summarised in Table 2.

Table 2: Summary of Monitoring Requirements.

Monitoring Type	Construction Stage	Minimum Measurement Frequency	Measurement Accuracy	Reporting Requirement to AC, unless otherwise stated	Relevant GSMCP Sections
Groundwater monitoring	Baseline (pre-construction)	Twice weekly for a four-week period before commencing dewatering in the monitoring piezometer near the Marmion Shaft.	±10 mm	Every two months for routine monitoring. Within 2 working days of any alert trigger level exceedances.	Section 4
	Excavation dewatering (during construction)	At least twice weekly until completion of dewatering.			
	Post-construction dewatering	Once a month for three months after the completion of dewatering. Monitoring can cease earlier if monitoring levels are stable (groundwater levels are within pre-construction range and seasonal variation is less than background variation of 1 m), or until stable measurements are demonstrated and written approval is provided by AC for certification.			
Building Condition Surveys (BCS)	Baseline (pre-construction)	A pre-construction condition survey is to be carried out on all buildings identified relevant to this GSMCP (subject to approval of the property owner), no more than six months prior to the commencement of dewatering.	Not applicable	Prior to commencement of construction.	Section 5.3.1
	Excavation dewatering (during construction)	Monthly visual inspections with photographic evidence of the surrounding ground and external facades of buildings identified, from the commencement of dewatering, or within one week of the completion of works for shorter duration activities[1]. This is to record any deterioration or further cracking after pre-construction conditions. Additionally, visual inspections with photographic evidence will be undertaken at intermediate intervals during construction if requested by the building or structure owner, following observation of cracking.		A record is to be maintained of the time, date and any observations for each inspection. This record is to be maintained and submitted to AC every two months or upon reasonable request from the AC Representative. Results are to be	

Monitoring Type	Construction Stage	Minimum Measurement Frequency	Measurement Accuracy	Reporting Requirement to AC, unless otherwise stated	Relevant GSMCP Sections
	Post-construction dewatering	If alarm levels are exceeded during excavation and dewatering, a post-construction condition survey shall be carried out six months after completion of dewatering.		included in the monitoring report to AC every two months.	
Ground Surface and Building Monitoring	Baseline (pre-construction)	Each ground settlement and building deflection monitoring mark shall be surveyed and recorded at least three times prior to the commencement of dewatering to establish baseline coordinates and elevation.	Horizontal and vertical accuracy of at least ±2 mm, or as otherwise achieved by precise levelling during baseline phase.	To be compiled and submitted to AC prior to the commencement of dewatering.	Section 5.3.2
	Excavation dewatering (during construction)	Weekly		A record is to be maintained of the time, date and any observations for each survey, and submitted to AC every two months.	
	Post-construction dewatering	Monthly for six months			
Retaining wall monitoring	Baseline (pre-excavation)	Twice within 1 month prior to the commencement of dewatering	Horizontal and vertical accuracy of at least ±2 mm, or as otherwise achieved by precise levelling during baseline phase.	To be compiled and submitted to AC prior to the commencement of excavation.	Section 5.3.3
	Excavation dewatering (during construction)	Retaining wall survey markers shall be surveyed and recorded at: • An average of each 2 metres depth excavation, at a minimum of once weekly; or • When changes to the propping system are being carried out; and • At a minimum frequency of weekly intervals from the commencement of dewatering.		A record is to be maintained of the time, date and any observations for each survey, and submitted to AC every two months.	

Monitoring Type	Construction Stage	Minimum Measurement Frequency	Measurement Accuracy	Reporting Requirement to AC, unless otherwise stated	Relevant GSMCP Sections
	Post-construction dewatering	Every two weeks, until construction is completed.			

[1] An activity of less than one month duration

3.2 ROLES AND RESPONSIBILITIES

The key management roles for each organisation in relation to groundwater and settlement management during the construction of the project are outlined in Table 3. Monitoring details and records shall be submitted to AC by those indicated as responsible.

Table 3: Specific roles and responsibilities.

Organisation	Role	Responsibilities
Watercare Services Limited (Watercare)	Consent Holder and Project Manager	• Overall responsibility for project compliance and performance in relation to environment, quality assurance and incident management. • Managing new or altered consents required during construction (if any).
Construction Contractor	Project Manager	• Overall responsibility for site management. • Accountable for the implementation of all Management Plans. • Review and implementation of this GSMCP.
	Environment and Sustainability Manager	• Prepare, review and update this GSMCP. • On-site compliance with consent conditions and other requirements and tracking compliance information. • Reviewing and reporting on environmental performance. • Monitoring and inspection of works to assess compliance with the GSMCP. • Implementation of the GSMCP including monitoring, interpretation and reporting. • Inspections, auditing and checking of environmental management practices and procedures. • Obtaining any new or varied consents required due to construction techniques or design changes. • Facilitate and oversee environmental monitoring. Update and maintain the environmental portion of the Project Risk Register. • Training of all staff including subcontractors.
Subcontractors	Project and Site Engineers	• Review and interpret monitoring observations and trends and communicate to the relevant members of the construction team. • Identify and respond to alert levels and manage contingency measures. • Overseeing subcontractors.
	Site Managers	• Adherence to the GSMCP
Independent	Asset Condition Engineer	• Undertake asset dilapidation surveys where exposed, by a suitably qualified and experienced professional (SQEP).

4 PROPOSED GROUNDWATER MONITORING PLAN

4.1 INTRODUCTION

Groundwater levels will be monitored in the piezometer positioned at a distance similar to that of the buildings near the shaft that may be affected by settlement. The purpose of the groundwater monitoring is to confirm where the groundwater level is in relation to the set Alert and Alarm Levels.

The proposed groundwater monitoring requirements are the minimum to be implemented, and the Contractor is expected to adapt the groundwater monitoring plan to align it with their method of working. This means that the Contractor is expected to update the settlement monitoring plan as the works progress. Refer to the GSMCP purpose in Section 1.2.

It is proposed that groundwater levels are monitored at the piezometer location presented in Table 4, to establish the initial baseline conditions, pre-excavation conditions with dewatering arrangement active and continue throughout and beyond the end of the construction process.

4.2 PROPOSED MONITORING PLAN

It is proposed that the monitoring network will comprise a single monitoring piezometer (PZ24/03) for the Marmion Shaft, installed at a distance from the shaft similar to that of the nearest buildings to the shaft, to assess whether the dewatering effects are within the estimated range of groundwater drawdown levels. The piezometer details are listed in Table 4 and the location shown on the monitoring plan in Appendix A. The modelling data at this location are used to define trigger levels.

Table 4: Proposed monitoring well details.

Monitoring well ID	Potentially affected structure	Depth (m bgl)	Screened interval (m bgl)	Distance to shaft edge (m)
PZ24/03	345-361 Queen Street	17	14-17	4.4

Should the monitoring piezometer be damaged and become in-operable during construction works, then AC is to be informed, and a new monitoring piezometer is to be drilled at an appropriate nearby location, if required.

4.3 PROPOSED MONITORING METHODOLOGY

It is proposed that groundwater levels are monitored using automatic pressure transducers set at 15-minute intervals. The specified monitoring frequency in Table 2 is considered the minimum frequency at which the data is retrieved and processed. All levels will be recorded to a minimum accuracy of ± 10 mm.

4.4 GROUNDWATER TRIGGER LEVELS

Groundwater drawdown as a result of the project works has been modelled by WSP and modelled drawdowns have been used to set the groundwater trigger levels. Two alert levels, as opposed to a single alert and alarm level, is set because the settlement itself will be measured, and any mitigation or contingency will be based on those settlement responses. The alert trigger levels will provide notification that groundwater responses to the construction works are nearing those estimated and that such groundwater responses may be close to having

implications for surface settlement. Management actions following exceedance of these alert levels are described in Section 6.

The first alert level will be set as the lowest groundwater level considering seasonal variation, plus a dewatering drawdown as per Table 5. The second alert level will be set as an additional 0.5 m of drawdown. A schematic diagram of monitoring sites and groundwater alert levels is shown in Figure 4-1.

Confirmation of the exact groundwater trigger levels requires completion of the baseline readings and identification of the lowest seasonal groundwater level. The longer-term monitoring from the existing piezometers at the Mayoral (PZ01_S and PZ01_D) shafts may be applicable to establish seasonal low if the data correlate well with the dedicated monitoring well water levels.

If the Alert level is reached, the actions outlined in Section 6 shall be carried out.

Table 5: Proposed alert groundwater levels for monitoring piezometer.

Piezometer	**Seasonal low groundwater level**	**Alert level 1** (expected drawn down groundwater level)		**Alert level 2** (0.5 m below expected drawn down groundwater level)	
	Level	*Level (m RL)*	*Depth (m bgl)*	*Level (m RL)*	*Depth (m bgl)*
PZ24/03	*13.75m RL* *13.76m bgl*	*11.25*	*16.06*	*10.95*	*16.56*

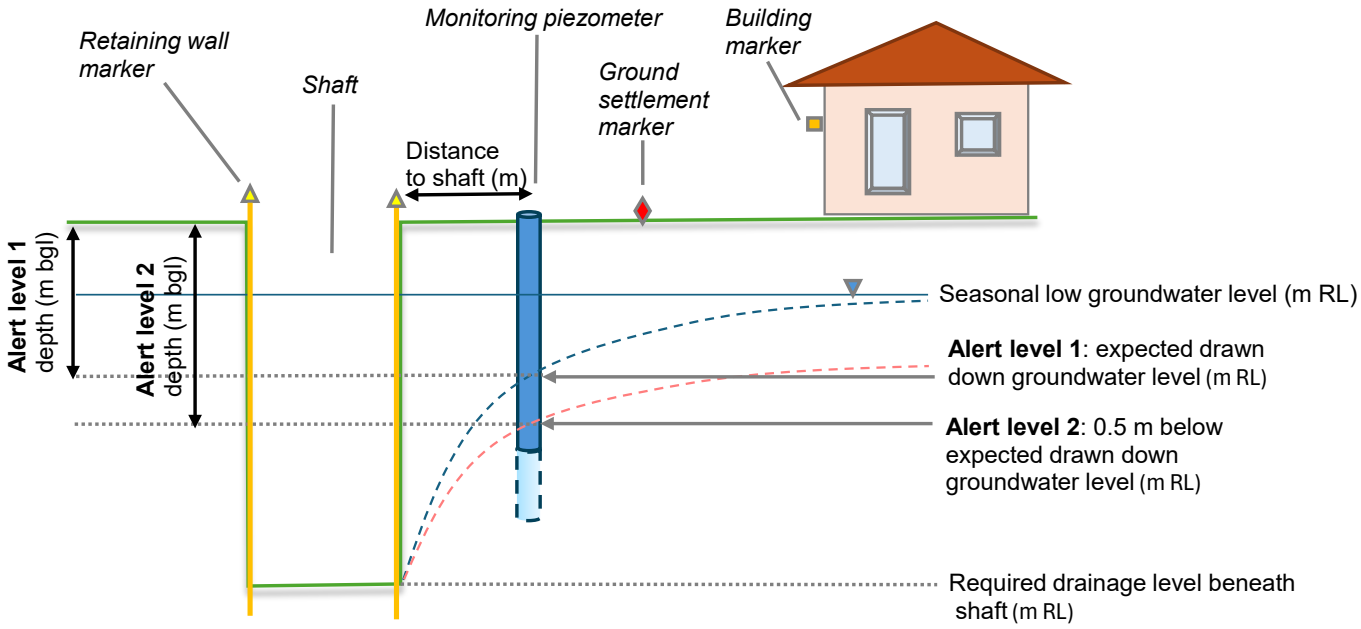


Figure 4-1: Schematic diagram showing monitoring sites and groundwater alert levels (not to scale).

5 PROPOSED SETTLEMENT AND DEFLECTION MONITORING PLAN

5.1 INTRODUCTION

The settlement monitoring plan provides advance warning if the ground is settling more than estimated. This provides time for mitigation or rectification works to be identified and implemented.

5.2 PROPOSED MONITORING PLAN

The settlement monitoring will use visual inspections, ground settlement markers, building markers, and retaining wall markers for monitoring the area around the shaft excavations. The proposed methodology is detailed below, but generally comprises the following:

- Pre-construction monitoring to determine existing conditions and baseline measurements.
- Monitoring during construction around active works areas at a higher frequency to determine actual ground settlements and compare with assumptions as the works progress.
- Post-construction monitoring continued until potential ground settlements have stabilised and no further potential for damage remains.

A preliminary plan showing the proposed location of monitoring points is included in Appendix A. This plan will be updated by the Contractor with as-built locations following installation of the monitoring points and their pre-construction survey.

5.3 PROPOSED MONITORING METHODOLOGY

5.3.1 CONDITION SURVEYS AND VISUAL INSPECTIONS

Pre- and post-construction condition surveys will be undertaken on all assets (buildings and services) determined to be susceptible to settlement. During construction additional visual inspections shall be undertaken with additional condition surveys performed as required by this plan.

The inspections and subsequent evaluations will be undertaken and reported on by a SQEP and shall include:

- For all inspections, approval from the asset owner shall be acquired.
- Type and arrangement of foundations.
- Condition of the existing asset including any pre-existing damage and the type of damage (e.g., aesthetic, serviceability impact).
- Photographic evidence of the above.

Visual inspections of the external building fronts facing the excavation, 20 m on either side of the excavation, must be undertaken for the purpose of detecting any existing external damage or new external damage or deterioration of building fronts. The 50 m portion of the basement at 345-361 Queen St facing the excavation must be included in the visual inspections. The sites to be surveyed are the buildings at:

- 345-361 Queen Street
- 430 Queen Street
- 438 Queen Street
- The 50 m portion of the basement at 345-361 Queen St facing the excavation.

Pre-construction

The details and photographs of the pre-construction condition surveys, as outlined above, shall be recorded and submitted to AC before the commencement of dewatering. Although not currently required, if internal access to the property is required and cannot be reasonably obtained, this shall be reported to AC and an alternative monitoring option implemented for the duration of the project or until access can be obtained.

During construction

Visual inspections of the structure and surrounding ground of the assets identified in the pre-construction survey shall be performed at monthly intervals or if requested by the building or structure owner. Additional inspections may be required as part of the contingency measures associated with the ground settlement trigger levels.

A record shall be kept of the visual inspections, including time and date, asset inspected, and any observations made. The result of the inspection shall be compared against the pre-construction condition surveys to determine if any damage has occurred.

Post-construction

If alarm levels are exceeded during excavation and dewatering, a post-construction inspection will be completed for each asset at the later of either the completion of the construction works or six months after completion of the dewatering or as otherwise agreed with the owner. In addition to the details recorded in the pre-construction inspection, the survey should note whether any additional damage has occurred to the structure and the probable cause of such damage. If damage or other type of deterioration has occurred to any building or structure as a result of the construction works, remedial actions must be taken as soon as practicable and in accordance with the GSMCP.

5.3.2 GROUND SURFACE AND BUILDING MONITORING

The purpose of the ground surface and building monitoring is to confirm that actual settlements are within the estimated settlement range, as a precautionary measure. The maximum total and differential settlements based on the modelling described in the specialist report (WSP, 2025) are estimated to be low and are therefore expected to be within the negligible damage category. Trigger levels are based on these estimated settlements.

Ground settlement and building markers will be installed in all directions around the shaft excavations, at the approximate locations indicated on the plan in Appendix B for the Marmion Shaft. The locations were selected as follows:

- The markers should be placed to allow for ease of access for pre and post construction monitoring.
- Ground settlement markers between the shaft edge and the building at 345-361 Queen Street, with at least two markers facing radially away from the excavation (G1 and G2, and G3 and G4) to allow for differential settlement to be determined. Ground settlement markers on the sidewalk near the buildings at 345-361, 430 and 438 Queen Street, where the estimated settlement is highest.

- Building markers on the buildings near the excavation (345-361, 430 and 438 Queen Street) where the estimated settlement is highest, with at least two markers on the building fronts closest to the excavation to allow for differential settlement to be determined.
- Building markers on the retaining wall in front of 345-361 Queen Street, with at least two markers on the retaining wall facing the excavation to allow for differential settlement to be determined.

Pre-construction

Existing levels will be determined for each marker by at least three baseline surveys taken prior to any dewatering commencing. The surveys shall record both the vertical and horizontal positions of the marker. Additional pre-construction monitoring may be required if any pre-existing ground settlements are identified by the initial surveys. The existing levels will be recorded and submitted to AC for approval before beginning dewatering.

During construction

Markers at the shaft location shall be surveyed once a week.

The results of the surveys shall be recorded in a database and compared against the baseline levels. During dewatering, and until settlements have stabilised, AC shall be provided with the results of the weekly monitoring and a summary report of the ground settlement, with interpretation, in a report every two months.

Post-construction

Following completion of the dewatering, surveying of the markers shall be continued monthly for six months or until the position of the markers is found to have stabilised and approval is given in writing by AC.

5.3.3 SHAFT RETAINING STRUCTURE MONITORING

The purpose of the retaining structure monitoring is to confirm that actual deflections remain within the estimated range. Trigger levels are based on the estimated deflections, as provided by AOS, 2024.

The retaining wall markers will be installed along the secant piles closest to the buildings at 345-361, 430 and 438 Queen Street, at the approximate locations indicated on the plan in Appendix A.

Monitoring can only be conducted once the relevant construction parts of the retaining structure, i.e. the secant piles, have been completed and as excavation commences.

Pre-construction

Existing levels will be determined for each marker by at least two baseline surveys taken prior to any of the dewatering commencing. The surveys shall record both the vertical and horizontal positions of the marker. Additional pre-construction monitoring may be required if any pre-existing ground settlements are identified by the initial surveys. The existing levels will be recorded and submitted to AC for approval before beginning shaft excavation works.

During construction

Markers at the shaft location shall be surveyed once for every two metres depth (on average) of excavation, and, in any case, at a minimum of once a week.

The results of the surveys shall be recorded in a database and compared against the baseline levels. The database should include the depth of the excavation at the time of the survey. During excavation, and until settlements have stabilised, AC shall be provided with the results of the weekly monitoring and a summary report of the ground settlement, with interpretation, in the monitoring report to AC every two months.

The results of the surveys shall be recorded in a database and compared against the estimated levels. AC shall be provided with the results of the monitoring and a summary report of the ground settlement, with interpretation, in the monitoring report to AC every two months.

5.3.4 MONITORING OF UTILITIES AND INFRASTRUCTURE

The shaft excavation will be undertaken in proximity to various existing underground services including water, wastewater, stormwater and electricity. These services are constructed of different materials to various standards, at different depths and locations, and as such may have varying tolerances to deformation. Therefore, settlement trigger levels based on conservative assessment of damage to typical services (refer WSP, 2025) are applied. The asset owners shall be consulted to confirm deformation tolerances of the given assets, and the associated proposed monitoring is suitable.

Prior to construction a pre-condition survey shall be undertaken on services that are accessed for relocation. The survey may comprise a CCTV condition assessment of services accessed for relocation for up to 20 m from the excavation, carried out by a SQEP, and shall include the following but are not limited to:

1. Existing levels of aesthetic damage.
2. Existing levels of serviceability damage.
3. Existing levels of structural damage.
4. Existing top of pipe/invert RL (GPS).
5. Photographic/video evidence of (1), (2), and (3) above.

If the total or differential Alarm limits are reached during construction close to the shaft (less than 20 m), a post-construction survey will be done within six months of completion of the dewatering activity covering the items detailed above.

A copy of the pre- and post-construction survey report shall be forwarded to AC within 15 working days of completing the reports along with a certificate from the SQEP who has certified that the survey has been completed in a professional manner and is an accurate assessment of the condition of the structure concerned.

The proposed ground settlement markers will be used for monitoring for the underground services as well.

If the trigger levels are exceeded, the actions outlined in Section 6 shall be carried out.

5.4 SETTLEMENT TRIGGER LEVELS

Two trigger levels are set for all settlement monitoring points:

- Alert: Measured settlements are still within normal levels but are approaching those predicted (≥ 70%) in the settlement assessment. Alert levels have been set to 70% of estimated settlement levels at the markers, or, for estimated settlement less than very slight damage levels (10 mm), alert levels have been set to 70% of damage levels (i.e., 7 mm).
- Alarm: Measured settlements have reached those predicted. Alarm levels have been set to 100% of estimated settlement levels at the markers, or, for estimated settlement less than damage levels (10 mm), alert levels have been set to very slight damage levels (i.e. 10 mm).

Details of the trigger levels for all monitoring points are provided in Table 6.

Trigger levels are based on the expected settlements calculated in the design and do not necessarily imply potential for damage to occur if they are exceeded. These trigger levels are based on an initial estimate of effects, and the Contractor may adopt more rigorous levels if needed for services condition surveys or because of further developments or changes in the design. At least 10 working days prior to adopting any change in trigger levels the Contractor will submit to AC the change in trigger levels for review.

Table 6: Shaft 14: Estimated settlement and trigger levels for monitoring locations.

Marker ID[1]	Distance to shaft edge (m)	Maximum estimated settlement (mm)	Trigger level (mm) - Ground		Trigger levels – differential settlement		Justification for marker locations
			Alert	Alarm	Alert	Alarm	
G1[2]	7	10.5	8	11	1:1,000	1:700	Ground settlement monitoring 345-361 Queen Street (including retaining wall in front of). Differential settlement monitoring.
G2	8.5	7.5	7	10	1:1,000	1:700	
G3	7	10.5	8	11	1:1,000	1:700	Ground settlement monitoring near 345-361 Queen Street (including retaining wall in front of). Differential settlement monitoring.
G4	8.5	7.5	7	10	1:1,000	1:700	
G5	20	6	7	10	1:1,000	1:700	Ground settlement monitoring near 430 Queen Street.
G6	16.5	6	7	10	1:1,000	1:700	Ground settlement monitoring near 438 Queen Street.
Marker ID	**Distance to shaft edge (m)**	**Maximum estimated settlement (mm)**	**Trigger level (mm) – Building**		**Trigger levels – differential settlement**		**Justification for marker locations**
			Alert	**Alarm**	**Alert**	**Alarm**	
B1	8.4	7.5	7	10	1:1,000	1:700	Building settlement monitoring 345-361 Queen Street. Differential settlement monitoring.
B2	11.2	6	7	10	1:1,000	1:700	
B3	20	5.7	7	10	1:1,000	1:700	Building settlement monitoring 430 Queen Street. Differential settlement monitoring.
B4	25	<5.7	7	10	1:1,000	1:700	
B5	17	5.7	7	10	1:1,000	1:700	Building settlement monitoring 438 Queen Street. Differential settlement monitoring
B6	20	5.7	7	10	1:1,000	1:700	
B-RW1	7.6	10	7	10	1:1,000	1:700	Building settlement monitoring 345-361 Queen Street retaining wall. Differential settlement monitoring with RW2.
B-RW2	8.4	7.5	7	10	1:1,000	1:700	
Marker ID	**Distance to shaft edge (m)**	**Maximum estimated settlement (mm)**	**Trigger level (mm) – Retaining Wall**		**Trigger levels – differential settlement**		**Justification for marker locations**
RW1	0	5.3	7	10	-	-	Retaining wall markers
RW2	0	5.3	7	10	-	-	
RW3	0	5.3	7	10	-	-	
RW4	0	5.3	7	10	-	-	

The following trigger levels are set for monitoring of services:

- Alert – total ground settlement measured at any ground marker exceeding 50 mm.

[1] The markers are denoted by prefix G for ground settlement markers, B for building movement markers, B_RW for the building deflection markers for the retaining wall in front of 345-361 Queen Street and RW for retaining wall markers.

[2] Note that some of the ground settlement and building markers for 345-361 Queen St will likely have line-of sight issue because of the trees next to the road. This will likely required discussions with the construction partner to resolve.

- Alarm – total ground settlement measured at any ground marker exceeding 70 mm.
- Alert – differential settlement calculated between two adjacent markers exceeding 1:300
- Alarm – calculated differential settlement between two adjacent markers exceeding 1:200.

The following ground settlement markers and marker pairs will be used for monitoring of total and differential settlement of services:

- G1 and G3 for the northwest side of street
- G5 and G6 for the southeast side of street

6 PROPOSED RESPONSE, MITIGATION AND CONTINGENCY PLAN

6.1 GROUNDWATER LEVELS

Dewatering of the excavations is expected and planned for as a part of the construction works. Groundwater monitoring will be used to confirm the groundwater levels are responding as estimated in the modelling.

Two alert levels for groundwater level monitoring have been set, as described in Section 4, with each alert level requiring specific management actions as follows:

Alert level 1 exceedance:

- The Contractor will notify and advise AC of the alert level exceedance within 24 hours.

Alert level 2 exceedance:

- The Contractor will notify and advise AC of the alert level exceedance within 24 hours.
- The Contractor will increase the groundwater level, ground settlement and building deflection monitoring frequency at the location of exceedances to daily. This monitoring frequency will continue if a ground settlement or building deflection trigger level has been exceeded as well. If no further settlement or building deflection occurs, the frequency reverts back to weekly.
- Monitoring results are to be submitted to AC.

If ground settlement and/or building deflection trigger levels are exceeded as well, further actions are required as outlined in Section 6.2 below.

6.2 GROUND SETTLEMENT AND BUILDING DEFLECTION

The settlement and deflection monitoring will be used to confirm if ground settlements and building deflections are within the estimated range (WSP, 2025). Responses and mitigation measures as outlined below are required in the unlikely event that alert or alarm trigger levels (described in Section 5) are exceeded:

Alert level exceedance:

“Alert” exceedance level means the ground settlement is still less than expected but approaching the estimated settlement. In the event of an alert exceedance the following steps shall be taken:

- The Contractor will notify and advise AC of the alert level exceedance within 24 hours.
- The Contractor will re-measure all monitoring stations within 20 m of the affected monitoring location to confirm the extent of apparent settlement and/or deflection. Re-measurements are undertaken for all these monitoring stations every two days until the written report has been submitted to AC.
- Prepare to institute mitigation measures in consultation with the consultants. These may include measures to reduce dewatering, increase the stiffness of the support measures etc.
- A written report, prepared by a SQEP, is to be submitted to the Council within five working days of the Alert Level exceedance.

Alarm level exceedance:

“Alarm” exceedance means the ground settlement has reached or exceeds the estimated settlement, and any further settlement and/or deflection may cause damage to nearby buildings or structures. Note that asset

damage is still not expected at this level. In the event of an alarm exceedance the Contractor will take the following steps:

- Initiate a “stop work” and implementation of mitigation measures as outlined following the Alert level exceedance, or as otherwise required to minimise risks of damage to nearby buildings and structures.
- Notify AC within 24 hours of the Alarm Level exceedance and provide details of measurements taken.
- The works will be assessed by a SQEP to identify the reasons for the ground settlements and reconsider the design assumptions.
- Undertake a condition survey by a SQEP on any building or structure located adjacent to any monitoring station where the Alarm Level has been exceeded.
- The SQEP will recommend and oversee the implementation of mitigation measures such as additional ground support (e.g., additional struts or anchors and / or recharge wells) to reduce further settlement and/or deflection and prevent asset damage. The SQEP may also propose additional monitoring instrumentation be installed at the affected area.
- Within five working days of recommencement of works, a report will be prepared by the SQEP and submitted to AC of the alarm exceedance being identified. The report will an analysis of all relevant monitoring data and comparison with the initial design, details of the mitigation measures implemented and the estimated risk of further ground settlement. The report will also include the results of the condition surveys and of asset damage, as well as any remedial works and/or agreements with affected parties.

6.3 RESPONSE TO DAMAGE

6.3.1 BUILDING DAMAGE

Building monitoring is proposed to establish early warning systems against significant damage. Thus, if a building is found to have been damaged as a result of the construction works, either from a post-construction building survey or one requested during construction, AC will be immediately notified as per the above. Should building repairs be required, these will be undertaken at the cost of the Contractor as soon as practicable. The timing and extent of repairs may vary depending on the building owner’s requirements.

6.3.2 UTILITY AND INFRASTRUCTURE DAMAGE

If trigger levels, in particular differential settlement trigger levels are exceeded at monitoring points related to utilities or infrastructure, the Contractor will immediately notify AC and the utility provider. A condition survey will be undertaken to determine the level and extent of any damage. Should the survey find that damage has occurred as a result of the construction works, the Contractor will notify AC and propose a methodology to repair the damage and prevent further damage.

7 GSMCP REVIEW

The Contractor will review the current plan at least quarterly or to reflect any material changes that occur throughout the course of the project in regard to site conditions, ground conditions or construction methodology. The Contractor's plan and any reviews will be approved in accordance with the Contractor's internal governance process. The reviews must take into consideration:

- Compliance with resource consent conditions, the GSMCP and material changes to these plans.
- Any changes to construction methodology.
- Key changes to roles and responsibilities within the project.
- Changes in industry best practice standards.
- Results of monitoring and reporting procedures associated with the management of adverse effects during construction.
- Any comments or recommendations received from AC regarding the GSMCP.
- Any unresolved complaints and any response to the complaints and remedial action taken to address the complaint as required by the relevant resource consent conditions.
- All affected parties will be notified of the review and any material changes proposed. Any material change proposed shall also be subject to an independent peer review and will be submitted to AC for review.

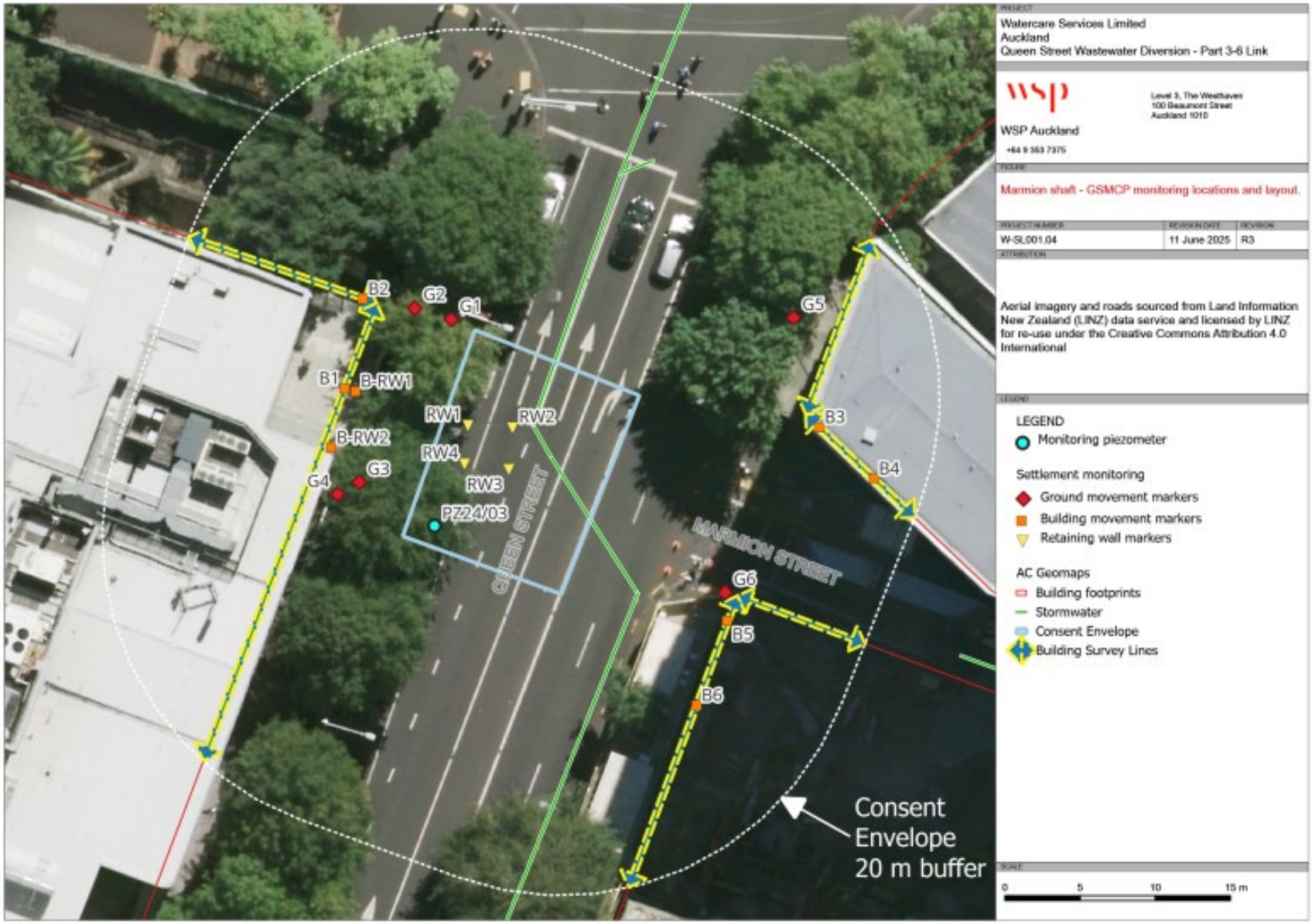
A copy of the Contractor's operative GSMCP document and subsequent revisions will be kept for the Project Records. Each new/updated revision of the GSMCP documentation will be issued with a revision number and date, and previous will be marked as obsolete to eliminate obsolete GSMCP documentation being used.

APPENDIX A:

FULTON HOGAN HIGH-LEVEL CONSTRUCTION METHODOLOGY

APPENDIX B:

MONITORING SITE PLAN – MARMION SHAFT



Placeholder – to be replaced with full page map in the pdf version.

From: Xenia Meier <xenia.meier@water.co.nz> (Environmental Manager on behalf of Watercare)
Sent: Tuesday, 8 July 2025 7:49 pm
To: Ireland, Emily <Emily.Ireland@wsp.com> (Consultant Planner on behalf of Watercare)
Subject: FW: Section 92 Request - WAT60444605 Queen Street, Auckland Central 1010

Current status of Marmion. I have asked Thomas to accept the draft without the minor amendment below which can be covered off during the final submission process.

From: Thomas Trevilla <thomas.trevilla@slrconsulting.com>
Sent: Friday, 4 July 2025 1:24 pm
To: Xenia Meier <xenia.meier@water.co.nz>
Subject: RE: Section 92 Request - WAT60444605 Queen Street, Auckland Central 1010

Hi Xenia,

Noted thanks, final bit is the update to the GSMCP section

We consider that the updated draft GSMCP (dated 11 June 2025, rev 3) is satisfactory, ***with the exception that we consider that post construction detailed condition surveys (described in Section 5.3.1) are required irrespective of whether or not building settlement alert or alarm levels are triggered. It is standard practice to undertake pre and post construction detailed condition surveys in order to make a direct comparison of any defects / cracks identified. Section 5.3.1 in the draft GSMCP should be updated accordingly and an updated report prepared.***

Ngā mihi nui,