28 March 2025

Attention: **Xenia Meier**
Watercare Services Limited

By email: xenia.meier@watercare.co.nz

Dear Xenia

Resource consent application – Further information request

Application number(s):	WAT60444605
Applicant:	Watercare Services Limited
Address:	Queen Street, Auckland Central 1010
Proposed activity(s):	To install new wastewater infrastructure and associated construction shafts and site works as part of the Part 3 to Part 6 link of the Midtown Wastewater Diversion Project

This letter is a request for further information that will help me better understand your proposal, including its effect on the environment and the ways any adverse effects might be mitigated.

Requested information

Groundwater

1. On the basis of the settlement predictions a draft Groundwater Settlement Monitoring & Contingency Plan (GSMCP) is required. The draft GSMCP should include (but not be limited to): a plan showing the locations and types of monitoring devices including groundwater monitoring bores, building settlement marks on the neighbouring buildings/structures, ground settlement marks, retaining wall deflection marks and inclinometers (if required). Alert and alarm trigger levels and monitoring frequency are also required for total and differential settlement of the ground surface, buildings and retaining walls and alert levels 1 & 2 for groundwater level monitoring. Pre-and-post dewatering detailed condition surveys are required for existing walls, together with appropriate settlement monitoring and the identification of neighbouring buildings/structures that require pre-and-post dewatering detailed condition surveys, together with those public and private services (if any), which require pre-and -post dewatering CCTV condition survey, together with a description of the proposed construction methodology/sequence and contingency options. Please note that further queries may arise once the draft GSMCP is received.

Arboriculture

2. Please provide an plan showing the AUP(OP) defined Protected Root Zones and the anticipated excavations and subsequent root zone incursion. This is required to confirm compliance with the permitted activity standards.

3. Please confirm that the piling machinery will not require height clearance of greater than 4.5 m when operating beneath the canopies of the identified trees. If there is any conflict between the machinery and tree canopy greater than 4.5 m above ground level, please provide a detailed description of the required pruning and confirm compliance with the permitted activity standards.

Note: If the relevant permitted activity standards are not complied with, please confirm and assess any additional resource consent requirements.

Providing the information

Please provide this information in writing within 15 working days[1] (before 18 April 2025). If you will not be able to provide the information by that date, please contact me before then to arrange an alternative time. We will not work on your application any further until either you provide this information, or you state that you refuse to provide it.

Note: If you will require more than 15 working days to provide this further information, I will seek that you agree to an extension of time under section 37 of the Resource Management Act 1991 (the RMA). This will enable appropriate time for me to undertake the necessary review of the information once provided.

Refusing to provide the information

If you refuse to provide the information, or if you do not submit the information to us within 15 days (or by another other agreed time), the RMA requires that we publicly notify your application.[2]

If this happens, you will be required to pay the notification fee of $20,000 in full before we proceed with the notification of your application.[3]

Next steps

Once you have provided the requested information, I will review what you have provided to make sure it adequately addresses all of the points of this request.

In the application acceptance letter, I described the statutory timeframe for our decision on your application. The time for you to respond to this further information request will be excluded from this timeframe[4]. I will be able to give you an updated forecast on a decision date on request once you have provided the information requested above.

If you have any queries, please contact me by email at thomas.trevilla@slrconsulting.com and reference the application number above.

Yours sincerely,

[1] Section 92A(1) of the RMA
[2] Section 95C of the RMA
[3] Section 36AAB(2) of the RMA
[4] Section 88C(2) of the RMA

Thomas Trevilla
Consultant Planner
Resource Consents

Public

Watercare Services Limited
Groundwater and Settlement Monitoring and Contingency Plan

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

13 May 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

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REV	DATE	DETAILS
0	19 Mar 2025	Draft for client review
1	12 May 2025	Final draft

	NAME	DATE
Prepared by:	Louise Soltau	15 April 2025
Reviewed by:	Vassilis Houssiadas	16 April 2025
Approved by:	Philip McFarlane	13 May 2025

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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 deflection baseline. • Groundwater level monitoring to establish baseline levels.
During construction monitoring	Monitoring during the construction phase is carried out to compare movements 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 pins 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 movement 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	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 pins 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. 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.

Table 5: Proposed alert groundwater levels for monitoring piezometer.

Monitoring well	Relative alert level (m RL)	Relative alert level (m bgl)	Comment
PZ24/03	1. Season low (m RL)-2.3 m 2. Season low (m RL)-2.8 m	1. Season low (m bgl)+2.3 m 2. Season low (m bgl)+2.8 m	To verify groundwater drawdown does not exceed estimated drawdown at the Marmion Shaft. Drawdown level is based on the Base case scenario dewatering model (WSP, 2025).

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

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 movement, building markers, and retaining wall pins 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 movements and compare with assumptions as the works progress.
- Post-construction monitoring continued until potential ground movements 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 movement 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 movement and building pins 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 pins should be placed to allow for ease of access for pre and post construction monitoring.
- Ground movement pins between the shaft edge and the building at 345-361 Queen Street, with at least two pins facing radially away from the excavation (G1 and G2, and G3 and G4) to allow for differential settlement to be determined. Ground movement pins on the sidewalk near the buildings at 345-361, 430 and 438 Queen Street, where the estimated settlement is highest.

- Building pins on the buildings near the excavation (345-361, 430 and 438 Queen Street) where the estimated settlement is highest, with at least two pins on the building fronts closest to the excavation to allow for differential settlement to be determined.
- Building pins on the retaining wall in front of 345-361 Queen Street, with at least two pins 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 movements 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 movements have stabilised, AC shall be provided with the results of the weekly monitoring and a summary report of the ground movement, 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 pins 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 movement deflections remain within the estimated range. Trigger levels are based on the estimated deflections, as provided by AOS, 2024.

The retaining wall pins 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 movements 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 movements have stabilised, AC shall be provided with the results of the weekly monitoring and a summary report of the ground movement, 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 movement, 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 movement 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 pins, 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 pins, 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	-	-	

[1] The markers are denoted by prefix G for ground movement markers, B for building movement markers, B_RW for the building movement 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 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.

The following trigger levels are set for monitoring of services.

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

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 until.
- 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 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 movement. 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 movement 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 movements 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

Part 3-6 Link High-Level Construction Methodology

Queen Street Wastewater Diversion – Part 3-6

Contract Manager:	Andre van Wonderen	Date:	15 November 2025
Project Manager:	Dominic Wakeland	Document No:	
		Revision:	04
		Status:	For Consent

Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
00	24/09/24	T Connell	D Wakeland		Draft
01	26/09/24	T Connell	D Wakeland		For Consent
02	27/09/24	T Connell	D Wakeland	D Wakeland	For Consent
03	21/10/24	D Wakeland		D Wakeland	For Consent
04	15/11/24	D Wakeland		D Wakeland	For Consent

Revision Details

Revision	Details
00	Draft methodology
01	Added post and panel shaft option
02	Minor Amendments
03	Amended as per WSP comments
04	Updated to include network utility relocations

Document Details

Document Name:	Part 3 – 6 High-Level Construction Methodology
Status:	Final
Document No:	
Author:	T Connell

Contents

1. Introduction

The purpose of this high-level methodology is to inform the planning and consent teams of how Fulton Hogan (FH) intends to construct the Part 3-6 link that forms part of Watercare's Queen Street Wastewater Diversion Programme.

These works comprise of a tunnelled section from the Part 3 Mayoral Drive shaft across the Mayoral Drive Queen Street intersection to a receival shaft for future connections at the Queen Street and Marmion St intersection. This methodology has been created with the plan that the works will be completed prior to the Mayoral Drive shaft being reinstated. The intention is to remove the requirement to reopen the Part 3 Mayoral Drive Shaft in the future, reducing the negative impact on the City Centre, its businesses, residents, and other stakeholders.

This methodology is high-level, and no site investigation has taken place. Due to this, broad assumptions have been made and the methodology will be reviewed as more information becomes available.

2. Construction Methodology

2.1. Site setup

The Construction Support Area (CSA) at 34-38 Greys Avenue established for the Part 3 main works will be utilised for the storage of pipes and equipment. This CSA will also contain worker welfare facilities and offices.

Traffic management will be set up in advance, and the design will be coordinated with Auckland Transport and subject to an agreed Traffic Management Plan (TMP).

A 45m long by 11m wide compound will be set up around the shaft area at Marmion St to allow for the construction of the shaft and the tunnelling operations. The compound will make use of temporary concrete or steel barriers with hoardings around the perimeter of each, with access gates on one or both ends.

Figure 1 below shows the shaft envelope for consenting the possible shaft location (red box). The compound, defined by the pink lines for the hoarding and traffic barrier, will move with the shaft as drawn below.

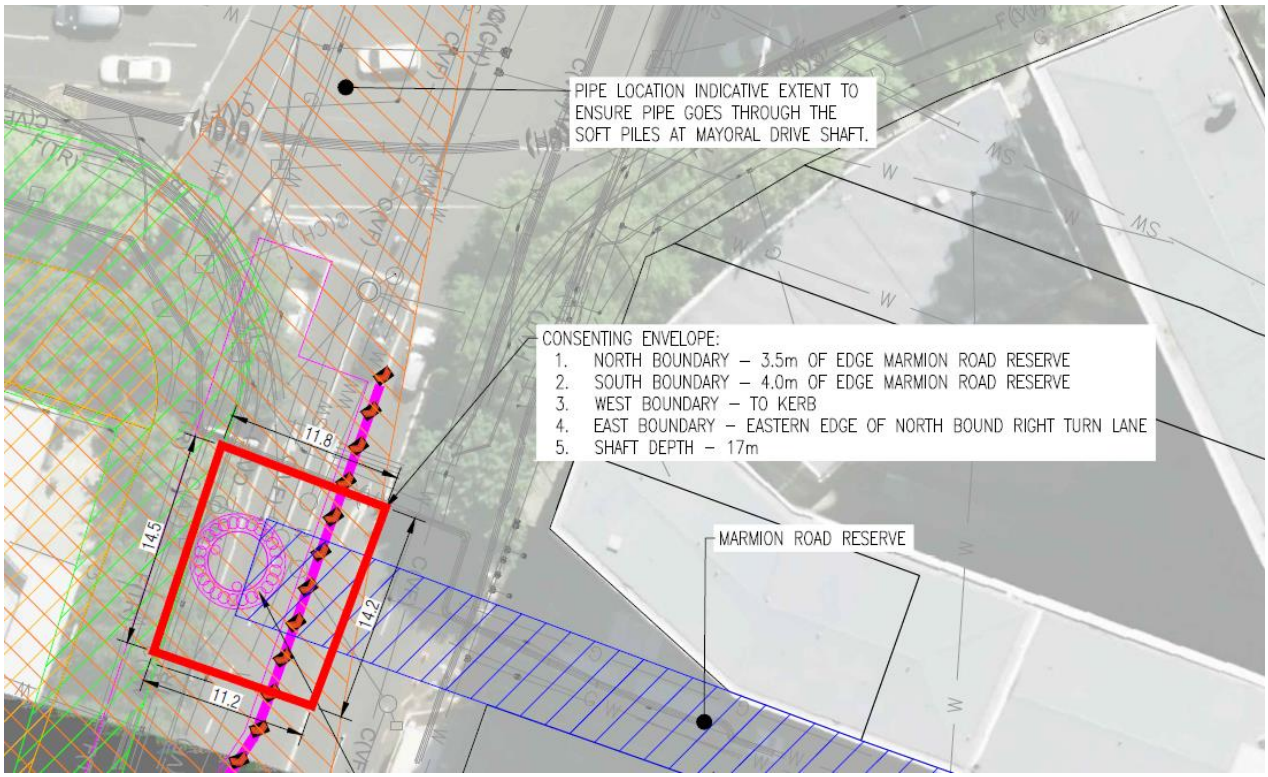


Figure 1: Shaft footprint consented envelope (red box)

2.1.1. Mayoral Drive

The shaft at Mayoral Drive used for Part 3 Main Works will act as the launch pit for the trenchless installation of the DN450-700 pipeline. The backfilling and construction of the Mayoral Drive manhole works will be paused while the Part 3-6 link is constructed. Once backfilled to the correct height for the pilot bore rig, a platform will be installed over the manhole to create a level working platform for the pilot bore rig to work from.

2.1.2. Marmion Street Shaft Construction

The Marmion Street shaft will be used as a reception pit for the Pilot Guided Boring Machine. The shafts outside diameter will be up to 6.4m constructed using 600-900mm piles, 200mm in-situ shotcrete lining, 4m internal diameter and 17m deep. The shaft construction will be required to go through a temporary works design process that will consider the ground condition and site requirements.

The basic steps required to construct secant shafts are outlined below:

1. A concrete guide wall is excavated and formed at ground level to guide the drill rig
2. Soft piles are drilled in a hit-and-miss fashion to avoid damaging the adjacent pile while they are curing.
3. The missed soft piles are then constructed.
4. Hard piles are then drilled through the soft piles creating a continuous retaining wall
5. Steps 2 to 4 are repeated until all piles are constructed and there is a continuous retaining wall.

The piles will be continuous flight auger (CFA) piles drilled using an SR-45 or SR-65. Once all piles are completed the shaft excavation will commence. The spoil material will be drilled out using an SR-45 or SR-65 and loaded using a 20T excavator into 6-8-wheeler trucks to be carted offsite over a period of 1-2 weeks.

Once the shaft has been excavated to approximately 1m below the invert, a 300-500mm thick concrete plug will be poured to form the base. This plug creates a level working platform while also

retaining the groundwater from below. Once the plug has been constructed the dewatering requirements will significantly reduce or stop.

The shaft will be lined using shotcrete in 2m lifts to the depth of the shaft, although this may happen later when the final manhole is to be constructed. This will be constructed with multiple lifts. Once the internal works and tie-ins for the shaft are complete, a precast lid with 1-2No. 600mm manhole openings will be installed for future entry and the road will be reinstated. The shaft lining and secant piles will remain in place and form part of the permanent works.

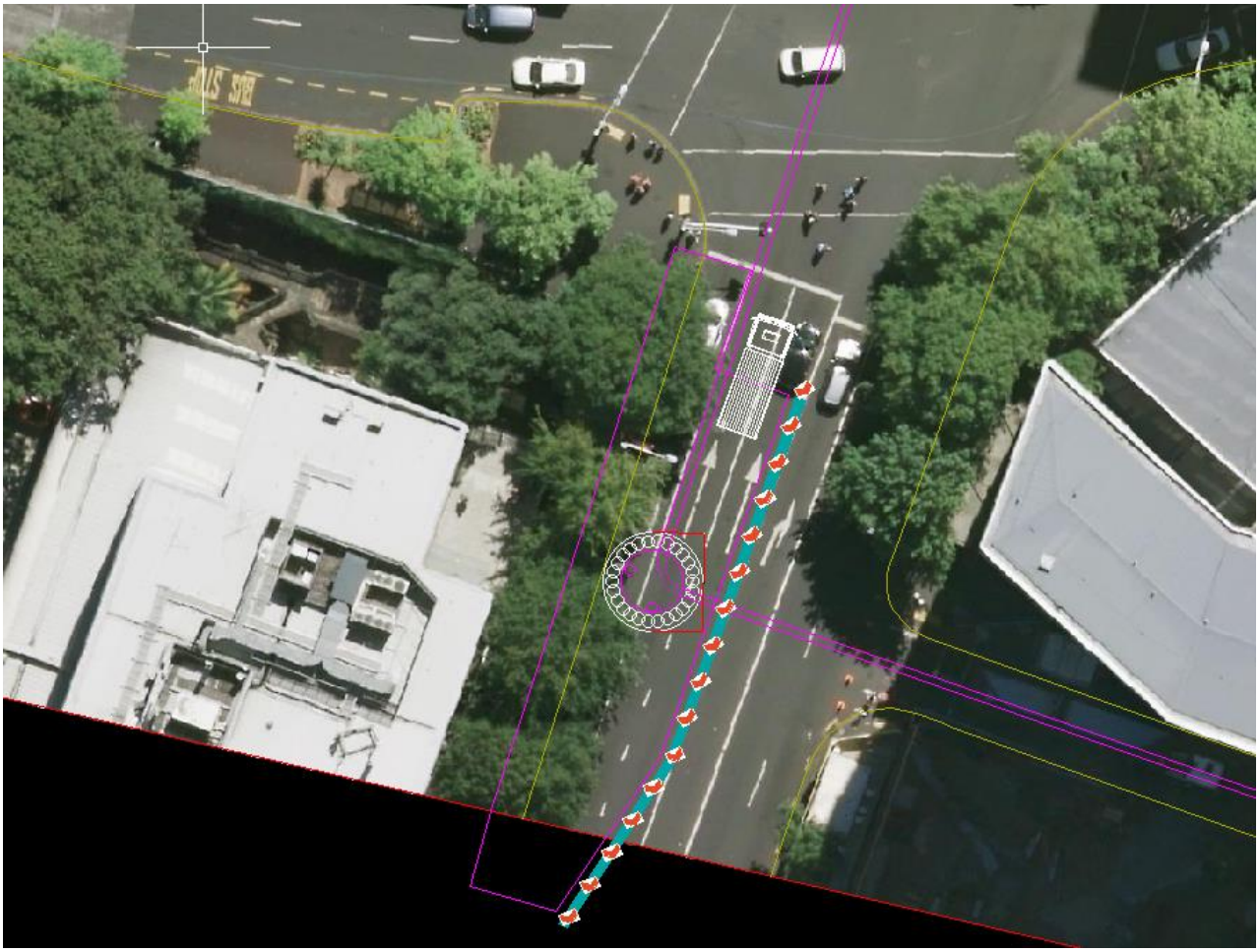


Figure 2: Secant piled shaft layout

2.2. Trenchless construction

A DN450-700 pipe will be installed using a pilot guided boring machine. This method drills a smaller diameter pilot bore from the launch pit to the reception pit, a reamer is then connected in reception pit and guided back to the launch pit. A soft pile window will be constructed on the pipe alignment at each shaft to allow the boring machine to breakthrough. The basic operation for this trenchless method is as follows:

Pilot Bore:

1. Set up the Guidance System in the Launch Pit
2. Place drill rig in launching pit and align rack
3. Place Drill Head on Drill Rack
4. Connect all supporting items including vacuum to carry the slurry
5. Commence pilot bore

Reamer and Pipe Installation:

1. Install pusher unit at reception pit
2. Attach the reamer to the pilot
3. Place pipe on pusher and install vacuum system through the pipe
4. Start the reamer and push pipe into bore
5. Place next pipe disconnect vacuum system and install through second pipe
6. Repeat steps 3-5 until all the pipes have reached the launch pit

2.3. Network Utility Relocations

The existing underground network utilities within both the footpath and carriageway of Queen Street will need to be relocated to enable the construction of the Marmion Shaft. The utilities to be relocated away from the shaft footprint will likely include potable water, electricity, wastewater, stormwater and communications. However, as potholing has not been undertaken, there may be further relocations required. Hence a flexible ‘shaft envelope’ (red box) is being sought to demonstrate the possible shaft location as mentioned in Section 2.1.

Open-cut progressive trenching will be utilised to relocate any utilities that are required to be relocated. The trenches are expected to typically be between 0.4m and 2m in width and between 0.3m and 3m deep, depending on the location of the utility, and will be constructed in 3 to 10 m-long sections per day (depending on depth of trench). Once the new ducts and pipes are installed, the trenches shall be backfilled with the footpath and/or road reinstated.

Where trench works are required within the road corridor, this will involve a combination of reduced traffic lanes and full closure of traffic lanes to enable utility relocation works to be completed.

The following high-level methodology will apply to network utility relocations:

Table 1: High-level network utility relocation methodology

Stage	Construction Activities
Site set out	Set up traffic management and fencing. Identify and mark-out position of trenches along the affected roadway and footpath areas.

Pavement removal	Saw cut and remove existing pavement.
Trench construction	Expose, identify, and support existing utilities up to a 1.5m – 3m depth. Trenches will be constructed to a width of approximately 1m. All spoil will be loaded onto trucks and disposed of off-site.
Utilities installation	Once trench is at required depth, bedding will be placed in the trench, with the new utility assets installed.
Reinstatement	Once installed, the trench will be backfilled and compacted in layers as specified. Surface is then reinstated with asphalt. Backfill material will be imported. Fill will be a mixture of cut to fill aggregate from site and imported fill. Backfill may be stockpiled on site for a short period.

The network utilities within the Marmion Shaft's consenting envelope which may need to be relocated or protected are outlined in Table 2 below.

Table 2: Summary of potentially affected network utilities

Asset ID	Type	Owner	Action
N/A	Electricity – 11 kV	Vector	Relocate
N/A	Electricity - HV	Vector	Avoid
Cable ID HOB-PEN-A-CBL	Electricity – LV	Transpower	Relocate
Manholes – IDs 2000465764, 2000308548, 2000017189	Stormwater	Healthy Waters	Protect
Pipes – IDs 2000110404, 2000937040, 2000486432	Stormwater	Healthy Waters	Protect
Pipes – IDs 2000277930, 2000679895	Stormwater	Healthy Waters	Relocate
Pipe ID 852334	Wastewater	Watercare	Relocate
Manhole ID 522814	Wastewater	Watercare	Protect
Pipe ID 1650257	Potable Water	Watercare	Relocate
N/A	Communications	Vector	Relocate
N/A	Communications	One NZ	Relocate
N/A	Communications	City Link	Relocate

Due to the proximity of these services to each other, a wider trench may be necessary to divert the services in a common service trench which would be either benched or shored. If a wider trench is required, then this could cause earthwork estimates to increase by 2-3 times.

2.4. Plant and Equipment

The following equipment is required to construct the Project:

Secant Shaft Construction	Trenchless construction	Network utility relocations
CFA piling - SR-45 or SR-65	35-90T All Terrain/Mobile Crane	Trucks (regular, concrete trucks and 4 – 8 wheeled)

3-35T excavators	HIAB truck	Concrete saw / handheld concrete breaker
6-8-wheeler trucks	Power pack container (may be truck-mounted)	8T excavator
400kg plate compactor	Tool truck	Hydro vac
Concrete pump	Vacuum truck	Trench shield
Concrete trucks	Axis/Pilot bore micro tunnelling machine	Air actuated compaction equipment
Silenced Generator	Bentonite mixing system (if required)	Asphalt paver
7T vibrating drum construction roller		Double drum roller
		Mobile generator

2.5. Earthworks (Estimate)

Activity	**Area**	**Volume**
Crane & piling platform	216m^2	152m^3
Shaft construction	32m^2	544m^3
Trenchless (pilot bore)	46m^2	25m^3
NU Relocations	260m^2	507.5m^3
Total	**554m^2**	**1,228.5m^3**

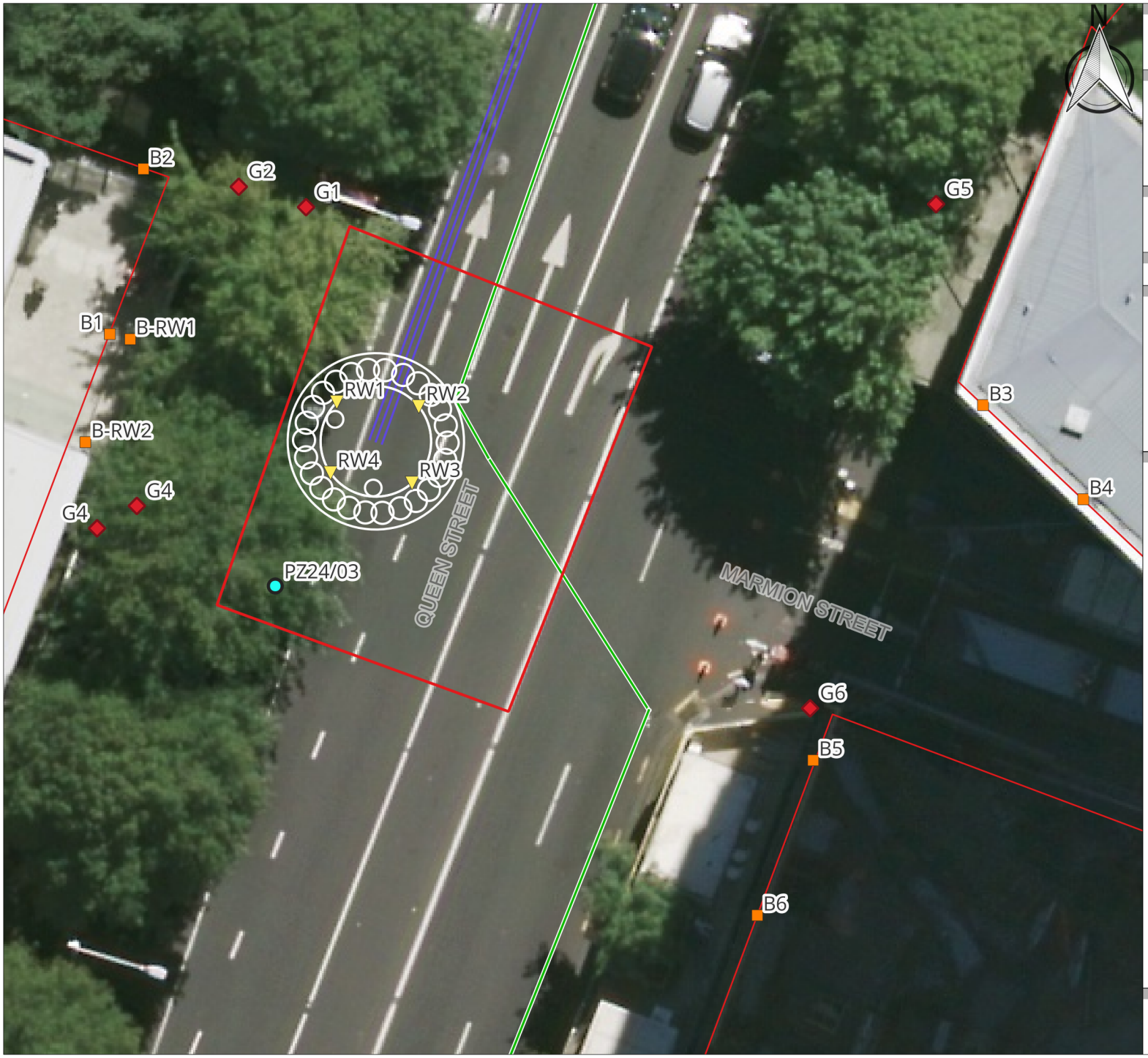
2.6. Programme Durations

The expected start date of this scope of work is September 2025.

- Compound/traffic management set up – 13 days
- Network utility relocations – 3 – 6 months
- Shaft construction – 50 days, of which dewatering is required for 20 days
- Tunnel construction – 15 days
- Manhole construction – 30 days (may be completed at a later date).
- Road reinstatement – 10 days

APPENDIX B:

MONITORING SITE PLAN – MARMION SHAFT



PROJECT

Watercare Services Limited
Auckland
Queen Street Wastewater Diversion - Part 3-6 Link

WSP Auckland
Level 3, The Westhaven
100 Beaumont Street
Auckland 1010
+64 9 353 7375

FIGURE

Marmion shaft - GSMCP monitoring locations and layout.

PROJECT NUMBER	REVISION DATE	REVISION
W-SL001.04	25 Feb 2025	R0

ATTRIBUTION

LEGEND

LEGEND
- Monitoring piezometer

Settlement monitoring
- Ground movement markers
- Building movement markers
- Retaining wall markers

Part 3-6 link works
- Consenting envelope
- P3-P6 LINK
- Marmion shaft

AC Geomaps
- Building footprints
- Stormwater

SCALE

0 5 10 m

PEERS BROWN MILLER LTD

Arboricultural & Environmental Consultants

REQUEST FOR FURTHER INFORMATION: QUEEN STREET WASTEWATER UPGRADE PROGRAMME – PART 3 – PART 6 LINK

TO: REPORTING PLANNER – AUCKLAND COUNCIL

FROM: Matthew Paul
DATE: 15.05.25

Applicant:	Watercare Services Ltd
Address:	Queen Street, Auckland Central 1010
Proposed activity(s):	To install new wastewater infrastructure and associated construction shafts and site works as part of the Part 3 to Part 6 link of the Midtown Wastewater Diversion Project (WAT60444605)

Background

An application has been lodged to install new wastewater infrastructure on Queen Street, Auckland Central, with the proposal to include works within the protected root zone of three (3) Sweet Gum street trees.

A request for more information from the Council planner processing the application has been received by the applicant, in which further information on an aspect of the proposal involving arboricultural/landscape matters was requested.

The following items provided as part of this request require comment from an arboricultural perspective.

Discussion of Arboricultural Matters

1.0 Council Query - 2

Please provide a plan showing the AUP(OP) defined Protected Root Zones and the anticipated excavations and subsequent root zone incursion. This is required to confirm compliance with the permitted activity standards.

1.1 Response

Please see Figure 1 – 4 attached demonstrating the estimated root zones. On site measurements combined with Council GIS have been used to inform the measurements. As seen in Figure 1, excavation for Tree 1 is at the outer edge of the PRZ and at 10m+ in depth, Figures 2 & 3 demonstrate disturbance of less than 20% of the PRZ, at 5.4% and 12.8% respectively. As stated in the captions, the measurements are conservative to allow for any potential overcut. The existing kerb line will stay intact.

An assessment of the relevant permitted standards for works within the protected root zone is provided in Table 1, further below in this document.

2.0 Council Query – Point 2

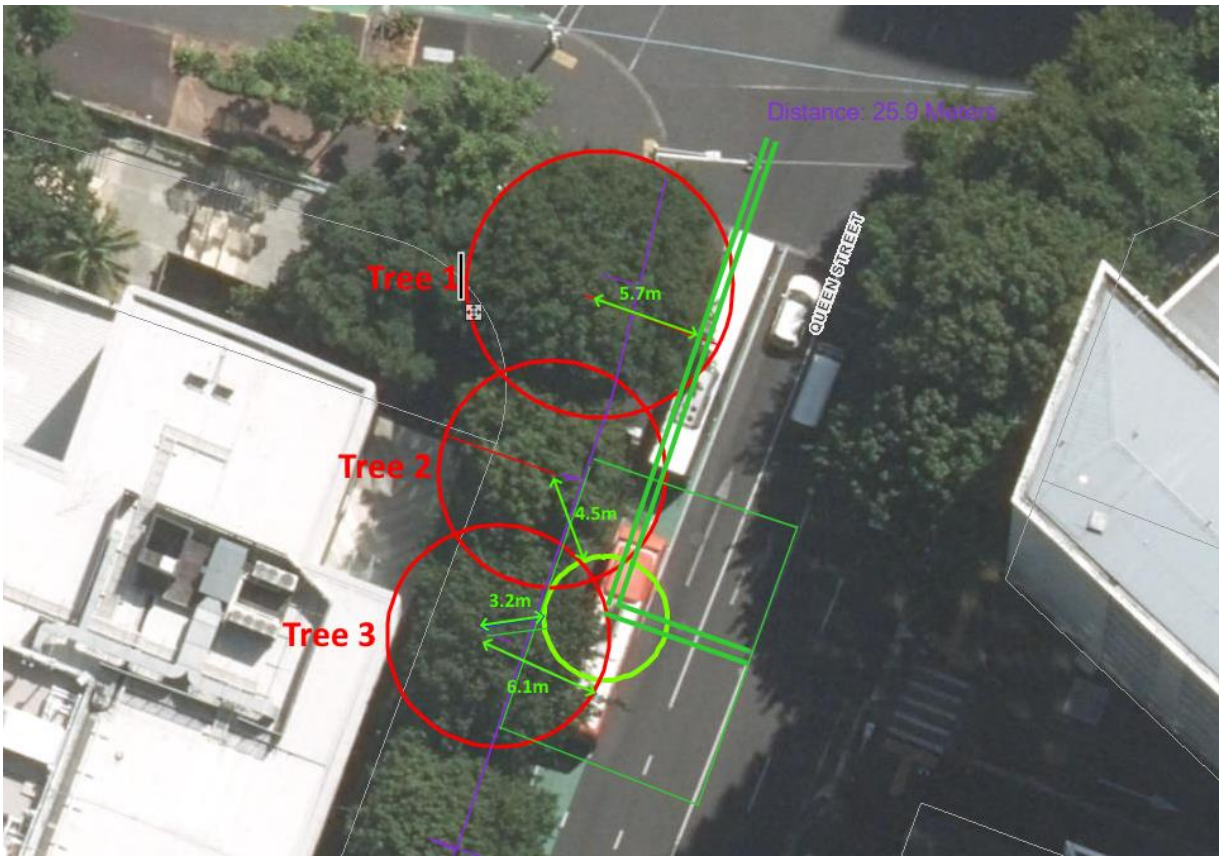


Figure 1 – Scaled markup showing location of shaft and below ground pipe route (green line)

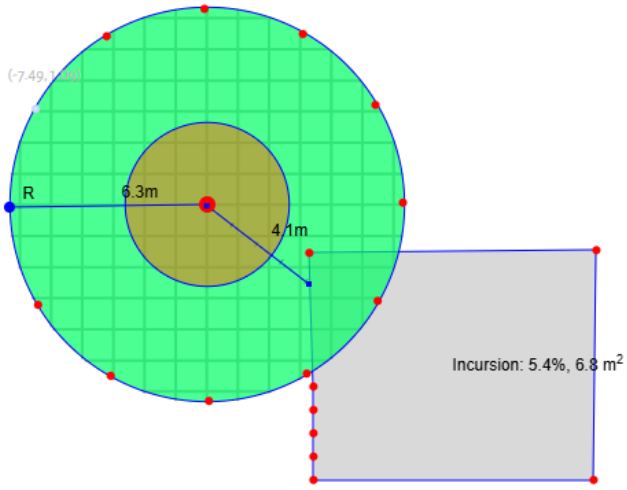


Figure 2 – PRZ measurement and estimated disturbance for Tree 2

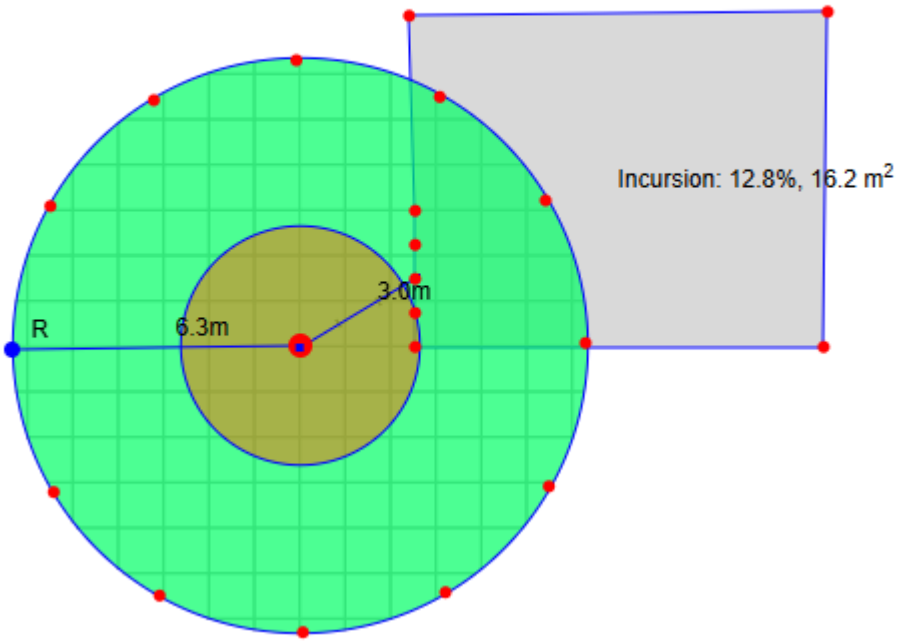


Figure 3 – Root Zone incursion for Tree 3 (less than 20% of the PRZ) **(Estimate is conservative to allow for overcut)**

2.0 Council Query – 3

Please confirm that the piling machinery will not require height clearance of greater than 4.5 m when operating beneath the canopies of the identified trees. If there is any conflict between the machinery and tree canopy greater than 4.5 m above ground level, please

provide a detailed description of the required pruning and confirm compliance with the permitted activity standards.

2.1 Response

Several onsite meetings have occurred to discuss the pruning works with the project team and project engineer. As illustrated in Figure 4 below, the subject trees have been subjected to lift pruning in excess of 4.5m for double decker buses. It was established on site that any pruning works would be minor and could be undertaken in accordance with the permitted standard provisions, being less than 20% of the respective trees canopy, with cuts no larger than 100mm in diameter. As shown in Figure 1, the shaft location where the piling works will occur is where the main height constraint will occur, with Figure 4 showing the branches are relatively small in diameter at height and could be suitably pruned in accordance with best arboricultural practice.

An assessment of the relevant permitted standards for tree trimming and alteration is provided in Table 1, further below in this document.

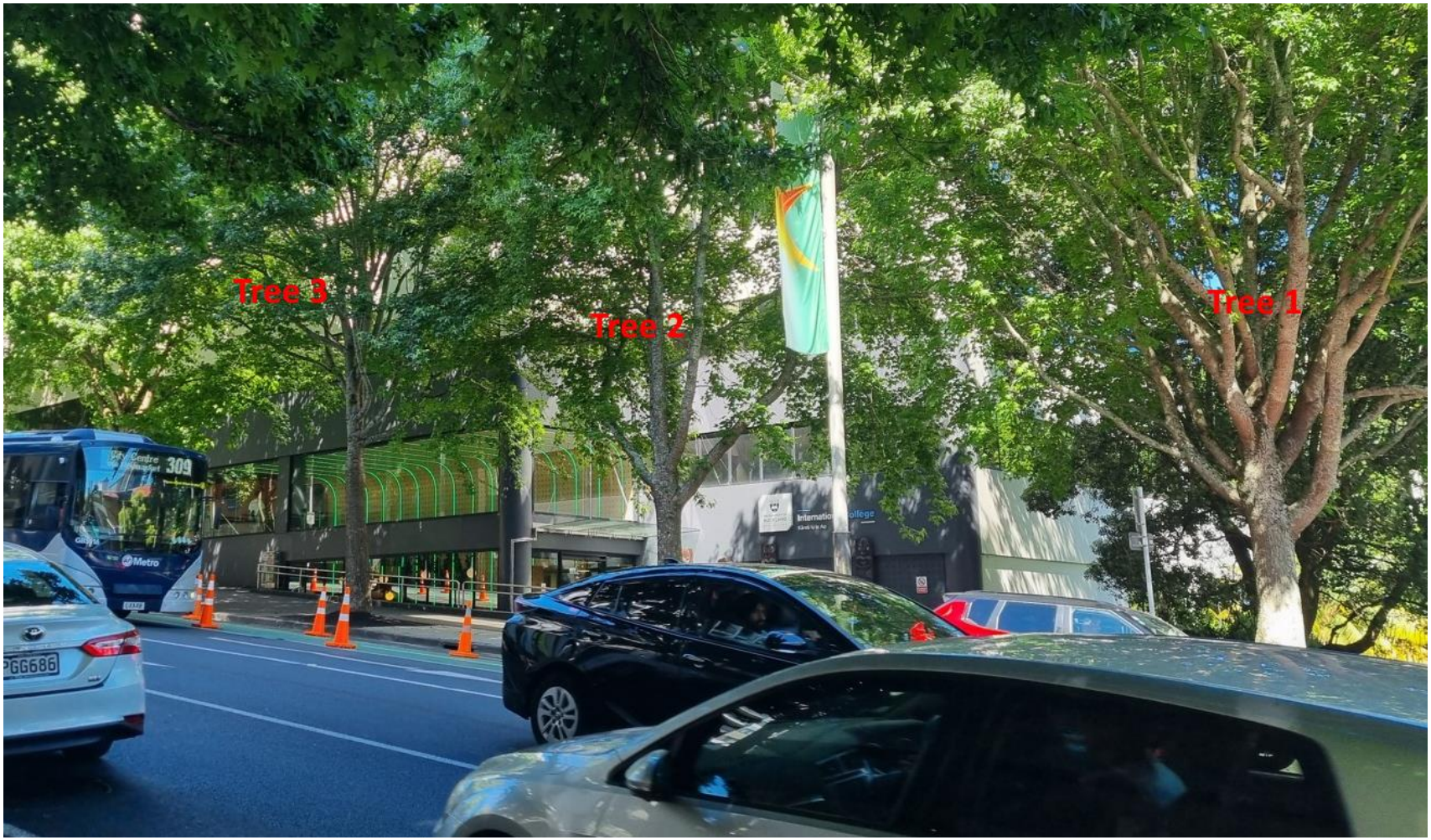


Figure 4 – Current clearances of Trees 1 -3 as of January 2025

Table 1 **Assessment of permitted standard E26.4.5.1 *Trees in roads and open space zones - tree trimming or alteration***	
Standard E26.4.5.1.	**Assessment**
(1) Tree trimming or alteration of trees in streets and open space zones must comply with the following standards: (a) the maximum diameter of any branch removed must be no greater than 100mm; (b) no more than 20 per cent of live growth of the tree must be removed which can be increased to 30 per cent under the direct supervision of a suitably qualified arborist; (c) the natural shape, form and branch habit of the tree must be retained for trees in public open space; (d) the natural shape, form and branch habit of the tree must be retained for trees in streets where practicable; and (e) All works must be carried out in accordance with best arboricultural practice.	Site visits have confirmed that the canopy of Trees 1-3 near the proposed shaft location has been lifted 4.5 m for clearance of double-decker buses (refer to Figure 4). If further pruning of these trees is required to accommodate the piling rig, an additional ~3 meters can be pruned within permitted limits at the time of proposed construction. This is because branches no larger than 100mm in diameter would need to be pruned, and less than 20% of the canopy would be pruned or altered, ensuring the trees retain a largely natural shape despite their already modified form. All pruning works are to be undertaken by a suitably qualified arborist under the direction of a works arborist. The works arborist is to confirm any required pruning at the time of the initial pre-construction meeting.
Assessment of permitted standard E26.4.5.2. *Trees in roads and open space zones - works within the protected root zone*	
Standard E26.4.5.2	**Assessment**
(2) For roots less than 80mm: (a) excavation undertaken by hand digging or air spade or hydro vac or machine excavator within the protected root zone with direction and/or supervision of a qualified arborist: (i) works must not disturb more than 20% of the protected root zone; (ii) works involving root pruning must not be on roots greater than 80mm in diameter at severance;	All cut excavations will be supervised, with a works arborist to be engaged for the duration of the physical works phase. As identified within Figures 1-3, the excavation to develop the shaft will not disturb more than 20% of the protected root zones (PRZs) of Trees 2 and 3. The incursion of the excavation into the PRZ of Tree 2 is estimated to be 5.4%, and for Tree 3, 12.8%.

(iii) any machine excavator must operate on top of paved surfaces and/or ground protection measures and must be fitted with a straight blade bucket;	The works will not involve pruning of roots greater than 80mm in diameter at severance. When excavating the shaft near Trees 2 and 3, the excavator will be fitted with a straight blade bucket and will sit on a paved surface.

Summary

This report has been prepared to address the Section 92 arboricultural matters raised by Auckland Council as part of the proposed Queen Street Wastewater Upgrade Programme – Part 3 – Part 6 Link.

Please contact me if you require any further information via email at matt.paul@peersbrownmiller.co.nz or phone 021399298.

Matthew Paul
Managing Director
Diploma in Arboricultural (Level 6) (Wintec)
Peers Brown Miller Ltd