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Queen Street Wastewater Diversion: Part 3 Works

21 JULY 2023

CONFIDENTIAL

Stormwater and Flood Hazard Assessment

wsp

150 YEARS IN AOTEAROA

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Contents

List of Figures

List of Tables

Abbreviation and Definitions

AC	Auckland Council
AEE	Assessment of Environmental Effects
AEP	Annual Exceedance Probability
ARI	Average Recurrence Interval
AT	Auckland Transport
AUP	Auckland Unitary Plan
CRLL	City Rail Link Limited
DCS	Design and Construction Statement
mTBM	Micro Tunnel Boring Machine
NES	National Environmental Standard
NPS	National Policy Statement
TMPs	Traffic Management Plans
Watercare	Watercare Services Limited
WSP	WSP New Zealand Limited

1 Executive Summary

Watercare Services Limited ('Watercare') proposes to construct a new sewer under Queen Street in Auckland's City Centre. As part of its design and consenting commission, WSP has been engaged by Watercare to assess the stormwater and natural hazards associated with the Part 3 Queen Street Wastewater Diversion Project in Auckland.

Stormwater and natural hazards have been assessed in accordance with the requirements of the Auckland Unitary Plan (Section E36.9). The desktop review of existing natural hazards within the Auckland City Centre catchment area suggests that several overland flow paths ('OLFPs') pass through and around the project area.

The proposed sewer development for Part 3 is entirely underground. This means that during its operational phase, the new pipeline will not interfere with the operation of the existing overland flow paths and floodplains along or near the alignment, providing any excavations associated with the pipeline are reinstated to existing ground levels.

The assessment of effects finds that the proposed pipeline for the Part 3 – Queen Street Diversion Project is not significantly constrained by the existing flooding hazards in its operational phase. It has been identified that the three shaft construction compounds at Wellesley Street East, Victoria Street East and Mayoral Drive compounds have the potential to obstruct one percent annual exceedance probability (AEP) overland flow paths and flood plains. Similarly, the proposed construction support area ('CSA') on Greys Ave is located on an existing OLFP and flood plain resulting in a slightly higher probability of obstructing features due to being an active site across the entire construction period.

At the street-based sites it should be possible to configure the on-site hot mix bunds from the Erosion and Sediment Control Plan in a way that diverts flood flows around the worksite and onto the other side of the street. In particularly extreme rain events flow may overtop the diversion bunds and inundate the construction site, however the compound will be mostly sealed, and little sediment is expected to be mobilised (although the shaft would be flooded and need subsequent pump-out). It was found that the kerbline within the Wellesley Street compound is especially shallow and requires silt socks to raise the kerbline and provide some additional freeboard for when an activated OLFP runs through the kerb channel. The remainder of the site and the other street-based compounds are to utilise the bunds to divert flows around the site.

The Greys Ave CSA, on the other hand, lies in a pronounced gully from which it will be very difficult to divert flow. Here it will be important to manage use of the site so that only resilient activities take place in the OLFP passage and flood zone (i.e. no earthworks or stockpiling of spoil). A tunnelling service pipe intersecting this passage is to be raised by 700 mm to prevent the obstruction of overland flow during a storm event. It is also recommended that this CSA implements a strict advisory program focusing on limiting activities within the hazardous zone over the period of time leading up to and during a forecasted storm event. This includes strictly monitoring and limiting any vehicle stationing within the clean water passage to reduce the possibility of obstructing the overland flow passing through the site.

2 Introduction

Watercare Services Limited ('Watercare') is a lifeline utility providing water and wastewater services to a population of 1.7 million people in Auckland. Its services are vital for life, keep people safe and help communities to flourish. More specifically, Watercare is the council-controlled organisation of Auckland Council responsible for municipal water supply and wastewater treatment within Auckland, and the provider of bulk water and wastewater services to Pokeno and Tuakau in the Waikato District.

Watercare are proposing to upgrade the wastewater network within the upper catchment (southern) of Auckland's City Centre. It has been established by Watercare that the existing network does not have sufficient capacity to meet future demands. WSP New Zealand ('WSP') has been engaged by Watercare to design and consent a new wastewater mainline through Auckland city centre ('the Project').

This report provides an assessment of stormwater and natural hazards in relation to Part 3 of the Queen Street Wastewater Diversion Project.

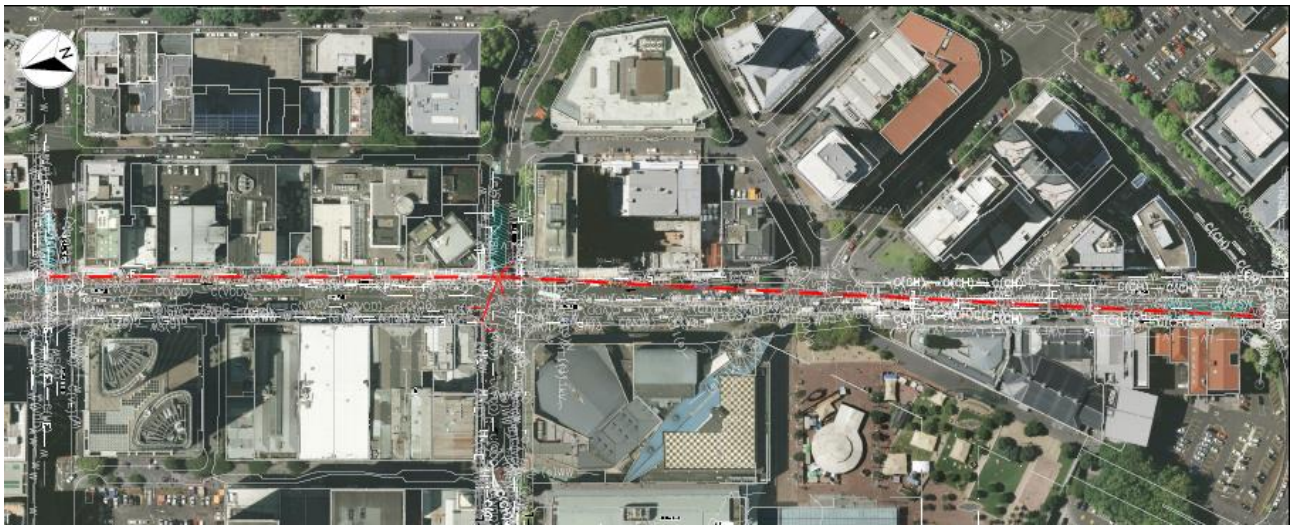

Figure 1: Aerial view of alignment along Queen Street

This project involves a new wastewater pipe being positioned under Queen Street, going from the intersection at Mayoral Drive to the intersection at Victoria Street. Manholes for the new wastewater pipe will be provided at the Mayoral Drive intersection, Wellesley Street intersection and Victoria Street intersection. During construction, the manhole locations will be temporarily used as construction shafts.

3 Description of Existing Environment

The project is located within the Auckland City Centre, a dense urban environment with a mixture of commercial, civic and residential activities and uses. The built form is predominantly made up of multi-level buildings that generally align to the street. Most buildings have verandas overhanging the footpath. The built form along Queen Street is a mix of modern buildings as well as important heritage structures. At street level the majority of buildings provide retail stores/units.

The project area is linear along Queen Street, between Victoria Street and Mayoral Drive. During construction, the area subject to project works will extend onto sections of Victoria Street, Wellesley Street and the surface carpark at 329 Queen Street and 38 Greys Avenue.

Figure 2 shows the geographic area for the project, however construction activity at surface level will be focused on the Queen Street intersections of Mayoral Drive, Wellesley Street and Victoria Street.

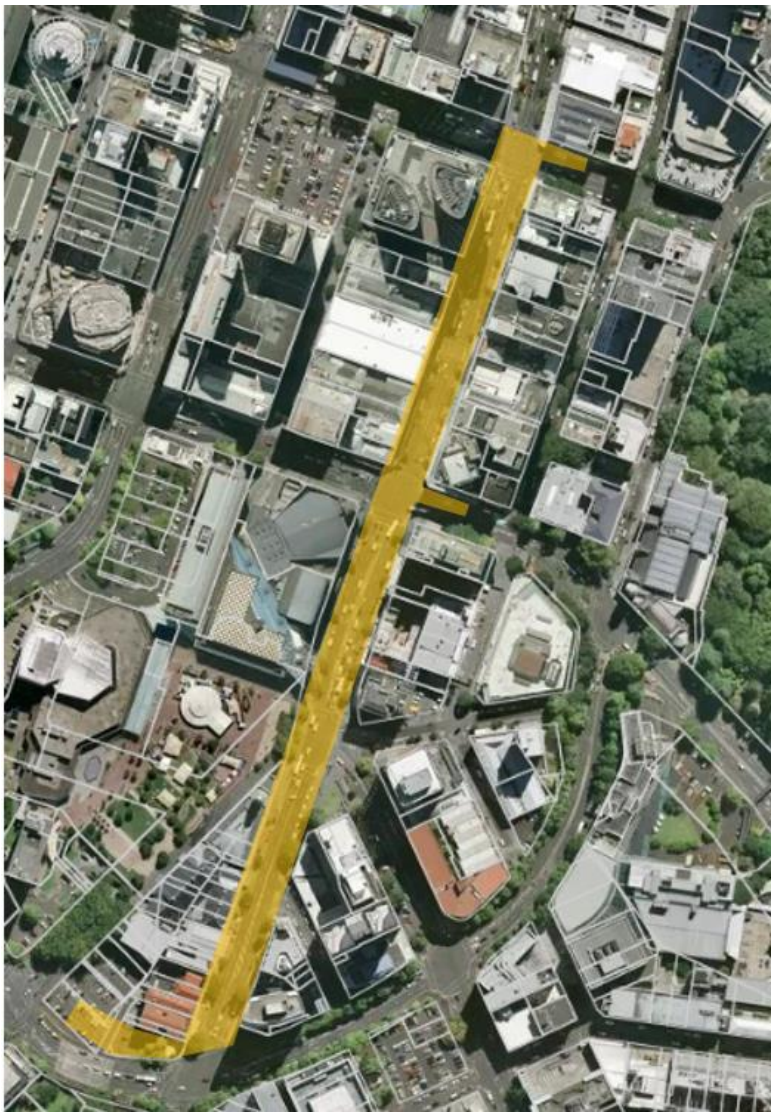

Figure 2: Project area

The Queen Street road corridor has been subject to layout changes, with a reduction in the number of general traffic lanes provided and footpaths being extended. The section between Mayoral Drive and Wakefield Street has been reduced to three vehicle lanes and the footpath extended on the western side of the corridor (removing a vehicle lane).

Between Wakefield Street and Wellesley Street, the road corridor is 'limited access', with general traffic being excluded. This section retains four vehicle lanes plus bus stops, being an important bus interchange location in the city centre.

Between Wellesley Street and Victoria Street, the footpath has been extended out on the eastern side of the corridor, with two vehicle lanes remaining.

All intersections are provided with traffic signals and pedestrian crossing facilities. Along the length of Queen Street, a number of street trees are provided along with other streetscape elements.

4 Project Works

The Project works will see the construction of a new wastewater pipeline under Queen Street, running between Mayoral Drive and Victoria Street. Connections to the existing wastewater network will be provided at Mayoral Drive, Wellesley Street and Victoria Street.

To provide for the new pipe, three temporary shafts will be provided along Queen Street (located at Mayoral Drive, Wellesley Street and Victoria Street). Once the shafts are constructed, tunnelling works will commence from Mayoral Drive, heading north along Queen Street towards Victoria Street. The Micro-Tunnel Boring Machine ('mTBM') will be extracted at Victoria Street. Once tunnelling works are completed, the three shafts will be back-filled and converted to manholes.

The following is a summary of the project works, with a more detailed description provided within the Design and Construction Statement (refer to Appendix C of the resource consent application).

4.1 Construction Hours and Duration

The anticipated construction hours are noted in Table 1 below.

Table 1: Construction hours

Shaft Construction	Monday to Saturday – 0700hrs to 1800hrs Sunday and night work will only be carried out if required by traffic management restrictions or Watercare operational requirements for tie ins/ connections to existing network
Tunnelling works	Monday to Saturday – 0700hrs to 1900hrs

In some circumstances, works may be required outside the hours noted above due to operational requirements.

The duration of construction works is to be confirmed, however it is anticipated that physical works will commence from Q1 2024 and would finish around Q1 2025. Table 2 notes the likely construction duration.

Table 2: Construction duration

Queen Street / Mayoral Drive Shaft	Queen Street/ Wellesley Street Shaft	Queen Street/ Victoria Street Shaft	Tunnelling Activity (including site establishment etc)
2 to 3 months to construct shaft (Q2 to Q3 2024)	2 to 3 months to construct shaft (Q2 to Q3 2024) Queen Street pipe work connections (x3) – 1 month (Q3 2024)	3 to 4 months to construct shaft (Q2 to Q3 2024)	Site Establishment: 2 months (Q2 2024) Tunnelling works: 4 months (Q3 to Q4 2024) Equipment Recovery Less than 1 months (Q4 2024)

4.2 Temporary Construction Shafts

Three temporary shafts are to be provided along the alignment that will be used for access during construction works.

Queen Street/ Mayoral Drive Shaft

This shaft will be located on Queen Street, outside 323 Queen Street and once constructed will have a depth of around 13.72m. This shaft will be used as a launch shaft for tunnelling works. The

shaft will be of post and panel construction and as such will require continuous dewatering to be undertaken whist the shaft is in use.

Once tunnelling works are completed, the shaft will be backfilled and will be used as a manhole.

Figure 3 shows the position of the shaft (marked red) and the surrounding construction support area.

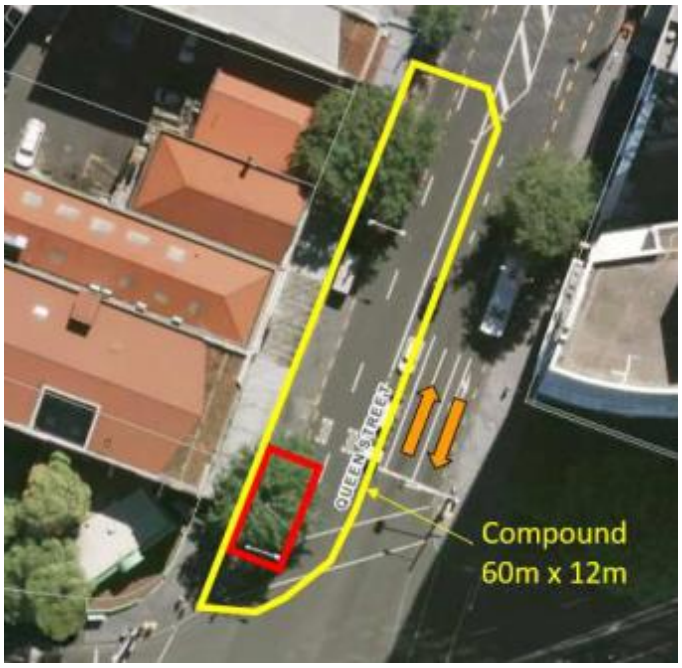

Figure 3: Mayoral Drive Shaft position and construction support area

Queen Street/ Wellesley Street Shaft

This shaft will be located on Wellesley Street, adjacent to 290 Queen Street and will have a total depth of around 7.24m. This shaft will be used for service connections as well as support to tunnelling works. This shaft will be sealed when constructed and as such ongoing dewatering will not be required.

Once tunnelling works are completed, the shaft will be backfilled and will be used as a manhole.

Figure 4 shows the position of the shaft (marked red) and the surrounding construction support area on Wellesley Street.

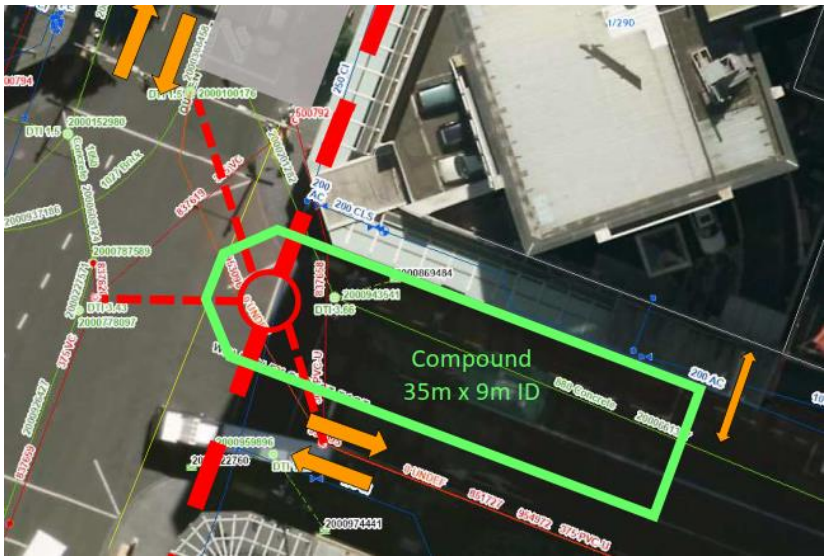

Figure 4: Wellesley Street Shaft position and construction support area

Queen Street/ Victoria Street Shaft

This shaft will be located on Victoria Street, adjacent to 210 Queen Street and will have a total depth of around 6.35m. This shaft will be used to provide a connection to the Orakei Main Sewer as well as for the recovery of the mTBM. The shaft will be of post and panel construction and as such will require continuous dewatering whilst the shaft is in use.

Once tunnelling works are completed, the shaft will be backfilled and will be used as a manhole.

Figure 5 shows the position of shaft (marked red) and the surrounding construction support area on Victoria Street.

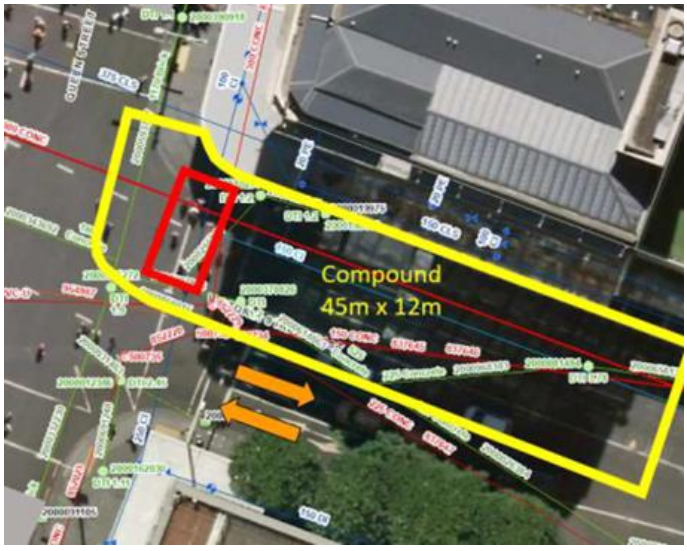

Figure 5: Victoria Street Shaft position and construction support area

4.3 Tunnelling Works

Tunnelling works will commence from the shaft at Mayoral Drive to the shaft at Victoria Street using a mTBM.

To support tunnelling works, a Construction Support Area (CSA) will be established on part of the public car park at 38 Greys Avenue and 329 Queen Street that will contain ancillary equipment and functions for tunnelling. Figure 6 shows the proposed layout for the Greys Avenue CSA and how it relates to the construction shaft on Queen Street.

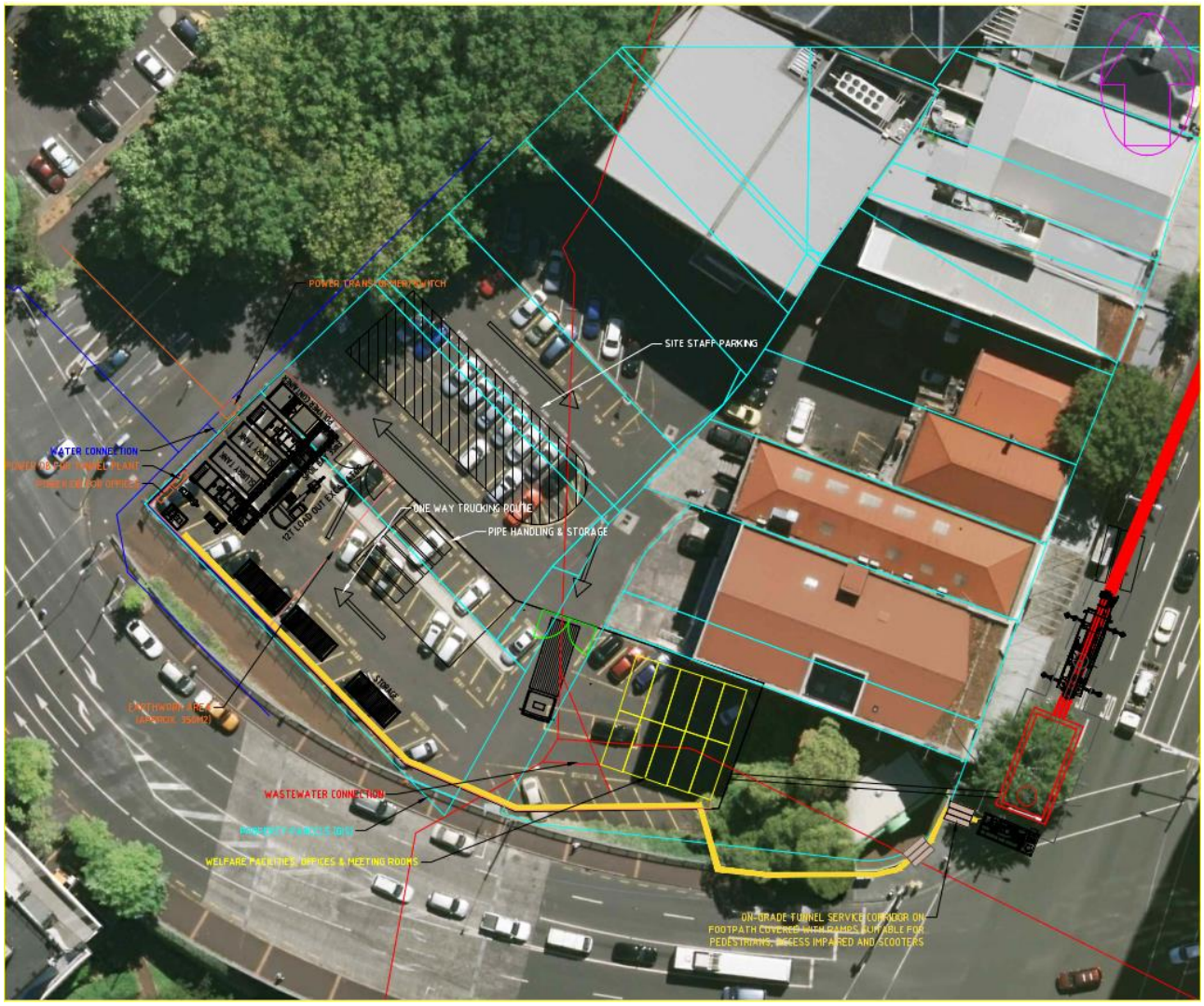

Figure 6: Greys Avenue CSA during tunnelling works

The equipment to be provided within the Greys Avenue CSA and the Mayoral Drive CSA during tunnelling is noted below.

Construction Support Areas Equipment during Tunnelling works	
Greys Avenue CSA	Mayoral Drive CSA
• Project site office • Staff welfare facilities • 12t excavator (for removing spoil from site, loading onto trucks) • Separation plant • Slurry tanks • Electrical container • 1MvA Generator • Pumps • Site laydown area/ material storage area • Pipe fit out area • Pipe raising equipment for clear water passage	• Tunnelling control cabin • In-shaft jacking equipment • 50t mobile crane • Pipe laydown area

Between the two CSAs will be a 2m wide service corridor, connecting the operations at the two sites together. The services will be laid on the ground and covered with a walkway to maintain pedestrian access between Queen Street and Mayoral Drive. This service pipe to be raised by 700 mm to prevent the obstruction of overland flow during a storm event.

Once tunnelling commences, extracted material will be transported in a slurry medium to the separation plant in at Greys Avenue CSA. Once liquid has been removed from the spoil (solid material), it will be loaded onto trucks and disposed off-site.

As the mTBM progresses, 6m long sections of pipe will be installed. As the jacking rig is retracted, the next pipe section is lowered by a crane from the surface and placed into position. The cycle continues until the drive is complete.

Once tunnelling is completed, the mTBM will be recovered at the Victoria Street Shaft.

4.4 Vehicle Movements

Vehicles movements will be occurring to and from CSAs during the project works. The following outlines the likely vehicle movements anticipated to occur.

Table 3: Vehicle movements

Stage of Works	Likely vehicle movements (daily – average)	
Shaft Construction	Mayoral Drive CSA	• Light vehicles: 10 per day • Flatbed delivery trucks: 2 per day • Spoil/ aggregate trucks: 8 per day (peak)
	Wellesley Street CSA	• Light vehicles: 10 per day • Flatbed delivery trucks: 2 per day • Spoil/ aggregate trucks: 8 per day (peak)
	Victoria Street CSA	• Light vehicles: 10 per day • Flatbed delivery trucks: 2 per day • Spoil/ aggregate trucks: 8 per day (peak)
Tunnelling Works	Spoil removal from Greys Avenue CSA: 10 trucks per day (peak)	
	Material delivery trucks to Greys Avenue CSA: 6 trucks per day (peak)	

Please note that other vehicle movements will occur during site establishment and disestablishment activities.

5 Assessment Methodology

Chapter E36 of the Auckland Unitary Plan (AUP) outlines the requirements for assessing development impacts on existing natural hazards. Section E36.9(1) requires a hazard risk assessment report where the developments requiring a resource consent is proposed on land subject to (among other things) 1 per cent annual exceedance probability (AEP) floodplain and overland flow paths. This assessment must address the following:

(a) *the type, frequency and scale of the natural hazard and whether adverse effects on the development will be temporary or permanent;*
(b) *the type of activity being undertaken and its vulnerability to natural hazard events;*
(c) *the consequences of a natural hazard event in relation to the proposed activity;*
(d) *the potential effects on public safety and other property;*
(e) *any exacerbation of an existing natural hazard risk or the emergence of natural hazard risks that previously were not present at the location;*
(f) *whether any building, structure or activity located on land subject to natural hazards or near the coast can be relocated in the event of severe coastal erosion, inundation or shoreline retreat;*
(g) *the ability to use non-structural solutions, such as planting or the retention or enhancement of natural landform buffers to avoid, remedy or mitigate hazards, rather than hard protection structures;*
(h) *the design and construction of buildings and structures to mitigate the effects of natural hazards;*
(i) *the effect of structures used to mitigate hazards on landscape values and public access;*
(j) *site layout and management to avoid or mitigate the adverse effects of*
(k) *natural hazards, including access and exit during a natural hazard event;*
(l) *the duration of consent and how this may limit the exposure for more or less vulnerable activities to the effects of natural hazards including the likely effects of climate change; and*
(m) *any proposed measures to mitigate the natural hazards and its effects.*

The assessment has been based on the requirements listed under the AUP (E36.9), industry best practice, and desktop review of available information about existing natural hazards provided by Auckland Council's Geomaps.

6 Technical Analysis

The receiving environment is the upper Waitemata Harbour, with flow reaching it via the piped stormwater system. There are no natural watercourses within or downstream of the project area.

The Auckland City Centre is heavily built-up and virtually fully impervious, with extremely limited absorption capacity for rainwater. Project works include three shaft sites and one CSA, contained within construction compounds. If unmitigated, significant rainfall events could generate flows that may potentially breach the compounds and become hazardous to site personnel and equipment. They could potentially mobilise stored equipment, materials, or spoil. Flow diverted around the work sites could spread onto neighbouring commercial properties, causing or increasing flooding. Section 8 describes the effects of such unmitigated events in further detail.

All four of the mentioned construction compounds have an overland flow path running through their site. Three of the compounds contain significant portions of flood plains within their boundary (Wellesley Street, Victoria Street and Greys Ave). Hot mix bunds will be configured to divert flood flows around or through the compounds, as much as possible. Additionally, the Greys Ave CSA proposes a tunnel services pipe that directly crosses a major overland flow path, as indicated by the yellow line in the third image of Figure 7. Certain measures are required to be taken so that the flow will not be obstructed by the pipe, otherwise flood related hazards are a likely consequence. Mentioned effects will be discussed in the Effects Assessment in Section 8. Measures to mitigate these effects will be discussed in Section 9.

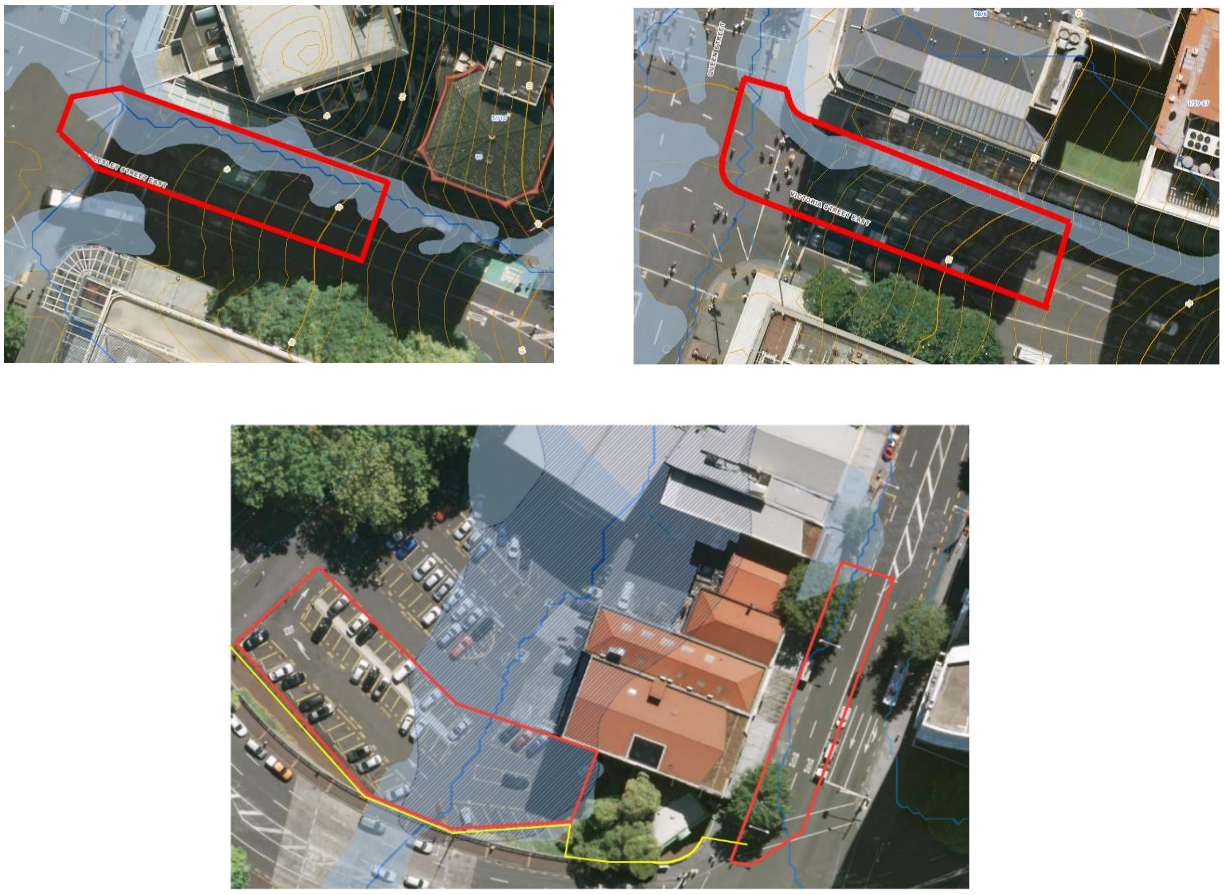

Figure 7: Wellesley Street, Victoria Street, Mayoral Drive and Greys Ave compounds. Yellow line marks the proposed tunnel services at Mayoral Drive/Greys Ave compounds.

7 Proposed Activity/s and Triggered Rules

7.1 Auckland Unitary Plan (AUP) – Chapter E36 Natural Hazards

The following permitted activities are relevant to the proposed works:

E36.4.1 (A28)
Storage of goods and material in the 1 per cent annual exceedance probability (AEP) floodplain

E36.4.1 (A54)
Infrastructure within roads or the Strategic Transport Corridor Zone in:
- *in the 1 per cent annual exceedance probability (AEP) floodplain;*
- *in overland flow paths*

The following permitted standards relate to activity (A28):

(1) Goods and materials stored in the 1 per cent annual exceedance probability (AEP) floodplain for longer than 28 consecutive days must:
a. *not impede flood flows; and*
b. *where capable of creating a safety hazard by being shifted by floodwaters, be contained and secured in order to minimise movement in times of floods; and*
c. *be stored in watertight containers if they are hazardous substances.*

Because the work sites are likely to involve the storage of goods and materials, and because the nature and location of those materials is currently unknown, we recommend that compliance with the permitted standards of activity E36.4.1 (A28) is addressed in the Construction Management Plan.

8 Effects Assessment

Relevant stormwater/flood information retrieved from Auckland Council's GeoMaps is shown in Figure 8.

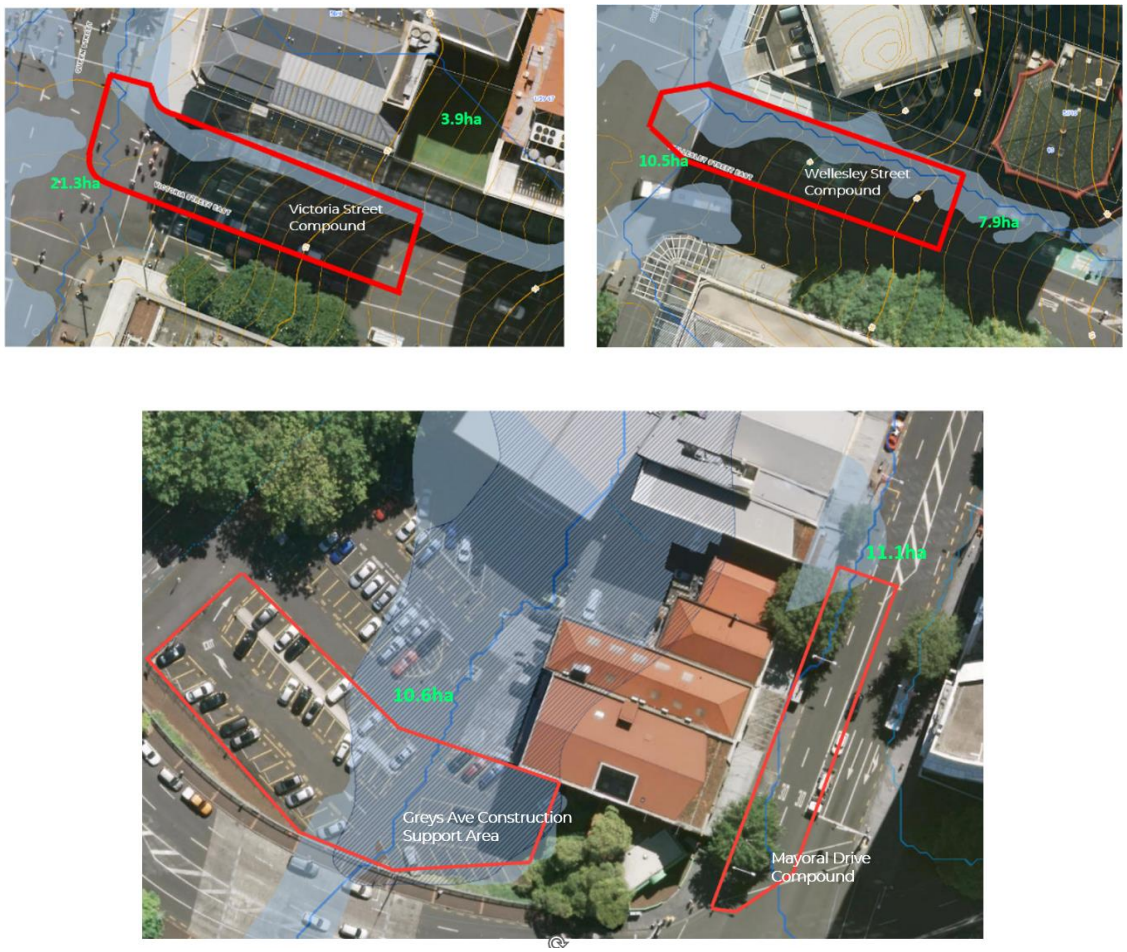

Figure 8: Stormwater and Flood Data Retrieved form Auckland Council's GeoMaps

The proposed sewer for Part 3 is entirely underground. This means that during operation the new pipeline will not interfere with any existing overland flow paths and floodplains along or near the alignment, providing that any works associated with the pipeline maintain existing ground levels.

As mentioned in Section 4.3, the Greys Ave CSA layout proposes a tunnel services pipe that directly intersects a significant overland flow path running through a constructed site passage. By obstructing a designated passage for flow during a storm event, the pipe creates hazards such as damming and/or backflow which may propagate into rapid flooding of unsuspecting areas of the site. This would threaten the health and safety of the site workers, as well as the integrity of the site vehicles, equipment, and other high-value assets. Mitigation measures are to be adopted so that this possibility can be minimised, including raising the pipe by at least 700mm above ground level over the flow path.

The CSA layout also illustrates the route taken by trucks when transporting materials in and out of the compound. This route runs directly over the same overland flow path. Although not indicated on the CSA plan, it is strongly recommended that trucks are not to be stationed or parked in the clean water corridor as this could potentially block the overland flow in a storm event and result in similar consequences to those mentioned above.

Section 8 outlines the behaviours of different hydrological features occurring in a 1% AEP storm and how they interfere with the current proposed construction compounds.

8.1 1% AEP Overland Flow Paths (OLFP)

Queen Street forms a distinct gully in the terrain, with 1% AEP overland flow paths (OLFPs) tracking along each side, and in some locations wide enough to meet in the middle. Several OLFPs appear to pass through and around the construction compounds as seen on GeoMaps. Victoria Steet construction compound appears to be bisected by a 3.9ha OLFP and eventually joins a downstream OLFP of 21.2ha running north along Queen Street. A major overland flow path servicing approximately 7.9ha of upper catchment area bisects the Wellesley Street compound flowing westbound, eventually joining the Queen Street OLFP with an of upper catchment area of approximately 10.5ha. Another major OLFP servicing approximately 11.1ha flows northbound through the Mayoral Drive construction compound. The Greys Ave CSA has a 10.6ha OLFP running through the middle of the site northbound. As mentioned, the proposed layout of the CSA suggests that this OLFP will potentially be temporarily obstructed by construction vehicles such as trucks. However, the site must be managed so that “dirty” activities do not take place in the OLFP.

The passage of the OLFPs must be maintained throughout the duration of the project. Victoria and Wellesley Streets are steep enough that overland flow arriving at the construction sites can be effectively diverted to and conveyed along the far side of the street. The described OLFPs at the Victoria Street, Wellesley Street and Mayoral construction compounds have the potential to obstruct existing OLFPs currently conveyed through the kerb and channel of their respective Queen Street junctions. It is estimated that the Wellesley Street and Victoria construction compounds will be open for approximately 16 weeks each. The probability of a rain event greater than the 1% AEP event occurring within each of the 16-week periods is approximately 0.31%. Mayoral Drive construction compound is expected to be open for approximately 12 weeks. The probability of a rain event greater than the 1% AEP event occurring within this 12-week period is 0.23%. The probabilities suggests that the activation of the described OLFPs in a 1% event is highly unlikely, therefore, overland flows through the construction compounds are not expected to be obstructed during the construction periods assuming that the existing stormwater network is operational and in good condition. The Greys Ave CSA however is scheduled to be operational for the entire construction period, thus having a higher probability of experiencing an overland flow event.

8.2 1% AEP Flood Plain

Auckland Council’s GeoMaps suggest the northern extent all three construction compounds and the central part of the Greys Ave construction support area are within 1% AEP flood plains. In reality, these flood plains are simply modelled and mapped versions of the overland flow paths described above (i.e. flowing rather than ponded areas), showing a more realistic indication of flow width. Therefore, comments above relating to flow paths are also applicable to flood plains. Victoria Street, Wellesley Street and Greys Ave have more significant presence of flood plains within the construction compounds due to the orientation of the sites.

It is estimated that the construction duration for Victoria Street and Wellesley Street sites are approximately 16 weeks respectively. The probability of a rain event greater than the 1% AEP event occurring within these 16-week periods is approximately 0.31%. This probability is comfortably low, suggesting that major inundation of the flood plains is highly unlikely during the construction, provided the existing stormwater network is operational and in good condition. Greys Ave CSA however will be an active site across the entire project construction period. Resulting inundation probabilities remain relatively low, yet still higher than the other compounds and thus warrant more small-scale mitigative measures than the other sites.

The intention is to retain overland flow within the road corridor to minimise any potential effects on neighbouring properties. It should be noted that the defined flood plains primarily represent

flowing water rather than ponded areas. Consequently, the potential loss of a small amount of flood storage at any specific location is unlikely to be critical.

9 Mitigation Measures

9.1 Construction Phase

This natural flood hazards assessment deems minor disruption with no alteration to the flow paths and floodplains. It is recommended that the construction methodology is adapted to allow safe evacuation of personnel and critical equipment in any event that triggers overland flows during the construction period. The site layout should be configured to maintain the operation of the identified overland flow paths and flood plains. This may include temporary pipes or diversions to convey road runoff in extreme events.

Monitoring of flood forecasts and weather conditions to stay informed about potential flood events. This allows for proactive measures to be taken, such as relocating stored goods and materials temporarily if there is an imminent risk of flooding.

Goods and materials should be stored outside of the 1% AEP floodplain areas, preferably in designated storage facilities or secure locations away from flood-prone zones.

Diversion bunds are expected to be already present as part of the on-site Erosion and Sediment Control Plan (refer to Appendix J of the application). For the street-based sites it may be possible to configure these hot mix bunds to divert flood flows around the worksite onto the other side of the street, lessening the effects of a significant event.

9.1.1 Wellesley Street

Silt socks are to be placed along the entire northern boundary line of the Wellesley Street construction compound. Using a Mannings calculation for street channel flow it was found that in the activation of the OLFP in a 5% AEP event the channel flow depth along the kerbline will reach approximately 250mm. This is expected to breach the relatively shallow (<100mm) kerbs within the Wellesley Street construction compound, thus justifying the need for it to be raised and prevent excess flows from entering the buildings across the footpath.

9.1.2 Greys Ave

The Greys Ave CSA lies within a major gully containing an overland flow path and flood plain. The OLFP is unable to be diverted due to the orientation and location of the site relative to the flow path. The section where the OLFP passes through the site is to be isolated using hot mix bunds to create a 5m minimum width overland flow corridor. The upstream interface will need 700mm high concrete training walls or gravel bunds.

The proposed tunnel services pipe crosses the overland flow path and has the potential to obstruct it. Analysis using Manning's Formula found that the 10-year event flow would reach a depth of approximately 200mm through the constructed cross section. Additionally, a desired freeboard was found using a simple velocity head calculation. By combining these two factors, it was found that the tunnel services pipe should be raised by at least 700 mm from the ground so that it does not obstruct the flow and cause flooding related issues. The most applicable method used to raise the tunnel services pipe is to be chosen by the on-site contractor.

A strict advisory program is to be implemented on the site with focus on limiting activities within this bunded section over the period of time leading up to and during a forecasted storm event. As mentioned, the OLFP should be strictly monitored for any unpermitted stationing or parking of vehicles.

9.2 Operational Phase

The proposed sewer development for Part 3 is entirely underground. There will be no permanent impacts onto the environmental response to floods. No provisions are required to address flood hazards in the operational phase provided that the existing ground level is reinstated after the

excavations associated with the pipeline are undertaken and the existing stormwater network is in good operational condition.

10 Identification of affected parties

Provided the diverted flow paths are kept within the road corridor, as is intended, the effects on other parties should be negligible.

As such, no affected parties have been identified.

11 RMA s104 Assessment

As the proposed activity is permitted under the AUP, there are no adverse effects to be considered.

12 Conclusion and Recommendations

The proposed pipeline for the Part 3 – Queen Street Diversion Project is not significantly constrained by the existing flooding hazards in its operational phase. Moreover, the construction of the new pipeline is not expected to create or worsen flood effects for any other party. Present diversion bunds from the Erosion and Sediment Control program are to be used to divert flows away from the sites and prevent early inundation. Mitigative measures taken to avoid potentially hazardous circumstances during construction include placing silt socks along the relatively shallow kerbline of the Wellesley Street compound to reduce the events of overtopping flows. Activities within the Greys Ave gully flow path must be strictly managed to avoid sediment release and dangerous circumstances in the event of an overland flow event. Mitigations for these circumstances are to maintain a 5m minimum width flow corridor, raise the tunnelling service pipe off the ground by 700 mm, and to limit vehicle stationing within the constructed clean flow corridor.

It is recommended that the Construction Management Plan to be provided to Auckland Council addresses compliance with the relevant permitted standards of Chapter E36 relating to the storage of goods and materials within the 1% AEP floodplains.

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