REPORT

Herne Bay Tunnel – Integrated Transport Assessment

Integrated Transport Assessment (ITA)

Prepared for
Watercare Services Ltd
Prepared by
Tonkin & Taylor Ltd
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Watercare Services Ltd	1 electronic copy
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1 Introduction and project overview

1.1 Introduction

Tonkin & Taylor Ltd (T+T) has been engaged by Watercare Services Ltd (Watercare) to undertake an Integrated Transport Assessment (ITA) related to the construction of the Herne Bay Tunnel (the Project) as part of the Western Isthmus Water Quality Improvement Programme (WIWQIP).

This report assesses the construction transport effects of the Project based on information provided by Watercare. This ITA report has been prepared in accordance with our Letter of Engagement dated 6 December 2022.

1.2 Project background

Watercare Services Limited (Watercare) is New Zealand's largest water and wastewater utility provider, responsible for the planning, maintenance, and operation of water and wastewater services to communities throughout Auckland and the northern Waikato regions. Watercare has supplied wholesale water supply and wastewater services since 1991 and is a Council Controlled Organisation (CCO), wholly owned by the Auckland Council.

As a lifeline utility, Watercare's services are vital for life, ensuring the safety and wellbeing of communities and helping them to flourish. Watercare's key services are:

- The collection, treatment, and distribution of drinking water from various dams, rivers and groundwater sources.
- The collection, treatment, and disposal of wastewater at various wastewater treatment plants.
- The transfer, treatment, and disposal of trade wastes.
- The provision of commercial laboratory services.

Watercare is responsible for the management of over 410 million litres of wastewater daily, which is collected, treated and disposed of in environmentally responsible ways. The wastewater network operated by Watercare consists of over 8,000 kilometres of pipes and 518 pump stations, directing wastewater to 18 treatment plants throughout the region.

Watercare is continually reviewing its activities and identifying maintenance, replacement, upgrading and new infrastructure projects to ensure it meets customer's needs, business objectives and statutory requirements. New infrastructure is frequently required across the region to cater for Auckland's growing population, to upgrade our assets and to improve the security of its services.

Over the coming 20 years, Auckland's population is expected to grow by 29%, adding another 476,000 people to the current population of 1.7 million. To build a resilient water and wastewater system for this growing population, and ensure reliability of service, Watercare will invest about $18.5 billion in renewing and upgrading critical assets over the next 20 years.

1.3 Project overview

Watercare is joint with Auckland Council in delivering a programme of infrastructure improvement works to reduce wastewater overflows and improve water quality at local beaches. The programme is known as the Western Isthmus Water Quality Improvement Programme (WIWQIP).

To build a resilient wastewater system and ensure reliability of service and reduced overflows, Watercare is proposing to construct a new wastewater trunk sewer for the Herne Bay catchment, to connect into the proposed Central Interceptor (CI) tunnel extension to Point Erin Park.

The scope of the works involves:

- Installation of approximately 1.5 km of 2.1 m internal diameter trunk sewer line, constructed via a tunnel-boring machine (TBM).
- Installation of approximately 150 m of 600 mm diameter trunk sewer within Marine Parade, constructed via open-cut trenching.
- Construction of 8x primary tunnel shafts, ranging in diameter from 3.5 m to 11 m, along with 4x 3.5 m diameter intercepting shafts.
- Installation of 4x interception pipes and 11x connections to existing engineered overflow points (EOPs).
- Establishment of two construction support areas (CSAs) in public reserves.
- Relocation and reinstatement of utilities as required.

The resource consent application is prepared for the activities described above; hereafter referred to as 'the Project'.

Figure 1.1 to Figure 1.2 below, show the proposed alignment and key features of the Project.

Figure 1.1: Eastern portion of the Project

Figure 1.2: Western portion of the Project

1.4 Purpose of the project

The primary purpose of the Project is to reduce engineered overflow spill frequencies resulting from the aging combined sewer network in the area and to ensure ongoing compliance with Watercare's Network Discharge Consent (NDC). This is expected to lead to improvements in bathing water quality conditions at the beaches, reduction of odour from stormwater catchpits and improved overall amenity.

1.5 Purpose of Integrated Transport Assessment

The purpose of this Integrated Transport Assessment (ITA) is to assess the potential traffic and transport impacts of constructing the proposed works and identify traffic management measures that a contractor could use to minimise potential effects of construction on traffic movements and residents. Any further traffic management and mitigation measures identified following Auckland Transport and other stakeholder consultation is to be considered and undertaken by the project contractor.

2 Site description

2.1 Overview

The Project is located within Herne Bay, a predominantly residential suburb on the western fringe of the Auckland City Centre. The location of the Project area within the context of Auckland is shown below in Figure 2.1.

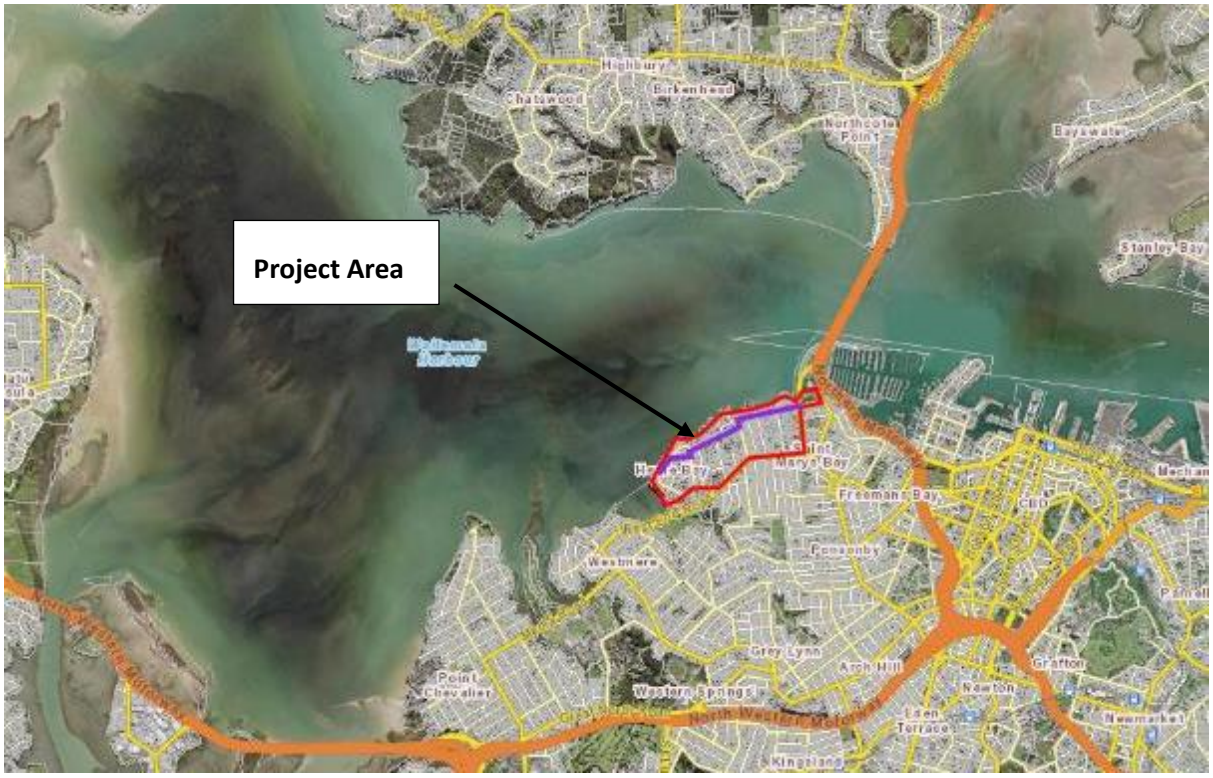

Figure 2.1: Location of the project area (Herne Bay) within the context of Auckland

The Project area is bound by Point Erin Park in the east, the edge of the Waitematā Harbour to the north and Marine Parade and Jervois Road to the south.

2.2 Site location

Key land uses surrounding the site are residential dwellings and several reserves. Zoning in the immediate vicinity of the site comprises residential, road, strategic road network and open space zones as shown in Figure 2.2 below.

Figure 2.2: Alignment of the trunk sewer line (red line) with the underlying zoning

Further from the construction works, Jervois Road lies to the south of the proposed works and features a shopping and commercial area. Three early childcare centres are located in the neighbourhood, as well as two primary schools (Bayfield School and Ponsonby Primary School).

2.3 Transport network

2.3.1 Introduction

The following sections provide a description of the existing transport network in terms of:

- Roads on the project route, as shown in Figure 2.3 below.
- Adjacent to the two proposed Construction Support Areas (CSAs), as shown in Figure 2.3 below.
- Roads that could be potential temporary detour routes - details of the detour routes for each shaft location are detailed in Sections 6.5.5 to 6.5.16. Although at this stage there are no confirmed details available on diversion routes to be used resulting from any road closures, possible diversion routes have been identified.

2.3.2 Description of roads surrounding the Project

2.3.2.1 **Roads on the Project route -** see Figure 2.3 below:

Figure 2.3: Roads adjacent to the Shaft locations and Construction Support Areas (CSAs)

Table 2.1 below provides a brief description of the layout for each road on the Project route:

Table 2.1: Layout of roads on the Project route (west to east)

Road name and section	Description
Marine Parade Bella Vista Road to Upton Street	• Two-way road. • 7.5 m wide carriageway. • No centreline markings. • On street parking permitted. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
Upton Street Marine Parade to Herne Bay Road	• Two-way road. • 8.5 m wide carriageway. • Centreline marking. • On street parking permitted. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
Herne Bay Road Upton Street to Marine Parade	• Two-way road. • 11 m wide carriageway. • Centreline marking. • On street parking permitted. • 2.5 m wide footpath on both sides. • Grass berms on both sides.

Road name and section	Description
Argyle Street Herne Bay Road to Wallace Street	• Two-way road. • 11 m wide carriageway – includes shoulders on both sides used as on street parking. • Centreline marking. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
Wallace Street Argyle Street to Sarsfield Street	• Two-way road. • 10 m wide carriageway– includes shoulders on both sides used as on street parking with 120 minute limit Monday to Friday (0800-1800). • No centreline marking. • 2.0 m wide footpath on both sides. • Grass berms on both sides.
Stack Street Wallace Street to Wairangi Street	• Two-way road. • 8 m wide carriageway. • Centreline marking. • On street parking permitted. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
Wairangi Street Stack Street to River Terrace	• Two-way road. • 7.0 m wide carriageway. • No centreline marking. • On street parking permitted. • 1.5 m wide footpath on both sides. • Grass berm on both sides.
River Terrace Full length	• Private road. • 5.5 m wide carriageway.
Sarsfield Street Wallace Street to Curran Street	• Two-way road. • 10.5 m wide carriageway– includes shoulders on both sides used as on street parking with 120 minute limit Monday to Friday (0800-1800). • Centreline marking. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
Sarsfield Street Curran Street to Shelly Beach Road	• Two-way Road. • 10 m wide carriageway. • Centreline marking. • 2.5 m wide footpath on both sides. • Grass berms on both sides. • On-street parallel car parking available on both sides with 120 minute limit between 0800-1800 Monday to Friday. • Not a Waka Kotahi or Auckland Transport over dimensioned route.

As detailed in Figure 2.1, carriageway widths typically range from 7.5 m – 11 m, with roads mainly used for residential access. Most streets provide for parallel parking, either fully delineated or within the shoulder. There are footpaths and berms on both sides of the roads. There are limited cycle facilities. All posted speed limits on the Project route are 50 km/h.

2.3.2.2 Roads adjacent to the CSAs

See Figure 2.3 above for the location and section 3.2 for a description of the CSA1 Salisbury Reserve and CSA2 94A and 95B Shelly Beach Road.

Table 2.2 below provides a brief description of the layout for each road adjacent to CSA1 and CSA2:

Table 2.2: Layout of roads adjacent to the CSAs

Road name and section	Description
CSA1 Salisbury Reserve ingress/egress	
Argyle Street Wallace Street to Curran Street	• Two-way road. • 11 m wide carriageway – includes shoulders on both sides used as on street parking. • Centreline marking. • 2.5 m wide footpath on both sides. • Grass berms on both sides.
CSA2 94A and 94B Shelly Beach Road ingress	
Curran Street - SH1 on ramp	• One-way road. • 8 m wide carriageway. • No Stopping At All Times (NSAAT's) both sides. • Shared path runs in parallel to the west at Curran Street end. • Not a Waka Kotahi or Auckland Transport over-dimension route.
CSA2 94A and 94B Shelly Beach Road egress north, south and to satellite sites	
SH1 -Auckland Harbour Bridge	• Eight lanes. • Is a Waka Kotahi over-dimension route.
SH1 off slip to Onewa Road	• One-way Road. • 8 m wide carriageway. • NSAAT's. • No footpath on either side. • Is a Waka Kotahi over-dimension route.
Onewa Road bridge	• Two-way Road. • 15.5 m carriageway. • NSAAT's. • No footpath or berm. • Waka Kotahi and Auckland Transport over-dimension route.
Onewa Road on slip to SH1	• One-way Road. • 9.0 m wide carriageway. • NSAAT's. • No footpath or berm. • Is a Waka Kotahi over-dimension route.
Shelly Beach Road Bridge / SH1 off ramp	• One-way Road. • 4.5 m wide carriageway on SH1 off ramp, 7.0 m wide on Road Bridge. • NSAAT's.

	• 2.0 m wide footpath along Eastern side of bridge. • 2.0 m wide gravel berm on eastern side of SH1 off ramp. • Not a Waka Kotahi or Auckland Transport over-dimension route.
Sarsfield Street Shelly Beach Road to Curran Street	• Two-way Road. • 10 m wide carriageway. • Centreline marking. • 2.5 m wide footpath on both sides. • Grass berms on both sides. • On-street parallel car parking available on both sides, limited to 120 minutes between 0800-1800 Monday to Friday. • Not a Waka Kotahi or Auckland Transport over dimensioned route.
Shelly Beach Road Sarsfield Street to Jervois Road	• Two-way Road. • 13.0 m wide carriageway– includes shoulders on both sides used as on street parking, limited to 120 minutes between 0800-1800 Monday to Friday. • Centreline marking. • 2.5 m wide footpaths on both sides. • No berms. • Is not a Waka Kotahi or Auckland Transport over-dimension route.

Commentary

Salisbury Reserve CSA is accessed from Sarsfield Street which is an 11 m wide Collector. Access to/from the 94A and 94B Shelly Beach Road CSA is from Curran Street and SH1, some of which are on a Waka Kotahi/AT over dimension route.

2.3.2.3 Potential temporary diversion routes (see section 6.5 for a description of these potential routes)

Table 2.3 below provides a brief description of the layout for each road which could be a potential temporary diversion route where temporary management measures may be in place:

Table 2.3: Layout of roads on potential temporary diversion routes (from west to east)

Road name and section	Description
Bella Vista Road	• Two-way Road. • 9.0 m wide carriageway. • No centreline markings. • On street parking permitted. • 2 m wide foot path on both sides. • Grass berms on both sides.
Annan Street	• Two-way Road. • 9.0 m wide carriageway. • No centreline markings. • On street parking permitted. • 2 m wide footpath on both sides. • Grass berms on both sides.
Wolseley Avenue	• Two-way Road. • 7.0 m wide carriageway.

Road name and section	Description
	• No centreline markings. • On street parking permitted. • 2 m wide footpath on both sides.
Galatea Terrace	• Two-way Road. • 11.0 m wide carriageway. • No centreline markings. • On street parking permitted. • 2 m wide footpath on both sides. • Grass berms on both sides.
Mason Avenue	• Two-way Road. • 13.0 m wide carriageway. • Centreline markings. • On street parking permitted. • 2.0 m wide footpath on both sides. • Grass berms on both sides.
Clifton Road	• Two-way Road. • 9.5 m wide carriageway. • Centreline markings. • On street parking permitted. • 20 m wide footpaths on both sides. • Grass berms on both sides.
Cremorne Street	• Two-way Road. • 8.0 m wide carriageway. • No centreline markings. • On street parking permitted. • 2.0 m wide footpaths on both sides. • Grass berm on both sides.
Lawrence Street	• Two-way Road. • 9.5 m wide carriageway. • No centreline marking. • On street parking permitted - 120 minute limit Monday to Friday (0800-1800). • 2.0 m wide footpath on both sides. • No berm on either side.
Sentinel Road	• Two-way road. • 11 m wide carriageway. • No centreline marking. • On street parking permitted - 120 minute limit Monday to Friday (0800-1800). • 2.0 m wide footpath on both sides. • Grass berms on both sides.
Hamilton Road	• Two-way road. • 9 m wide carriageway. • No centreline marking.

Road name and section	Description
	• On street parking permitted - 120 minute limit Monday to Friday (0800-1800). • 2.0 m wide footpath on both sides. • Grass berms on both sides.
Emmett Street	• Two-way road. • 9 m wide carriage way. • Centreline markings. • On street parking permitted - 120 minute limit Monday to Friday (0800-1800). • 2 m wide footpath on northern side and 2.5 m on the southern side. • Grass berms on both sides.
Tweed Street	• Two-way Road. • 7.0 m wide carriageway. • No centreline markings. • On street parking permitted - 120 minute limit Monday to Friday (0800-1800). • 2.5 m wide footpath on both sides. • No berms on either side.
Jervois Road	• Two-way road. • 18.0 m wide carriageway. • Variable carriageway width. • Centreline markings. • Marked parking on both sides.
Curran Street (Jervois Road to Sarsfield Street)	• Two-way Road. • 11 m wide carriageway– includes shoulders on both sides used as on street parking - 120 minute limit Monday to Friday (0800-1800). • Centreline marking. • 2 m wide footpath on both sides. • Grass berms on both sides. • Not an Auckland Transport or Waka Kotahi over-dimension route.

Commentary

The carriageway widths of the potential diversion routes in Table 2.3 vary between 7 m to 18 m, they are all two-way roads and a mixture of Local, Collector and Arterial roads.

2.3.3 Existing traffic flows

2.3.3.1 Route of the Project (see Figure 2.2 above)

Existing traffic counts, heavy vehicle percentages and road classifications along the route of the Project are detailed in Table 2.4 below:

Table 2.4: Traffic counts, heavy vehicle percentages and road classification along the route of the Project

Road name	Average Daily Traffic (veh/day two way)	Estimated Heavy Vehicle % (number)	Count/Estimate year	Auckland Unitary Plan Road Classification
Marine Parade Bella Vista Road to Upton Street	314	5% (16)	2020	Collector
Upton Street Marine Parade to Herne Bay Road	261	5% (13)	2020	Local Road
Herne Bay Road Upton Street to Marine Parade	523	5% (26)	2020	Collector
Argyle Street Herne Bay Road to Wallace Street	1,181	1% (12)	2022	Collector
Wallace Street Argyle Street to Sarsfield Street	1,828	3% (55)	2020	Collector
Sarsfield Street Wallace Street to Curran Street	3,940	3.7% (158)	2020	Collector
Sarsfield Street Curran Street to Shelly Beach Road	4,168	3.7% (154)	2020	Collector
Source: Traffic counts from Mobile Road, https://mobileroad.org/desktop.html,				

Most of the roads potentially impacted by the Project have very low traffic volumes (typically less than 1,800 vehicles per day), except Sarsfield Street. This reflects the predominantly local residential access nature of the roads potentially impacted by the Project. Sarsfield Street serves a greater volume of traffic, being a Collector.

A two hour AM peak (0700-0900) and a two hour PM peak (1600-1800) turning count survey was undertaken at the Curran Street/Sarsfield Street intersection on Tuesday 4th April 2023. The results from this survey are summarised in **Appendix A**. The AM peak hour was observed to be 0730-0830 and the PM peak hour was observed to be 1615-1715. Key findings from this survey were:

- Sarsfield Street (between Curran Street and Shelly Beach Road) - the predominant direction of flow in both peaks is westbound towards Curran Street and the predominant movement is the right turn to the SH1 on ramp. Flows are higher in the PM peak.
- Sarsfield Street (between Curran Street and Hamilton Road) - the predominant direction of flow in both peaks is eastbound towards Curran Street and the predominant movement is the left turn to the SH1 on ramp. Flows are similar in both peaks.
- Curran Street - the predominant movement in both peaks is northbound to the SH1 on ramp, with a similar level of flow in both peak periods.
- Very few school children were observed walking to Ponsonby Primary School in the AM Peak along both Curran Street and Sarsfield Street.

- Very few cyclists were observed at the intersection.
- A small number of pedestrians were observed using the footpath into Point Erin Park.

2.3.3.2 Construction Support Areas (see section 3.2 for a description of the CSA1 Salisbury Reserve and CSA2 94A and 95B Shelly Beach Road)

Existing traffic counts, heavy vehicle percentages and road classifications providing access to CSA1 and CSA2 are detailed in Table 2.5 below:

Table 2.5: Traffic counts, heavy vehicle percentages, and road classification providing access to CSA1 and CSA2

Road name	Average Daily Traffic (veh/day)	Estimated Heavy Vehicle % (number)	Count/Estimate year	Auckland Unitary Plan Road Classification
CSA1 Salisbury Reserve ingress/egress				
Argyle Street Herne Bay Road to Wallace Street	1,181	1% (12)	2022	Collector
Wallace Street Argyle Street to Sarsfield Street	1,828	3% (55)	2020	Collector
Sarsfield Street Wallace Street to Curran Street	3,940	3.7% (146)	2020	Collector
CSA2 94A and 94B Shelly Beach Road ingress				
Curran Street - SH1 on ramp	6,162	2.3% (142)	2021	Arterial – SH1 on ramp
CSA2 94A and 94B Shelly Beach Road egress north, south and to satellite sites				
Auckland Harbour Bridge	170,000	8.7% (14,790) (from mobile roads)	From Auckland Harbour Bridge factsheet (nzta.govt.nz)	SH1/Motorway
SH1 off slip to Onewa Road	11,697	4% (468)	2021	Off ramp/ Motorway
Onewa Road bridge	34,444	6.8% (2,342)	2022	Primary Arterial
Onewa Road on slip to SH1	18,302	3% (549)	2021	On ramp/ Motorway
Shelly Beach Road Bridge / SH1 off ramp	5,429	1.5% (81)	2021	Arterial – SH1 off ramp
Sarsfield Street Curran Street to Shelly Beach Road	4,168	3.7% (154)	2020	Collector
Shelly Beach Road Sarsfield Street to Jervois Road	7,718 – 8,296	3.7% (273)	Various	Primary Arterial

Source: Traffic counts from Mobile Road, https://mobileroad.org/desktop.html,

As demonstrated above, access to CSA1 and CSA2 will be via existing higher trafficked roads of Collector or above status. These are considered suitable for the proposed movements in and out of CSA1 and CSA2.

2.3.3.3 Potential temporary diversion routes (see section 6.5 for a description of these potential routes)

Existing traffic counts, heavy vehicle percentages and road classifications on potential temporary diversion routes where temporary management measures may be in place (as outlined in section 6.5 below) are detailed in Table 2.6 below:

Table 2.6: Traffic counts, heavy vehicle percentages, and road classification – potential temporary diversion routes

Road name	Average Daily Traffic (veh/day)	Estimated Heavy Vehicle %	Count/Estimate year	Auckland Unitary Plan Road Classification
Bella Vista Road	412	6%	2020	Local Road
Annan Street	104	5.4%	2020	Local Road
Wolseley Avenue	157	5.4%	2020	Local Road
Galatea Terrace	261	5.4%	2020	Local Road
Mason Ave	1,256	5.4%	2020	Local Road
Clifton Road	1,148	2%	2020	Local Road
Cremorne Street	209	5.4%	2020	Local Road
Stack Street	1,079	2%	2020	Local Road
Wairangi Street	104	5%	2020	Local Road
River Terrace	N/A	N/A	N/A	Local Road
Lawrence Street	1,197	4%	2020	Local Road
Sentinel Road	1,242	3%	2020	Local Road
Hamilton Road	1,866	5%	2020	Local Road
Emmett Street	532	1%	2020	Local Road
Tweed Street	523	5.4%	2020	Local Road
Jervois Road	19,168	5.5%	2022	Primary Arterial
Curran Street	8,179	8% (654)	2022	Primary Arterial

Jervois Road to Sarsfield Street				
Source: Traffic counts from Mobile Road, https://mobileroad.org/desktop.html,				

Most of the roads on potential temporary diversion routes have very low traffic volumes (typically less than 1,800 vehicles per day), except Jervois Road and Curran Street. This reflects the predominantly local residential access of the roads potentially impacted by the Project. Jervois Road and Curran Street serve a greater volume of traffic being Arterials.

2.3.4 Intersections

The Project traverses 14 intersections, as shown in Figure 2.4 below:

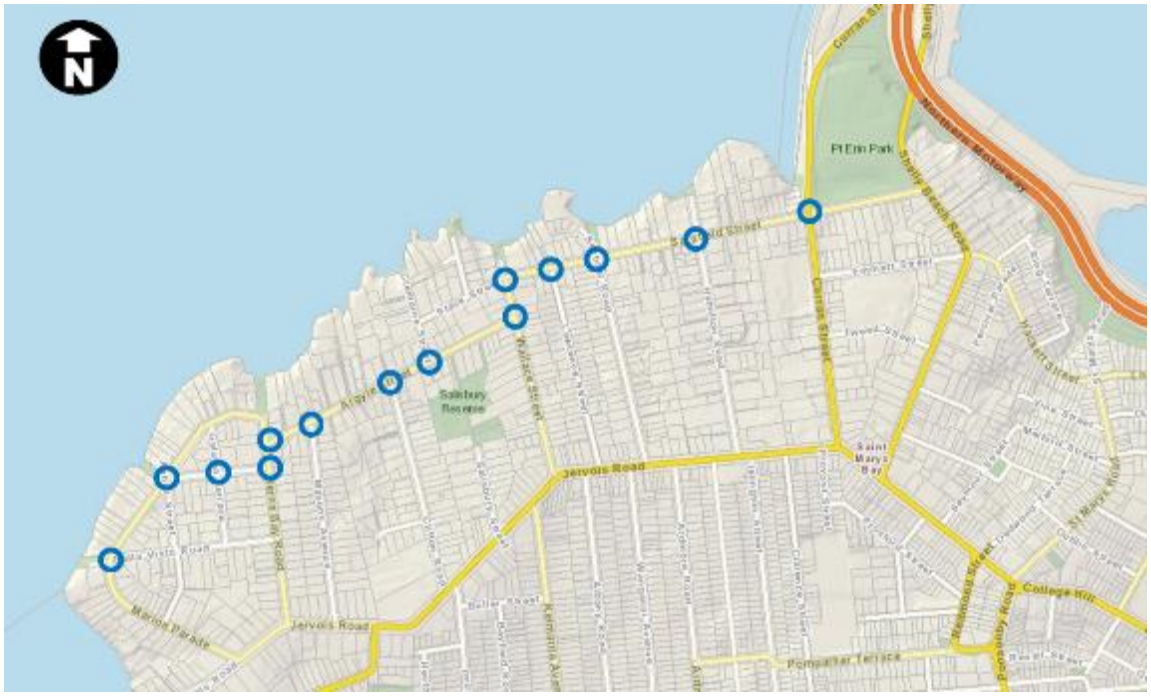

Figure 2.4: Intersection locations along the Project

Most intersections have low traffic volumes and are either give-way controlled (with some having no signs or markings) and six are Stop controlled. Key intersections are described in Table 2.7: Key intersections along the Project route (west to east)below:

Table 2.7: Key intersections along the Project route (west to east)

Intersection	Description + Layout Images from Google Maps and Google Streetview
Marine Parade / Bella Vista Road	 Unsignalised 4-way intersection, with no signs or pavement markings. Visibility may be limited between the east and north leg of the intersection due to the angle of approach. Traffic volumes are low, allowing time for driver judgement as they travel through this intersection.
Marine Parade / Upton Street / Annan Street	 Unsignalised 4-way intersection, with no signs and no pavement markings. Upton Street and Annan Street approach Marine Parade at an oblique angle on its eastern side. As a result, visibility is limited for all drivers approaching this intersection. Traffic volumes are low, allowing time for driver judgement as they travel through this intersection.

Intersection	Description + Layout Images from Google Maps and Google Streetview
Herne Bay Road / Upton Street / Argyle Street	 Unsignalised staggered T-intersections. There is 50 m between the two intersections, and a left-right stagger. Traffic volumes are low, allowing time for driver judgement as they travel through this intersection.
• Argyle Street / Mason Avenue • Argyle Street/ Clifton Road • Argyle Street / Cremorne Street • Argyle Street / Wallace Street • Wallace Street / Sarsfield Street / Stack Street • Sarsfield Street / Sentinel Road • Sarsfield Street / Lawrence Steet • Sarsfield Street / Hamilton Road	  T-intersections or four-way intersections, mixture of Stop and Give Way control. These intersections have all had recent safety improvements including raised platforms, kerb buildouts, and tactile pavers. Images above are examples from Argyle St / Wallace St and Wallace St / Sarsfield St / Stack St.

Intersection	Description + Layout Images from Google Maps and Google Streetview
Sarsfield Street / Curran Street	 This intersection has had recent safety improvements including raised platforms on the Sarsfield Street approaches, kerb buildouts, and tactile pavers. The Curran Street south approach also has a pedestrian refuge island. The north leg is one way for general traffic and only allows north-bound traffic to access the SH1 on ramp and Curran Street to Westhaven. At this leg, there is a small south-bound bay for service vehicles and two properties adjacent to the intersection.

2.3.5 Existing traffic conditions

2.3.5.1 Roads on the Project route

Typical traffic speeds on the Project route from Google Maps in the weekday AM and PM peaks, as well as school pick-up times, are shown Figure 2.5 (noting this is for the busiest/worst case time period in the AM peak), Figure 2.6 (at 3 pm to tie into the school finish time) and Figure 2.7 (noting this is for the busiest/worst case time period in the PM peak) below:

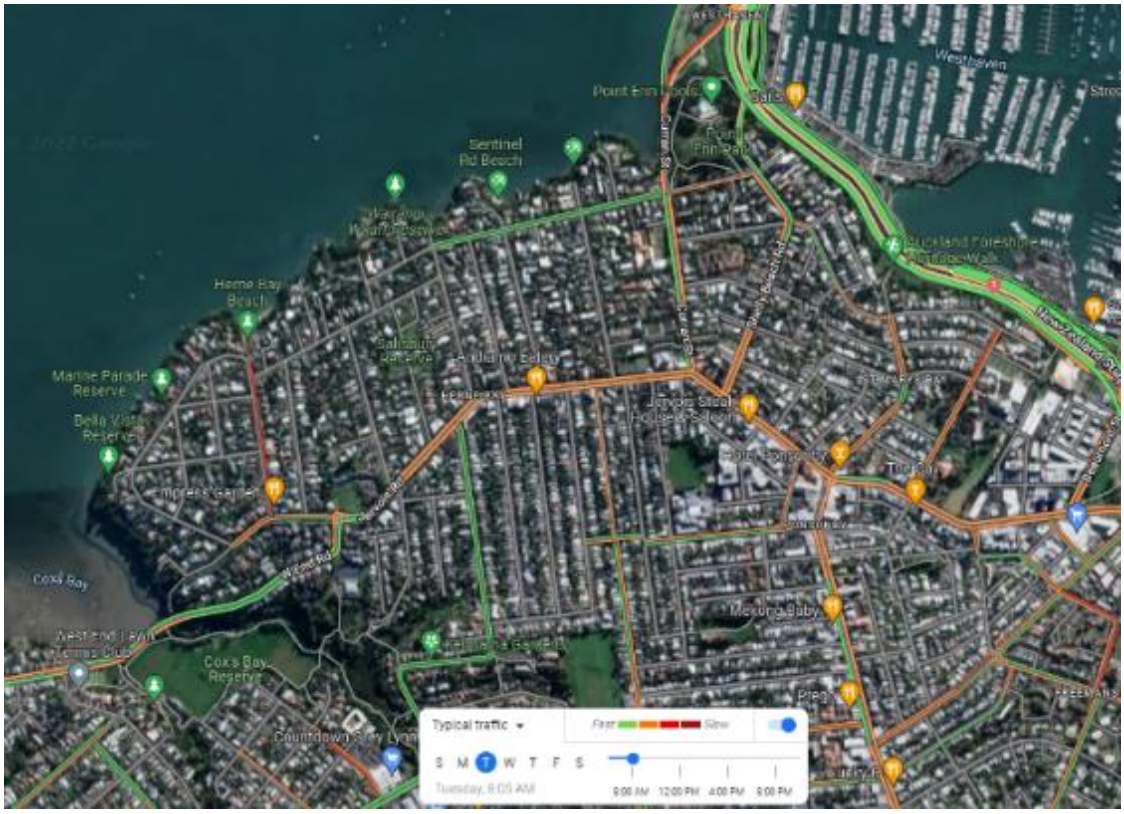

Figure 2.5: Typical AM peak traffic (Source: Google Maps)

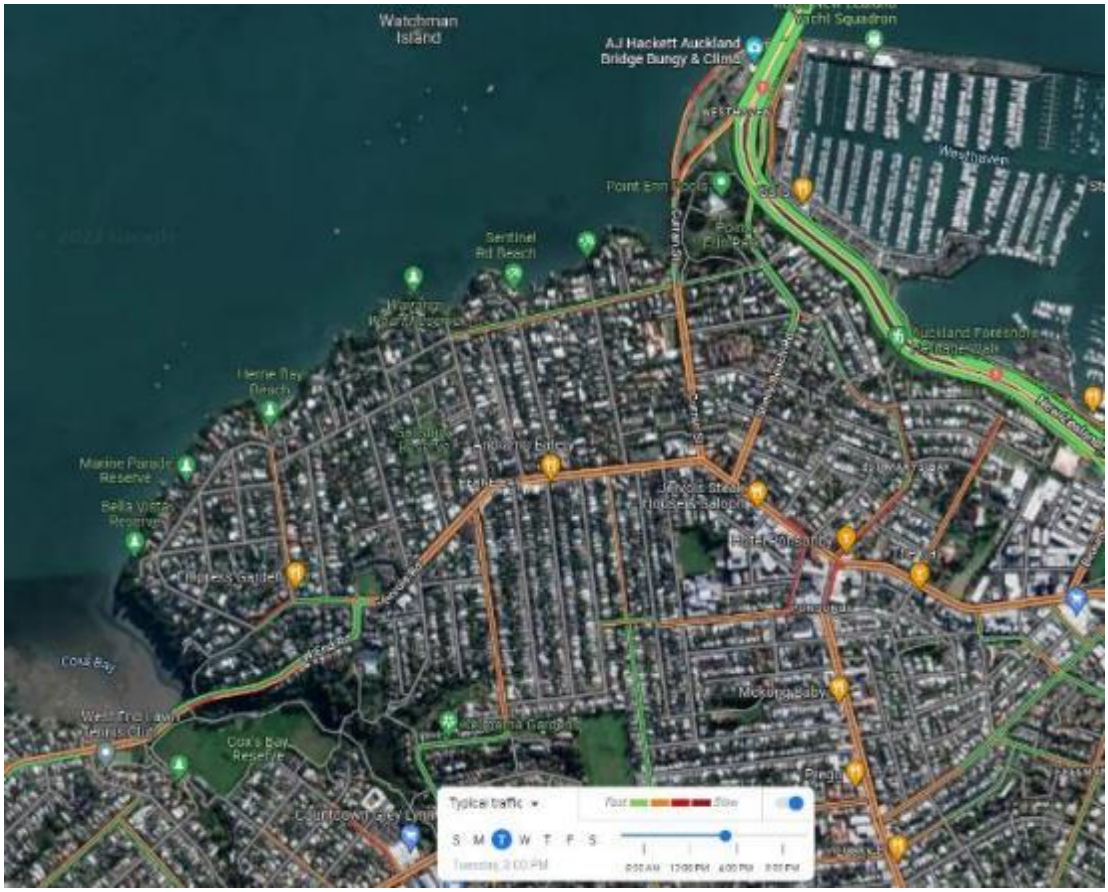

Figure 2.6: Typical traffic at school pick-up time (Source: Google Maps)

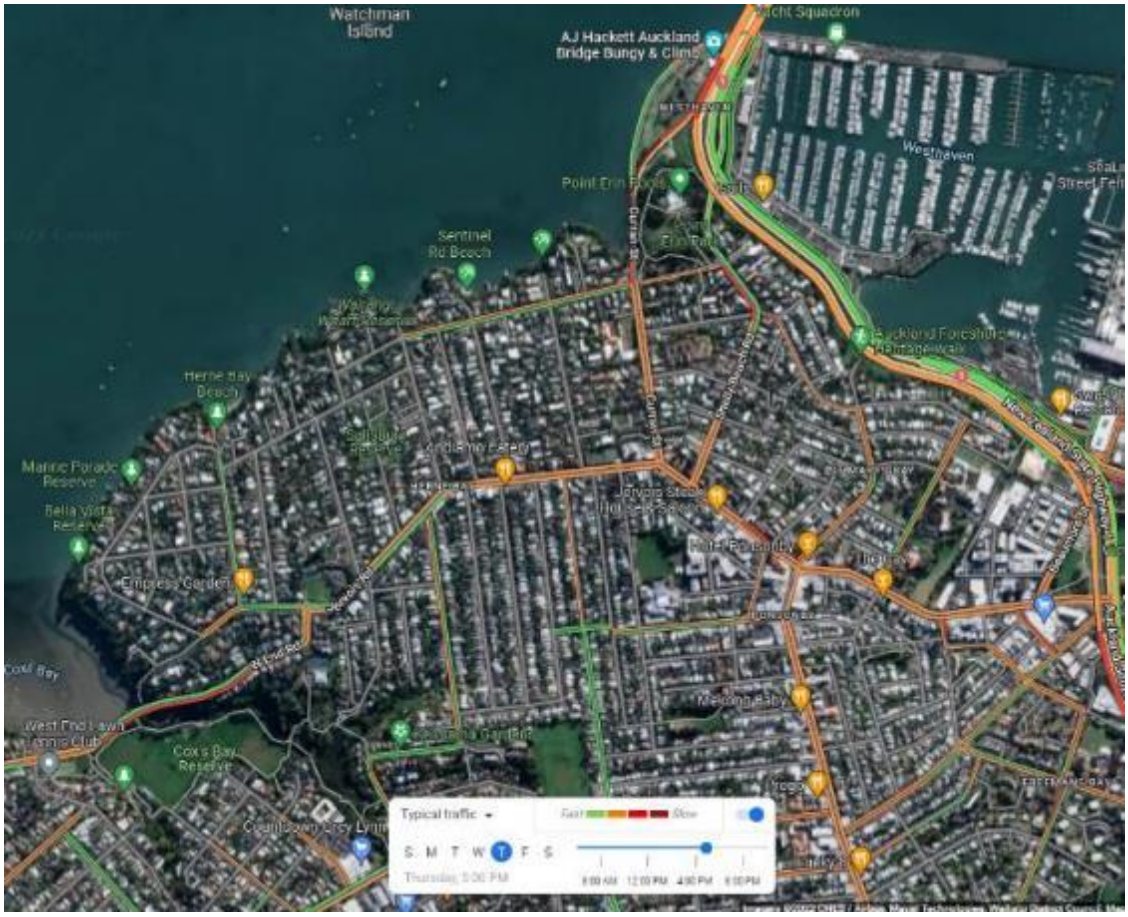

Figure 2.7: Typical PM peak traffic (Source: Google Maps)

The peaks in these figures were selected as examples of the busiest/worst-case congestion, with slow traffic speeds assumed to be due to congestion.

2.3.5.2 Roads on the Project route and the CSAs

On the whole, the streets on the route of the Project are not congested which is not unsurprising given they are low flow roads serving as residential access. Congestion is evident during peak periods on Sarsfield Street (between Shelly Beach Road and Curran Street) which is due to congestion backing up from the SH1 on ramp signals on Curran Street. There is no congestion during the off peak.

2.3.5.3 Roads on potential temporary diversion routes (see section 6.5 for a description of these potential routes)

A similar conclusion can be drawn for roads on the potential temporary diversion routes with the majority not experiencing any congestion. Exceptions to this are the Arterial routes of Jervois Road, Curran Street and Shelly Beach Road, where peak period congestion does occur.

2.3.5.4 SH1 and Onewa Road interchange (for CSA2 94A and 94B Shelly Beach Road northbound and southbound movements)

Typical traffic speeds from Google Maps in the weekday AM and PM peaks, as well as school pick-up times, are shown in Figure 2.8 (noting this is for the busiest/worst case time period in the AM peak), Figure 2.9 (at 3 pm to tie into the school finish time) and Figure 2.10 (noting this is for the busiest/worst case time period in the PM peak) below:

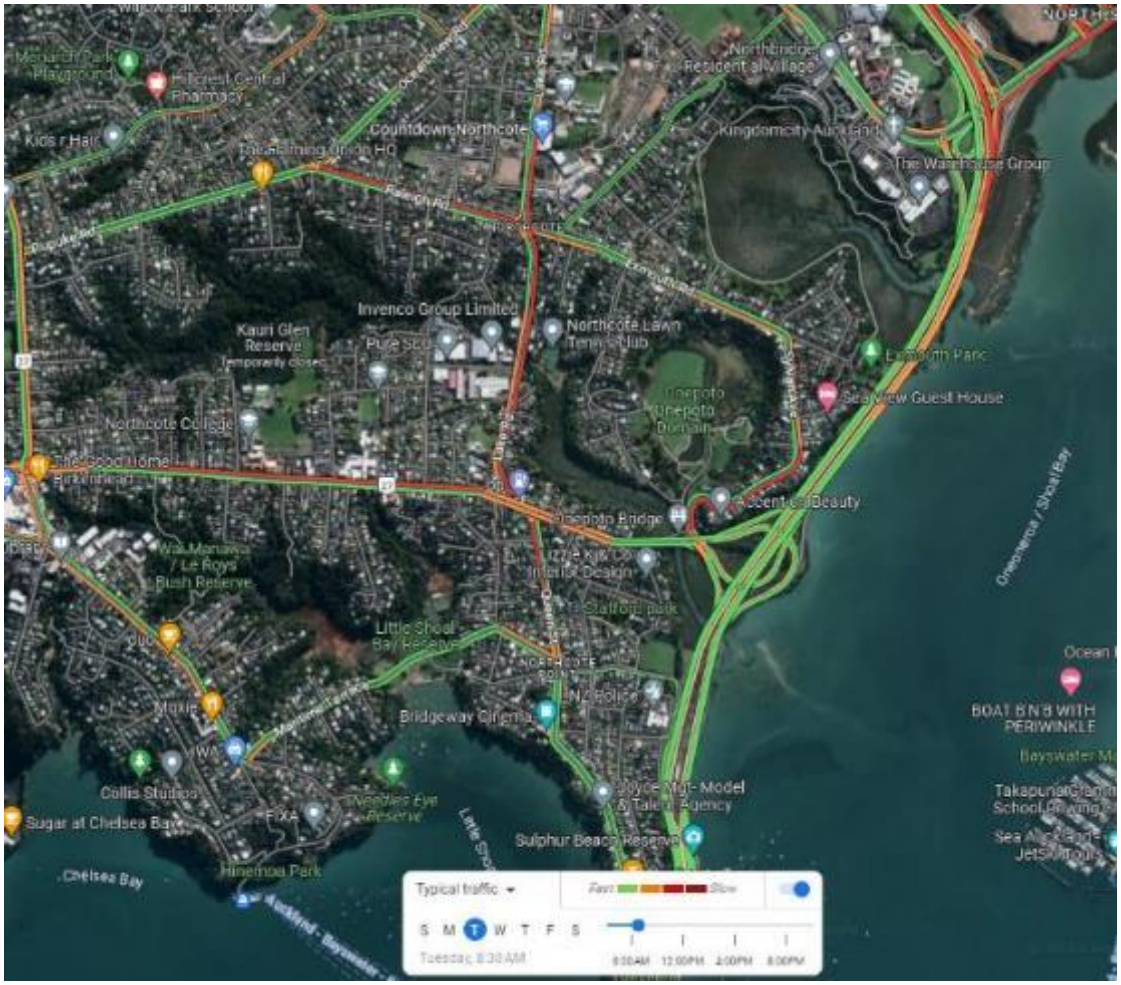

Figure 2.8: Typical AM peak traffic (Source: Google Maps)

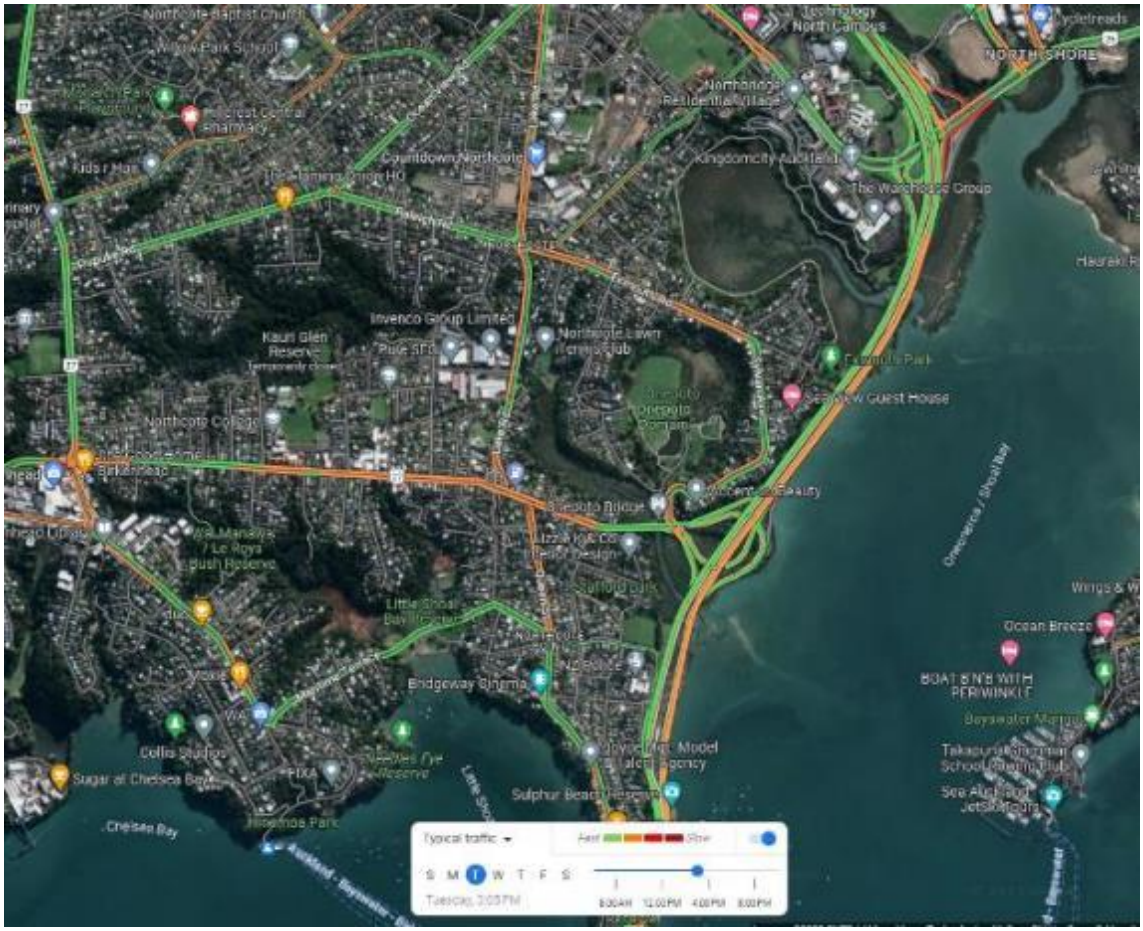

Figure 2.9: Typical traffic at school pick up time (Source: Google Maps)

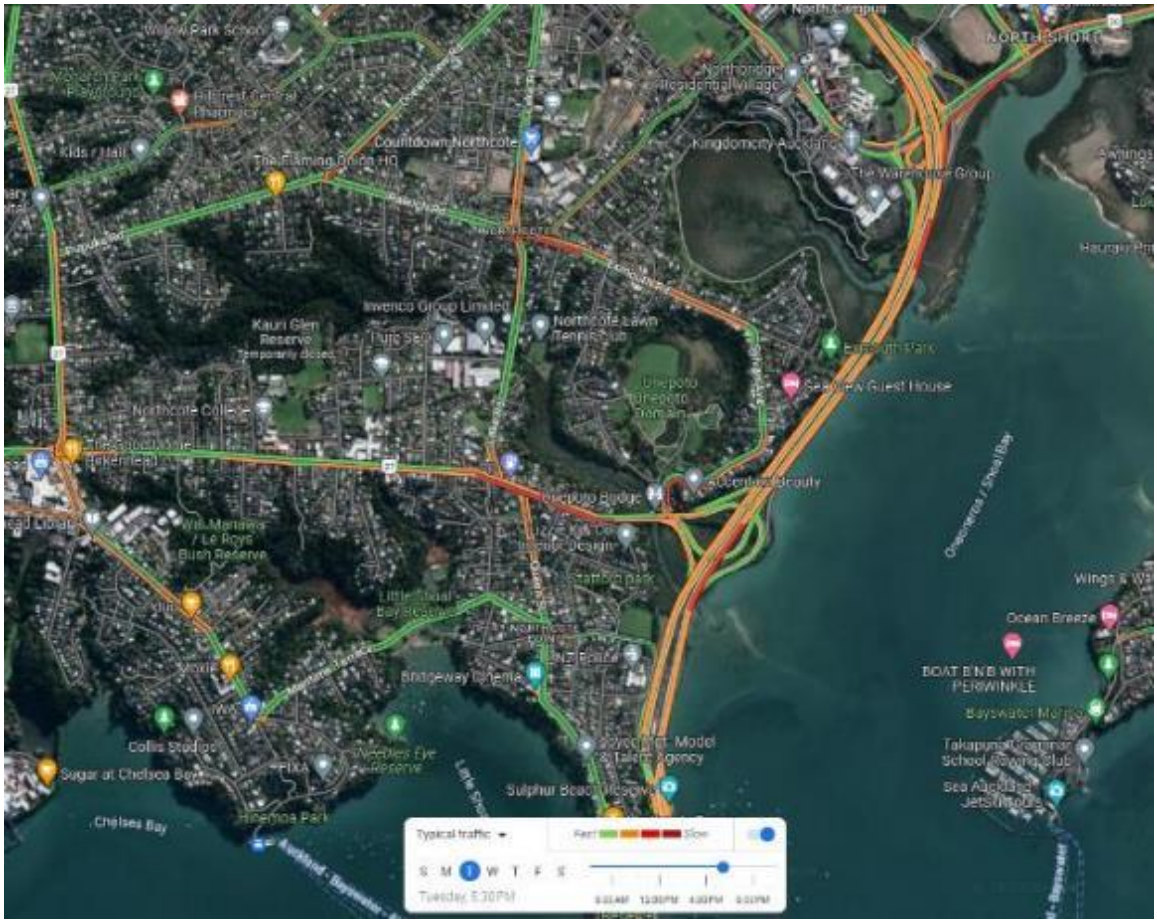

Figure 2.10: Typical PM peak traffic (Source: Google Maps)

The peaks in these figures were selected as examples of the busiest/worst-case congestion, with slow traffic speeds assumed to be due to congestion.

In the AM peak and PM peak there is little congestion on the Onewa Bridge and SH1 on and off ramps (except for slow moving traffic on the SH1 off ramp in the PM peak). In the AM and school PM peak there is little congestion on SH1, but slow-moving traffic in the PM peak.

2.4 Public transport

There are no scheduled bus services on the Project route. However, there are several bus stops on Jervois Road approximately 500 m to the south of the proposed works. These bus stops service routes 101 and the Outer link (OUT).

The 101 bus travels between Point Chevalier Road to the west of the site, to the University of Auckland. This service runs from 6:35 am to 7:00 pm on weekdays only.

The OUT bus travels in a loop encompassing the University of Auckland, Ponsonby, Westmere, Point Chevalier, Western Springs, Mount Eden, Epsom, Newmarket train station and Parnell train station. The OUT service runs from 6:30 am to 11:00 pm Monday to Saturday and 7:00 am to 11:00 pm on Sundays and public holidays, at 15-minute intervals.

Bus numbers 866 and 966 route via Curran Street and Shelly Beach Road to/from the North Shore.

2.5 Walking and cycling

2.5.1 On the Project route and CSAs

As detailed in Table 2.1 above, on the project route and at CSA1 there are footpaths and berms on both sides of all of the roads and at numerous locations there are raised platforms to assist pedestrian crossing movements. There are no footpaths adjacent to CSA2.

Cycle routes are shown in Figure 2.11 below (extract from the Auckland Cycle network, source at.govt.nz):

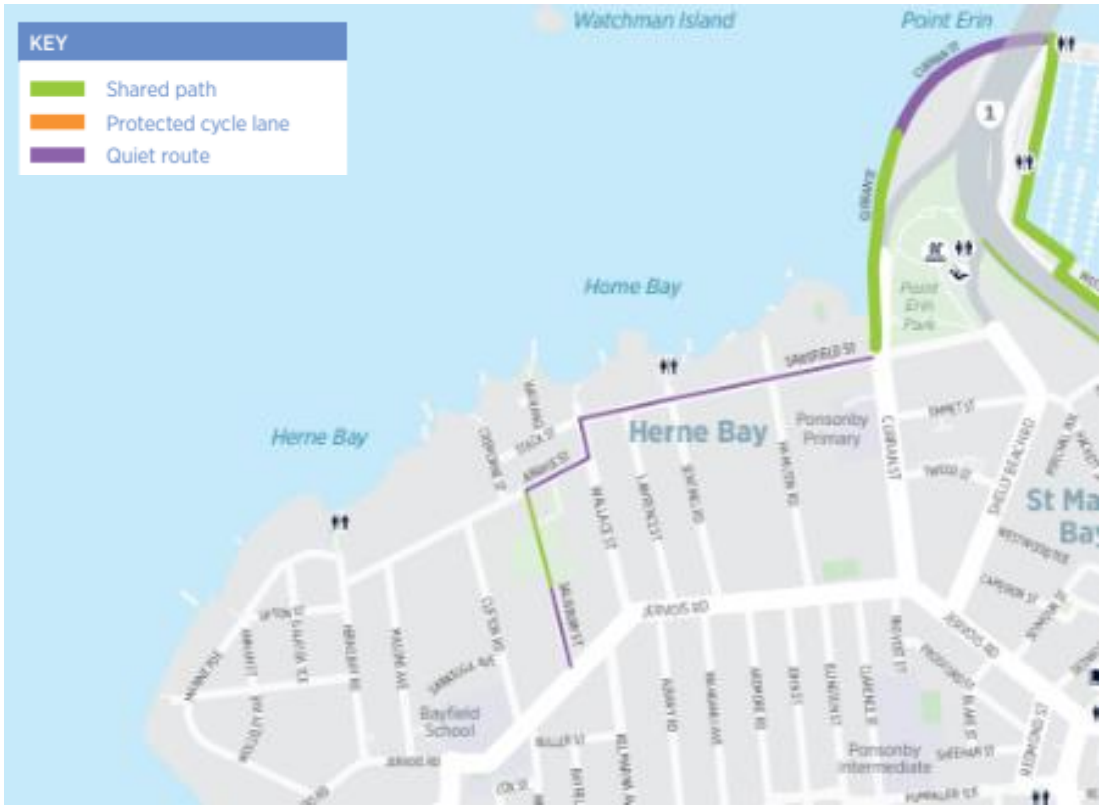

Figure 2.11: Existing cycleways on the Project route

There are limited cycleways on the Project route and CSA1 and these consist of a shared path through Salisbury reserve and Salisbury Street/Argyle Street/Sarsfield Street are classified as 'quiet routes' for cyclists to use. There are no cycleways adjacent to CSA2.

2.5.2 Adjacent reserves and beaches

Adjacent to the Project route are pedestrian accesses to beaches, reserves and playgrounds including:

- Bella Vista Reserve.
- Marine Parade Reserve.
- Herne Bay Beach.
- Salisbury Reserve.
- Cremorne Reserve.
- Wairangi Wharf Reserve.
- Home Bay Beach Reserve.

- Sentinel Road Beach.
- Hamilton Beach Reserve.
- Hamilton Road Beach.
- Point Erin Park.
- Masefield Beach Reserve.

Other recreational facilities include the Herne Bay Pétanque club, Herne Bay Ponsonby Rackets Club and the West End Bowling Club. Outdoor pools are open at Point Erin Park from the last weekend of November to the last weekend of March.

2.6 Road safety

2.6.1 Crashes on the Project route and CSA1

An assessment of the road safety record of the surrounding road network has been undertaken using the Waka Kotahi Crash Analysis System (CAS). Crash history was assessed for the period from 2017 – 2023 (inclusive) on the route of the Project (noting some 2022 and 2023 data are incomplete due to a delay between crashes and upload of their data), as shown in Figure 2.12 below:

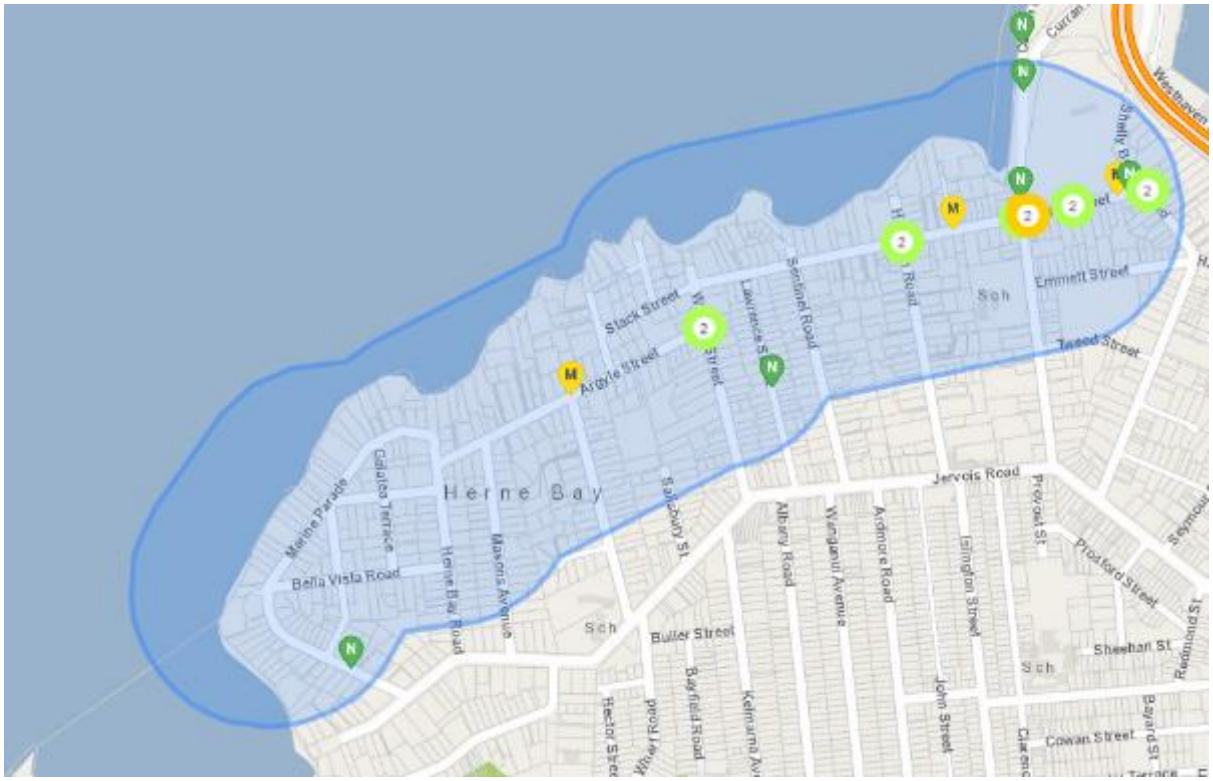

Figure 2.12: Project route crash study area.

From this search, a total of 24 crashes were recorded, with no fatal or serious crashes. A summary of the crash severities and factors can be found in Table 2.8 and Table 2.9 below and the collision diagram is attached in **Appendix B**.

Table 2.8: Crash summary on Project route

Year	Minor	Non-injury	Total
2017	1	4	5
2018	0	2	2
2019	2	5	7
2020	3	3	6
2021	1	3	4
2022	0	0	0
2023	0	0	0
Total	**7**	**17**	**24**

Table 2.9: Crash factor summary on Project route

Crash Type	Crash Numbers
Overtaking crashes	0
Straight road lost control/head on	2
Bend – lost control/Head on	3
Rear end/obstruction	9
Crossing/turning	8
Pedestrian crashes	1
Miscellaneous crashes	1
TOTAL	24

The following is concluded from a review of the crash data:

- All the recorded crashes were either minor or non-injury crashes.
- The majority of the crashes are at the Curran Street/Sarsfield Street intersection and east of this towards the Shelly Beach Road intersection. At the Sarsfield Street / Curran Street intersection there have been five crashes with no common crash type /pattern (and also noting the recent safety and pedestrian/cycle improvements implemented at this intersection).
- Along the rest of the Project route, the number of crashes that have occurred is very low and there is not a common crash type or pattern.
- Overall, the number of crashes, as well as the severity of the crashes, is considered to be low and it is considered that there are no inherent safety issues present in the vicinity of the Project and the Salisbury Reserve CSA1.

2.6.2 Crashes adjacent to CSA2 94A and 94B Shelly Beach Road

Figure 2.13 below shows the crash record for the Curran Street on ramp area (noting this includes SH1 crashes) adjacent to the 94A and 94B Shelly Beach Road CSA for the study period of 2017 – 2023 (inclusive – noting comments in 2.6.1 above):

Figure 2.13: CSA2 Curran Street on ramp crash study area

Three crashes occurred on the on ramp, all of which were south of the 94A and 94B Shelly Beach Road CSA2 site access. All of these were non-injury crashes. Of these, two crashes were due to queuing, and one was due to poor driver judgement (reversing due to a wrong turn). The cluster of crashes north of the site access are on SH1 and not associated with the on ramp. Overall, the number of crashes, as well as the severity of the crashes, is considered to be low and it is considered that there are no inherent safety issues present in the vicinity of CSA2.

2.6.3 Crashes on potential temporary diversion routes

Figure 2.14 below shows the crash record for the potential temporary diversion routes for the same study period:

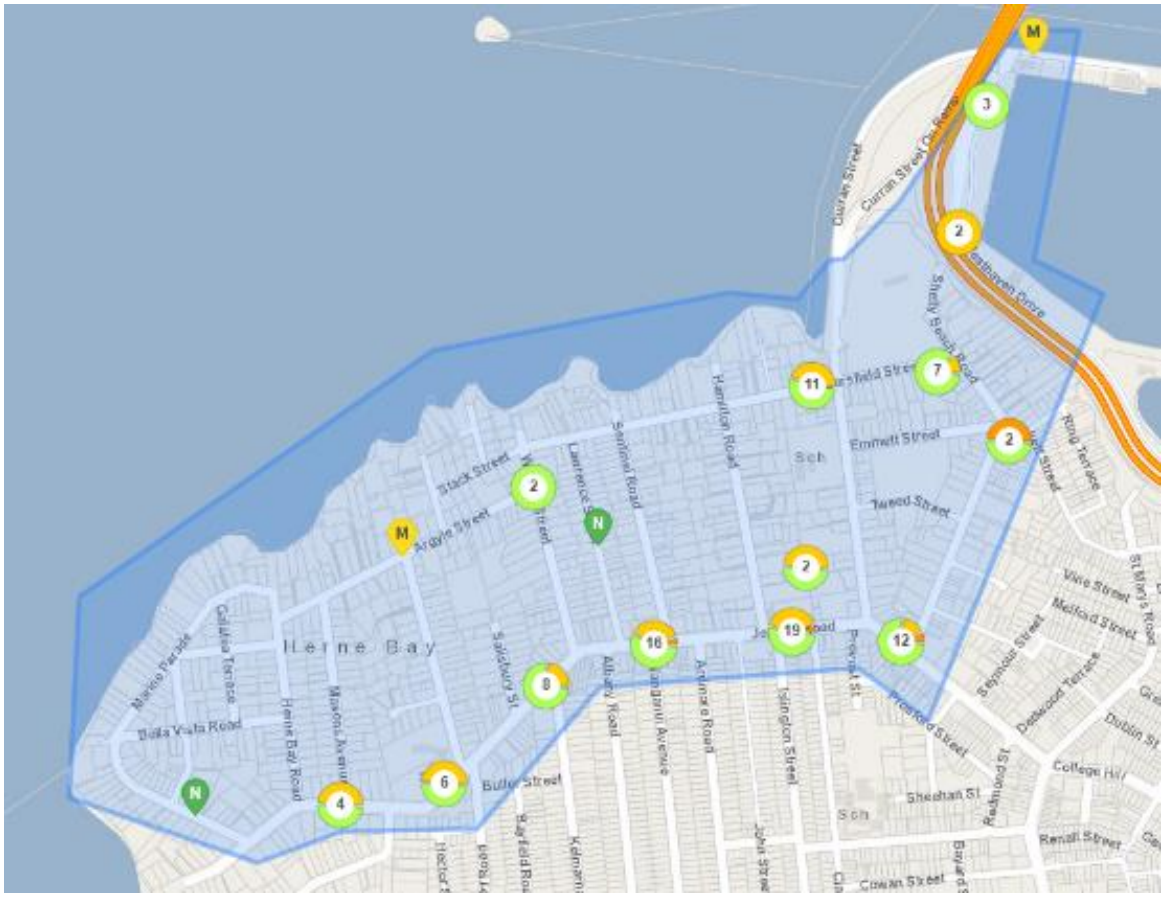

Figure 2.14: Potential temporary diversion routes crash study area

From this search, a total of 98 crashes were recorded, with no fatal crashes. A summary of the crash severities and factors can be found in Table 2.10 and Table 2.11, below and the collision diagram is attached in Appendix B. Crashes from SH1 within the crash study area boundary have been excluded from the data.

Table 2.10: Crash summary on potential diversion routes

Year	Serious	Minor	Non-injury	Total
2017	2	5	16	23
2018	1	6	8	15
2019	0	4	11	15
2020	1	7	10	18
2021	0	5	10	15
2022	0	6	5	11
2023	0	1	0	1
Total	**4**	**34**	**60**	**98**

Table 2.11: Crash factor summary on potential diversion routes

Crash Type	Crash Numbers
Overtaking crashes	6
Straight road lost control/head on	10
Bend – lost control/Head on	13
Rear end/obstruction	35
Crossing/turning	28
Pedestrian crashes	5
Miscellaneous crashes	1
TOTAL	98

The following is concluded from a review of the crash data in Table 2.10 and Table 2.11:

- There are no recorded crashes on any of the residential streets or on Curran Street (between Jervois Road and Sarsfield Street) which could be potential diversion routes.
- The majority of the crashes are along Jervois Road, which is not unexpected since this is a high volume Arterial route.

3 Proposed works

3.1 Overview

A wastewater trunk sewer pipeline is proposed for the Herne Bay catchment, to connect into the proposed CI tunnel extension to Point Erin Park. The primary purpose of the Project is to reduce engineered overflow spill frequencies to enable ongoing compliance with Watercare's NDC. This is expected to lead to improvements in bathing water quality conditions in the beaches within this catchment. It should be noted that not all of the works will be carried out at the same time and hence any impacts will be localised for a temporary period and not sustained across the whole project area for the full duration of the project.

3.2 Indicative construction methodology and programme

Appendix C provides details of the indicative construction methodology and the transport assessment of effects has been based on this. From a transport effects assessment key points to note are:

- Two Construction Support Areas (CSAs) will be established. These will act as hubs for the Satellite sites (i.e., where the shafts are being constructed) and enable short term storage of plant and materials. This will enable a reduction of materials and equipment stored at each Satellite Site and reduce the size and number of trucks on the local residential street network.
- At each Satellite site, a construction site will be established with the footprint minimised by using the CSAs for material and plant storage, thus minimising the impact on local resident vehicle and pedestrian access.
- As works are completed at each Satellite site, then the construction site will be de-established and returned to public use, thus minimising the number of construction sites open at any one time.
- It is anticipated that two or more satellite site works may be carried out concurrently where there isn't any overlap of traffic management arrangements.

3.3 Construction hours

General construction works are proposed to occur between 7am and 6pm, Monday to Friday and 8am – 6pm on Saturdays. No works are proposed on Sundays or public holidays. Site mobilisation and pack down works are proposed to occur 30 minutes before and after these windows.

There may be occasions where it is necessary to undertake construction activities outside of usual hours, such as for:

- Site setup and pack up.
- Large plant delivery early in the morning or later in the evening to avoid peak traffic volumes.
- Service relocations and their connections to reduce service disruptions.

It is understood that works outside of standard hours will be limited as far as is practicable and that based on experience at other Watercare sites, should this occur then it will take place intermittently and for a limited period of time. From a transport effects perspective, movements outside of peak times will have less effect on traffic movements on the surrounding roads, and as such, this assessment has not further considered out of hours traffic movements.

Any works outside the usual hours will be detailed in the Project's Construction Traffic Management Plan (CTMP) or Construction Management Plan which will identify appropriate management and

mitigation measures to be implemented and, if required, will be coordinated and programmed with AT.

4 Approach to the ITA

4.1 Background and experience to date

Watercare has extensive experience in successfully delivering wastewater improvement projects throughout Auckland in residential areas, which they can bring to this project. As such, the activities and effects of construction are well understood and the project team's experience has demonstrated that the effects associated with the construction of, for example the Central Interceptor tunnel, including traffic effects, can be successfully managed by resource consent conditions and the suite of management plans approved by Council for construction sites. However, it is also acknowledged that every new construction site needs to be assessed for its individual characteristics and its potential for effects on the surrounding transport network.

This ITA to support the resource consent application for the Project has been based on an indicative construction methodology (attached in Appendix C) and details on the duration and types and numbers of vehicles for the construction activities as provided by the contractor. A detailed construction programme and methodology will be finalised prior to the commencement of construction activities. It is anticipated this will be prepared by the Contractor and incorporated into the Project's Construction Management Plan (CMP). The ITA has been prepared on a conservative basis, using worst case traffic scenarios, such that any effects arising from the construction (once methodology is confirmed) will be within the envelope of effects assessed.

This ITA is heavily informed by practical on-the-ground experience, including directly comparable experience in relation to the type of works (tunnel and shafts) and location of works (in proximity to houses and reserves). However, while this ITA has been informed by this experience to date, careful consideration has been given to the particular characteristics of the area. The previous experience is helpful insofar as it provides a solid 'real-world' basis for understanding the nature of activities at Herne Bay, the actual and potential traffic effects of those activities and how the effects are best managed and mitigated to cause the least disruption to surrounding residents and to minimise environmental effects, but ultimately it is the particular receiving environment and characteristics of the surrounding transport network that are paramount and which are the focus of this ITA.

4.2 Proposed Point Erin CI works – cumulative assessment

At this stage there is not a work programme available for the Project. Both this Project and the Point Erin CI works are Watercare projects and Watercare will seek to avoid any overlaps between the two projects (in particular on Sarsfield Street) and where this is not possible will ensure the impacts on the projects are minimal. Notwithstanding this, to ensure a robust, worst-case assessment, a cumulative assessment of traffic effects has been carried out to assess the impact of the closure of Sarsfield Street as detailed in Section 6 below.

4.3 ITA and the traffic management approach

This ITA forms part of a comprehensive suite of technical reports to support the resource consent application and to inform the Assessment of Effects on the Environment (AEE) report. The ITA assesses the impact of construction traffic on the surrounding transport network and identifies key issues to be addressed within conditions and the Contractor's final Construction Traffic Management Plan (CTMP). Site Specific Traffic Management Plans (SSTMP's) with detailed Traffic Management Plan Drawings will also need to be provided to Auckland Transport (AT) prior to construction.

Figure 4.1 shows the relationship between the sequence of documents relating to traffic management activities post approval of the ITA. It is important to note that the CTMP does not enable physical works to take place on the road corridor but rather sets the philosophy as to how traffic is managed for this project. SSTMP's and Corridor Access Requests (CAR) approved by AT

enable physical works to take place within the road corridor. These will be developed in accordance with the philosophy documented in the CTMP.

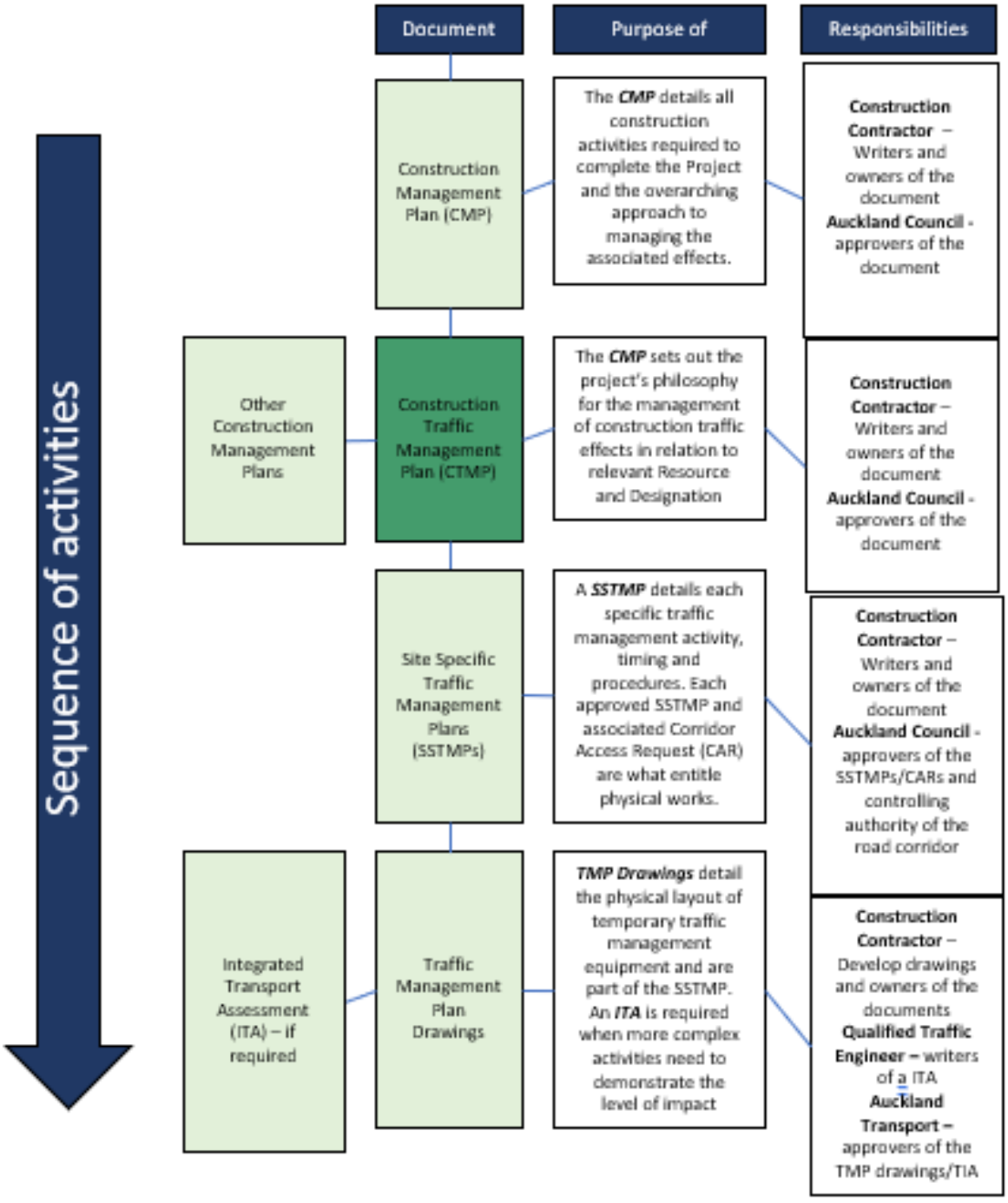

Figure 4.1: Sequence of activities for traffic management related documents following approval of the ITA.

5 Construction traffic volumes and distribution

5.1 Overview

The Project transport movements will be associated with activities including delivery of plant and construction materials, staff access, site establishment, piling, removal of material excavated during the construction of the shafts, concrete pours, TBM removal, trenching, demobilisation and site remediation.

Light vehicle movements for construction, management and supervision staff, inbound and outbound, are likely to be tidal due to staff arrivals at the start of the shift (i.e., 0600/0630) and departures at the end of the shift (i.e.,1900) i.e., before and after the network AM and PM peak periods.

5.2 Construction vehicle trip generation

It is anticipated that the typical daily construction vehicles associated with the Project will consist of:

5.2.1 Worker and servicing vehicle movements Salisbury Reserve CSA1

- Construction, management and supervision staff = 24 cars/utes per day arriving 0630 and departing 1900 (i.e., before and after the AM and PM peak periods (assuming all workers drive and no car sharing or use of PT or active modes).
- One service truck/ day (e.g., Portaloo/Refuse/Hiab).

Therefore, daily worker and servicing movements to/from the Salisbury Reserve CSA = 24 cars and 1 truck a day (i.e., 50 two way vehicles movements/day) and this will predominately be outside of the AM and PM peak periods.

At this stage, exact origin and destinations for predicted vehicle movements associated with the construction of the project are not confirmed, but it can be expected that these trips will access Salisbury Reserve CSA either to/from Curran Street or Sarsfield Street (east of Curran Street).

5.2.2 Vehicle movements to and from the Salisbury Reserve CSA1 and the Satellite sites

- Maximum of four staff cars.
- 1 x car trailer carrying 500 kg compactor (or may deliver in 6-Wheeler when practical) = 1 trip/day.
- 1 x 2 T Digger – to/from the CSA and Satellite sites = one trip/day.
- 1 x 5 T Digger– to/from the CSA and Satellite sites - may be stored over night at a Satellite site, but to ensure a conservative assessment assume one trip a day.
- 1 x 4 t tip truck– four trips to/from the CSA and Satellite sites (carrying tools and supplies) = four trips/day.
- Due its size, the 14 t Digger will be stored at each Satellite site and won't be moved each day.

Therefore, typical daily movements between the Salisbury Reserve CSA and the Satellite sites = seven trucks/ day and four cars/utes per day (i.e., 22 two way vehicles movements/day).

These movements would be taking place between the Salisbury Reserve CSA to each of the Satellite sites where work is being carried out via Argyle Street/Sarsfield Street.

For the majority of the time, the 6 wheeler trucks will be the largest vehicle used but occasionally an 11 m rigid transporter would be required to deliver and move cranes, diggers and bore machine

from one Satellite site to the next. Also, occasionally a 12 m artic truck would be required to deliver the steel cages to the Satellite sites.

5.2.3 Vehicle movements between concrete suppliers and satellite sites

Concrete trucks will go to the Satellite sites directly from the supplier. It is anticipated this involves four trucks a day while drilling and filling the pile holes which create the circumference wall of the shaft and will only be for short durations of up to 20 days per shaft. To ensure a conservative assessment, these have been assumed to occur every day. Therefore, typical daily movements between the Concrete suppliers and the Satellite sites = four trucks a day (i.e., eight two way vehicles movements/day). It can be expected that these trips will access the Satellite sites using Curran Street and Curran Street on ramp or Shelly Beach Road off ramp and Sarsfield Street (east of Curran Street). The Salisbury Reserve CSA will be used as a marshalling yard when there is no capacity on site for waiting concrete trucks.

5.2.4 Vehicle movements between the Salisbury Reserve CSA1/satellite sites and CSA2 94A and 94B Shelly Beach Road

- Two trucks per day primarily for deliveries of hard fill from CSA2 94A and 94B Shelly Beach Road to the Salisbury Reserve CSA1 in 6-wheeler trucks (average length = 7.7 m).
- Up to four trucks/ day moving spoil from the Satellite sites to CSA2 94A and 94B Shelly Beach Road (only when removing spoil as part of drilling the piles and shafts) in 6-wheeler trucks.

Therefore, typical daily movements between the Salisbury Reserve CSA1/Satellite sites and CSA2 94A and 94B Shelly Beach Road = six trucks a day (i.e., 12 two way vehicles movements/day).

It can be expected that these trips will access Salisbury Reserve CSA1/Satellite sites either to/from Curran Street on ramp or Sarsfield Street (east of Curran Street).

5.2.5 Vehicle movements to/from CSA2 94A and 94B Shelly Beach Road

This CSA would be the receiving CSA of spoil from the Satellite sites (via the 6-wheeler trucks as described in section 5.2.2 above) which would then be taken by truck and trailer units from the CSA to transport to landfill. Truck and trailer units would also deliver hardfill to the stockpile area, which would then be collected by the 6 wheelers to deliver to the Salisbury Reserve CSA1 and Satellite sites when required. As well as the construction vehicle generation from the 6 wheelers (accounted for in section 5.2.2 above) there would also be the following vehicle movements per day at the 94A and 94B Shelly Beach Road CSA2:

- Worker and service movements to/from CSA2 94A and 94B Shelly Beach Road.
- Construction, management and supervision staff = two.
- Servicing trucks = one every three days (assume as worst case one per day).
- Deliveries to/from CSA2 94A and 94B Shelly Beach Road.
- Truck and trailer removal of spoil to landfill site = four trucks per day.
- Truck and trailer delivery of hardfill = up to two trucks/day.

Therefore, daily worker and servicing movements to/from CSA2 94A and 94B Shelly Beach Road = two cars and seven trucks a day (i.e. 18 two way vehicles movements/day).

At this stage, exact origin and destinations for predicted vehicle movements associated with the construction of the project are not confirmed, but it can be expected that these trips will access CSA2 by ingress from Curran Street, egress north via SH1 Auckland Harbour bridge and egress South via SH1 and then U-turn at Onewa interchange.

These routes are considered appropriate to access CSA2, as these large trucks are primarily routed on Arterial roads and SH1 (whose role and function is primarily efficient movement of traffic) and thus avoiding routing large trucks on the local residential streets adjacent to the Satellite Sites.

5.3 Construction traffic summary

Table 5.1 below summarises anticipated daily maximum construction vehicles within the Project area and the key routes to/from the Salisbury Reserve and 94A and 94B Shelly Beach Road CSAs (locations shown in Figure 2.3).

Table 5.1: Daily anticipated maximum number of construction vehicles

	Salisbury Reserve CSA1 – staff/ servicing	Between Salisbury Reserve CSA1 and Satellite Sites and between concrete suppliers and Satellite sites	Between Salisbury Reserve CSA1 /Satellite Sites and 94A and 94B Shelly Beach Road CSA2	CSA2 94A and 94B Shelly Beach Road– staff/ deliveries	Total Vehicles (two way trips)
East of Salisbury Reserve (Argyle Street Wallace Street and Sarsfield Street)	25	7 +4 +4 (15)	6	0	46 (92)
West of Salisbury Reserve (Herne Bay Road/Upton Street/Marine Parade)	0	7 +4 +4 (15)	6	0	21 (42)
Curran Street SH1 on ramp	6.25	2+4 (6)	6	9	27
SH1 (AHB)	12.5	2+4	6	9	33.5 (67)
SH1/Shelly Beach Road off ramp/Sarsfield Street (between Shelly Beach Road and Curran Street)	6.25	2+4	6	9	27 (54)
Curran Street (between Jervois Road and Sarsfield Street)	12.5	2	0	9	23.5 (47)
SH1 on/off (south facing) ramps Onewa interchange	0	0	6	9	15(30)
SH1 on/off (north facing) ramps Onewa interchange	0	0	0	0	0

As detailed in Table 5.1 it is anticipated that on a typical day:

- On the residential streets on the Project, east of Salisbury Reserve there will be an increase of up to 46 vehicles/day with the construction traffic. Over a 12 hour working day this represents 4 vehicles per hour or 1 vehicle approximately every 15 minutes.
- On the residential streets on the Project, west of Salisbury Reserve there will be an increase of up to 21 vehicles/day with the construction traffic. Over a 12 hour working day this represents under two vehicles per hour.
- On key arterials and collectors such as Curran Street, Sarsfield Street and Shelly Beach Road, there will be an increase of up to 23 vehicles/day with the construction traffic. Over a 12 hour working day this represents just under two vehicles per hour or one vehicle approximately every 30 minutes.
- On SH1 and on/off ramps at Onewa interchange , there will be an increase of up to 15 vehicles/day with the construction traffic. Over a 12 hour working day this represents just over one vehicle per hour.

5.4 Staff and visitor car parking

Watercare propose to have car parking for staff and visitors located within the Salisbury Reserve CSA1 and the 94A and 94B Shelly Beach Road CSA2.

6 Assessment of effects

6.1 Traffic impact of the additional construction vehicles on the surrounding road network (usual construction hours)

Table 6.1 below compares the anticipated number of construction vehicles identified in Table 5.1 with the existing traffic flows detailed in Table 2.4 and Table 2.5.

Table 6.1: Traffic impact of construction traffic

Road sections	Average Daily Traffic (veh/day)	% impact (two way)
Residential Streets on the Project route east of Salisbury Reserve CSA1 i.e., Argyle Street/Wallace Street/Sarsfield Street (between Curran Street and Wallace Street)	1,181 to 3,940	2% to 7%
Residential Streets on the Project route west of Salisbury Reserve CSA1 i.e., Argyle Street /Herne Bay Road/Upton Street/Marine Parade	261 to 1,181	3% to 13%
Curran Street SH1 On ramp	6,162	0.7%
SH1 (AHB)	170,000	0.03%
SH1/Shelly Beach Road off ramp/Sarsfield Street (between Shelly Beach Road and Curran Street)	4,168-5,429	0.9% to 1%
Curran Street (between Jervois Road and Sarsfield Street)	8,179	0.6%
SH1 on/off ramps Onewa interchange	11,697 to 18,302	0.2% to 0.3%

Overall, the increase in traffic generated from the construction of the Project is considered to be negligible given:

- Residential streets on the Project Route – on these existing low flow roads, construction traffic will temporarily increase traffic volumes by between 3% and 13%. There are no existing congestion issues on these roads and hence the additional construction traffic will not impact on the capacity of these roads. These increases represent approximately two additional vehicles every hour, which is considered to be negligible. The negligible increase in overall hourly and daily traffic movements therefore should not result in a noticeable increase in congestion or unreasonable delays for road users on these residential roads.
- Collectors, Arterials and SH1 - construction traffic will temporarily increase traffic volumes by typically less than 1% and this increase in vehicles is well within the range of typical day to day fluctuations in traffic flow of 5% to 10% that regularly occur on the road network. These roads are already performing a movement function. The negligible increase in daily traffic movements therefore should not result in a noticeable increase in congestion or unreasonable delays for road users on the Collectors, Arterials and SH1.

As detailed in Section 7, it is proposed that the CTMP includes measures to provide traffic management supervisors to safely manage the movement of construction traffic to and from the road network to ensure the safety of all road users is maintained and that the construction vehicles can safely negotiate access and egress to avoid any additional queueing on the adjacent road network in the peak periods on Collectors, Arterials and SH1.

6.2 Traffic impact of the additional construction vehicles on the surrounding road network (outside of usual construction hours)

As detailed in Section 3.3, there may be occasions where it is necessary to undertake construction activities outside of usual construction hours. Given these activities will take place at off peak times on the surrounding road network (when there is no congestion), then it is considered that the traffic impact of these activities is minimal.

6.3 Road safety impact of the additional construction vehicles on the surrounding road network

As demonstrated in Section 2.6 above, in the vicinity of the Project the number of crashes, as well as the severity of the crashes, is considered to be low and it is considered that there are no inherent road safety issues present. It is therefore considered that the low number of additional trips generated by the construction traffic for the Project will have a negligible impact on the safety of the surrounding residential road network.

Although section 2.6 indicated a relatively large number of crashes on the wider Arterial and SH1 network, given the low number of additional trips to/from CSA2 94A and 94B Shelly Beach Road added to the network, then it is considered that this will have a negligible impact on the safety of the surrounding road network and is not likely to exacerbate any existing crash patterns.

6.4 Compliance with AUP transport rules

Although Auckland Unitary Plan – operative in Part (AUP) Rule E27 is not directly applicable to construction activities, the Project complies with the following E27 rules of:

- E27.6.1 Trip Generation - E27.6.1 (1) (b), where trips generated from the Project are below the 100 vehicles/hour threshold.
- E27.6.2 Number of parking and loading spaces - Table E27.6.2.3 (T36), noting no maximum parking rates apply.
- E27.6.3 Design of parking and loading spaces, the Project complies with:
  - E27.6.3.1 and E27.6.3.2 – parking and loading space dimensions will comply with these requirements.
  - E27.6.3.3 - access and manoeuvring complies with Waka Kotahi/NZTA tracking curves.
  - E27.6.3.4 – vehicles do not need to reverse into or from the site.
  - E27.6.3.6 – gradients of parking spaces will not exceed 5% and manoeuvring areas will not exceed 12.5%.
- E27.6.4 Access, the construction phase access for the Project complies with:
  - E27.6.4.1 (3) (a)- Site accesses are located more than 10 m from an intersection and hence no Vehicle Access Restriction applies.
  - Table E27.6.4.2.1 (T146) and Table E27.6.4.3.2 – vehicle crossing width and number of vehicle crossings complied with and noting the requirement that a maximum width of 9 m is permitted where the crossing needs to accommodate the tracking path of large heavy vehicles.
  - Table E27.6.4.3.2 (T158) maximum gradient of 12.5% will be complied with.

6.5 Transport impact of the construction activities

6.5.1 Background

The following sections assess the transport effects of each individual construction activity using the construction methodology outlined in section 3.2 above and detailed in Appendix C. For each section of road closure, proposed traffic management and for each CSA, this is assessed in terms of (noting impact of additional construction vehicles on road safety has been assessed in 6.3 above):

- Access to residential properties.
- Pedestrians and cyclists.
- Pedestrian access to reserves/parks.
- Public Transport (PT).
- On street parking.
- Refuse/delivery access.

Although at this stage there are no confirmed details available on diversion routes to be used resulting from any road closures, possible diversion routes have been identified and potential impact also assessed in terms of:

- Traffic impact of additional diverted traffic.
- Road safety impact.

Figure 6.2 below, shows the Shaft and CSA locations.

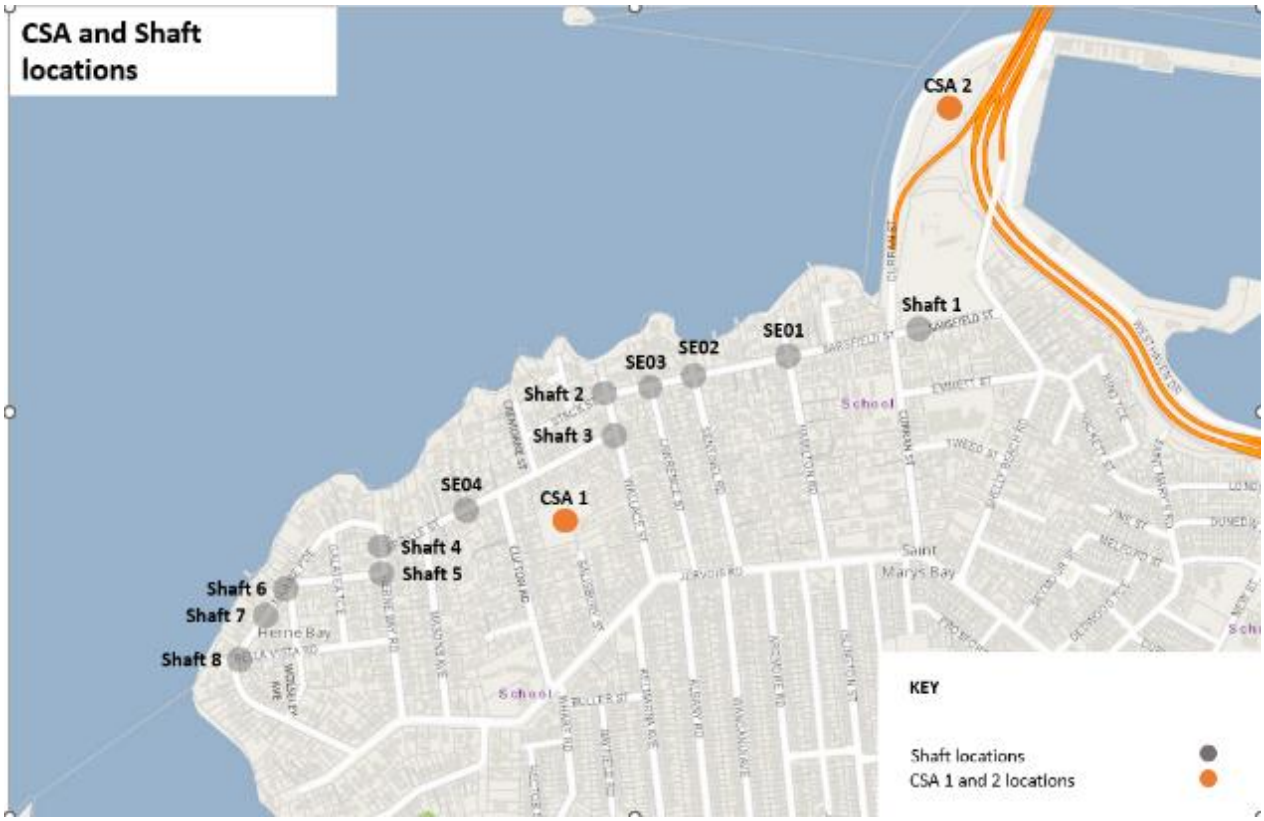

Figure 6.1: Shaft and CSA locations.

The following sections provide details of the transport impact of the Project at each location/construction activity. This assessment is based on a worst case assessment in terms of the highest number of days assumed for road closures and Watercare will endeavour to reduce the number of days of closures where possible when work starts on site.

For the locations where both full and partial closures are identified, the full closure will occur first, followed by a partial re-opening of the road (partial closure), once more space becomes available for vehicle access.

6.5.2 Salisbury Reserve CSA1

- Description of work = set up and operate CSA1.
- Assumed duration of works = two years.
- Road closure required = No.

Criteria	Impact Assessment	Comments
Access to residential properties.	No impact	Residential access not impacted.
Pedestrians and cyclists	Pedestrians – minimal Cyclists - No impact	Secondary pedestrian access will be closed for circa two years. Existing raised platform will be removed for circa two years and reinstated upon completion of works. No impact on shared path through the reserve. No impact on Sarsfield Street AT classification as a quiet road for cycling.
Pedestrian access to reserves/parks	Minimal	Secondary pedestrian access to Salisbury Reserve will be closed for circa two years but the primary pedestrian access is maintained. The two existing pedestrian accesses are only circa 50m apart and the increased walking time of circa 40 seconds for those using the secondary access is considered to be a minimal impact for pedestrians.
Public Transport	No impact	No existing PT services.
On street parking.	Minimal	Will result in loss of some on street parking adjacent to the proposed CSA1 access for circa two years but residential properties have off street parking.
Refuse/delivery access	No impact	No closures/restrictions.
Overall Assessment	**Less than minor impact**	

6.5.3 94A and 94B Shelly Beach Road CSA2

- Description of work = set up and operate CSA2. The site has been previously used by Healthy Waters as a shaft construction site for the St Marys Bay Water Quality Improvement project;
- Assumed duration of works = two years;
- Road closure required = No.

Criteria	Impact Assessment	Comments
Access to residential properties.	No impact	No residential properties.
Pedestrians and cyclists	No impact	No pedestrian or cycle routes. Pedestrian access to the area east of the CSA will be restricted to ensure pedestrians walking in Point Erin Park and along the path adjacent to SH1, do not enter the site.
Pedestrian access to reserves/parks	No impact	No pedestrian access to Point Erin Park.
Public transport.	No impact	Not impact on bus services using Curran Street.
On street parking.	No impact	No existing parking.
Refuse/delivery access	No impact	No impact.
Overall Assessment	**Less than minor impact**	

On the Curran Street on ramp, temporary traffic management could be used to make drivers aware of the CSA2 ingress and egress (e.g., through warning signs, lane narrowing and potentially a temporary reduction in the existing 80 km/h speed limit). To minimise impacts of the CSA vehicle movements in the peak periods, it is proposed that ingress and egress to the site will only be permitted outside of the weekday AM peak (0700-0900) and PM peak (1600-1800) periods.

Construction vehicles will exit the site to the north on to SH1 beyond the existing on ramp signals. To ensure trucks and other vehicles are exiting the site safely, the Site Traffic Management Supervisor (STMS) will ensure a vehicle can leave safely and is not conflicting with general traffic.

6.5.4 Service investigations and diversions

- Description of work – service diversions at each shaft location.
- Assumed duration of works – 25 days.
- Road closure required – No.

Criteria	Impact Assessment	Comments
Access to residential properties.	No impact	Residential access not impacted.
Pedestrians and cyclists	Pedestrians – minimal Cyclists - No impact	Footpaths on one side possibly closed for short time periods at each shaft location.
Pedestrian access to reserves/parks	No impact	Will ensure access is provided.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	On street parking to be temporarily removed for a short duration of time, residential properties have off street parking.
Refuse/delivery access	No impact	No closures/restrictions.
Overall Assessment	**Less than minor impact**	

6.5.5 Shaft 1 construction and tunnelling – Sarsfield Street east of Curran Street (including cumulative assessment with Point Erin CI works)

- Description of work – Shaft 1 construction and tunnelling.
- Assumed duration of works – 247 days.
- Road closures required:
  - For 100 days - Sarsfield Street in both directions between Curran Street and Shelly Beach Road - resident access and Point Erin Park vehicle access will be retained to/from Shelly Beach Road.
  - For 147 days - Sarsfield Street eastbound (i.e. Curran Street to Shelly Beach Road) - resident access and Point Erin Park vehicle access will be retained to/from Shelly Beach Road and to Curran Street.

In terms of cumulative assessment with Point Erin CI works, this relates to the CI construction traffic that needs to detour on alternative routes as a result of the closure of Sarsfield Street as a result of the Shaft 1 works.

6.5.5.1 Transport impact of Sarsfield Street closure (both directions) re-routed traffic on diversion routes

As detailed in sections 6.1 and 6.3 above, overall, the impact of the increase in traffic generated from the Project construction vehicles is considered to be negligible and will also have a negligible impact on the safety of the surrounding road network.

To ensure a robust assessment of the impact of the closure of Sarsfield Street, a cumulative assessment has been carried out to include the impact of diverted Point Erin CI construction traffic.

For the temporary closure of Sarsfield Street in both directions, it is anticipated that traffic would be re-routed via Emmett Street and Curran Street (between Emmett Street and Sarsfield Street). However, the right turn from Emmett Street to Shelly Beach Road is currently banned and hence any traffic wanting to turn right onto Shelly Breach Road (which, based on the traffic count survey in Appendix A, is anticipated to be very low in number) would be re-routed via Tweed Street. For the purposes of this assessment all traffic is assumed to route via Emmett Street. Figure 6.2 below, shows the diversion routes with full closure of Sarsfield Street.

Figure 6.2: Sarsfield Street full closure detour routes.

Emmett Street transport impact

As indicated in Table 2.4 above, Sarsfield Street (which is a Collector) has a two way daily flow of 4,168 which includes 154 heavy vehicles/day.

Re-routing of the Project construction traffic during this closure would add up to 44 construction vehicles/day to Emmett Street (of which 18 would be trucks - from Section 5.2 above).

Re-routing of the Point Erin CI construction traffic during this closure would add up to 67 construction vehicles/day (of which 58 would be trucks) to Emmett Street (based on section 4.3 of the Point Erin CI extension ITA dated 1 February 2023).

Therefore, the temporary additional traffic from a combination of the rerouted existing Sarsfield Street traffic, the Project construction traffic and the Point Erin CI construction traffic would equate to up to 4,279 additional vehicles/ day on Emmett Street. As indicated in Table 2.6 above, traffic flows on Emmett Street are currently 532 vehicles/day. As a result of the closure of Sarsfield Street traffic volumes will increase to 4,811, which is a 9 fold increase. Heavy vehicles will increase from the existing five heavy vehicles day to 230 heavy vehicles/day.

This level of increase in traffic is considered to result in a temporary significant adverse transport impact on Emmett Street in terms of a significant increase in both the volume of traffic and of heavy vehicles, which could impact on the uncongested traffic flow conditions currently experienced and could also impact on residents' ability to safely manoeuvre in and out of their driveways. However, it should be noted that:

- This is a temporary impact for only 100 days.
- The driveways on Emmett Street are predominantly on the north side, which reduces the amount of potential conflict points.
- The overall traffic level would be similar to that currently experienced on Sarsfield Street (between Shelly Beach Road and Curran Street) and there are no reported crashes on this

section of Sarsfield Street, and neither are we aware of any reported issues raised by residents having difficulty accessing their driveways. It therefore could be expected that Emmett Street could function safely as Sarsfield Street does currently with this level of traffic flow.

Notwithstanding the above, given the significant increase in traffic on Emmett Street, it is recommended that the CTMP includes the following measures in relation to Emmett Street:

- Vehicle tracking of the Project and proposed Point Erin CI construction vehicles will need to be carried out and any temporary physical works improvements at the Emmett Street intersections with Shelly Beach Road and Curran Street will need to be identified and implemented prior to the temporary closure taking effect. This could include temporary removal of on street parking on Curran Street and Shelly Beach Road to assist vehicles turning at the intersections and to provide improved sight lines.
- Given the narrow width of Emmett Street, then to accommodate this level of traffic, temporary removal of on street parking is recommended along the whole length of Emmett Street.
- Temporary 30 km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Continuous communications with residents on Emmett Street will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes and in particular, of the existing right turn ban from Emmett Street to Shelly Beach Road and the need to use Tweed Street for this manoeuvre.

Curran Street (between Emmett Street and Sarsfield Street) transport impact

As indicated in Table 2.4 above, Sarsfield Street (which is a Collector) has a two-way daily flow of 4,168 which includes 154 heavy vehicles/day.

Re-routing of the Project construction traffic during this closure would add up to 44 construction vehicles/day to Curran Street (of which 18 would be trucks - from Section 5.2 above).

Re-routing of the Point Erin CI construction traffic during this closure would add up to 67 construction vehicles/day (of which 58 would be trucks) to Curran Street (based on section 4.3 of the Point Erin CI extension ITA dated 1 February 2023).

Therefore, the temporary additional traffic from a combination of the rerouted existing Sarsfield Street traffic, the Project construction traffic and the Point Erin CI construction traffic would equate to up to 4,279 additional vehicles/ day on Curran Street between Emmett Street and Sarsfield Street. As indicated in Table Table 2.4 above, traffic flows on Curran Street are currently 8,179 vehicles day (with 654 heavy vehicles). As a result of the closure of Sarsfield Street, traffic volumes will increase to 12,347 vehicles/day which is an increase of 52%. Heavy vehicles will increase from the existing 654 heavy vehicles day to 884 heavy vehicles/day.

This level of increase in traffic is considered to result in a temporary significant adverse transport impact on Curran Street in terms of a large increase in both volumes of traffic and heavy vehicles which could impact on:

- All of this additional traffic would be passing Ponsonby Primary School.
- Curran Street is congested in the peak periods (queue back from the on ramp signals) and this additional traffic could increase this.
- Worsening congestion could impact on bus journey times and reliability on Curran Street.
- Could also impact on Curran Street residents ability to safely manoeuvre in and out of their driveways.

However, it should be noted that:

- This is a temporary impact only.
- The diverted traffic flow is a maximum, worst case traffic flow since it has been assumed that all of the existing Sarsfield Street traffic will use the diversion route. In reality with Sarsfield Street closed and depending on the end destination and trip purpose, drivers may reroute to an alternative choice of SH1 interchange e.g., Wellington Street on ramp/Cook Street off ramp.
- There would not be an increase in traffic through the existing pedestrian controlled crossing for the school, thus reducing any potential impact on school children walking to school.
- The traffic survey detailed in 2.3.3 above reported very few school children walking to school on Sarsfield Street and Curran Street, thus reducing any potential impact on school children walking to school.
- As reported in section 5.8 of the Point Erin CI extension ITA (dated 1 February 2023) Ponsonby Primary School operates a Walking bus from Clarence Street and Jervois Road to the school, which would not be impacted by the additional traffic.

Notwithstanding the above, given the significant increase in traffic on Curran Street between Emmett Street and Sarsfield Street, it is recommended that the CTMP includes the following measures in relation to Curran Street:

- Vehicle tracking of the Project and Point Erin CI construction vehicles will need to be carried out and any temporary physical works improvements at the Sarsfield Street/Curran Street intersection will need to be identified and implemented prior to the temporary closure taking effect.
- To accommodate this level of traffic, temporary removal of on street parking is recommended along the whole length of Curran Street between Emmett Street and Sarsfield Street.
- Temporary 30 Km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Work with the school to establish whether any temporary crossing patrols are required to assist pedestrians crossing Curran Street.
- Provisions for restricting movements of the Project construction traffic during peak school drop-off and pick-up times (for example 0815-0900 and 1445 and 1515).
- Continuous communications with residents on Curran Street and the Primary School will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes.

Alternative diversion route options considered

Alternative diversion routes were considered including:

Option 1

An option to divert traffic via the longer route via Shelly Beach Road/Jervois Road/Curran Street – key issues though with this option include:

- Long detour of circa 1.2 km – therefore, if this is the signed route then would all traffic actually take this route (given Emmett Street and Tweed Street are shorter diversion routes).
- Increase existing peak period congestion on Jervois Road and its intersections with Shelly Beach Road and Curran Street.
- Greater impact on bus journey times and reliability on Jervois Road and Curran Street.

- Increased traffic passing Ponsonby Primary School and the existing controlled pedestrian crossing.

Option 2

Another option considered was to use Emmett Street/Tweed Street as a diversion route for light vehicles and all heavy vehicles diverted via Shelly Beach Road/Jervois Road/Curran Street. However, enforcement of this could be difficult and also this would require substantial clear traffic management signage and wider communications to make this clear to drivers.

6.5.5.2 Transport impact of Sarsfield Street closure (eastbound) re-routed traffic on diversion routes

For the temporary eastbound closure of Sarsfield Street, it is anticipated that traffic would be re-routed via Curran Street (between Emmett Street and Sarsfield Street) and Emmett Street. However, the right turn from Emmett Street to Shelly Beach Road is banned and hence any traffic wanting to turn right onto Shelly Breach Road (which, based on the traffic count survey in Appendix A, is anticipated to be very low in number) would be rerouted via Tweed Street. For the purposes of this assessment all traffic is assumed to route via Emmett Street. Figure 6.3 below, shows the diversion routes with eastbound closure of Sarsfield Street:

Figure 6.3: Sarsfield Street eastbound closure detour routes.

Emmett Street transport impact

As indicated in Table 2.4, Sarsfield Street has a two-way daily flow of 4,168 which includes 154 heavy vehicles/day. As demonstrated in Section 2.3.3 and Appendix A, the predominant direction of flow on Sarsfield Street is westbound towards Curran Street. Approximately 13% of the observed average

peak period flow on Sarsfield Street is eastbound, which would equate to a daily eastbound flow of approximately 542 vehicles/day of which 20 would be heavy vehicles.

An eastbound closure would not result in any re-routing of the Project construction traffic nor of any re-routing of the Point Erin CI construction traffic.

Therefore, the temporary additional traffic from rerouted existing eastbound Sarsfield Street would equate to up to 542 additional vehicles/ day on Emmett Street. As indicated in Table 2.6 above, traffic flows on Emmett Street are currently 532 vehicles/day. As a result of the eastbound closure of Sarsfield Street, traffic volumes will increase to 1074, which is a 100% increase. Heavy vehicles will increase from the existing five heavy vehicles day to 25 heavy vehicles/day.

This level of increase in traffic is considered to result in a temporary more than minor transport impact on Emmett Street in terms of the increase in the overall volume of traffic for 147 days, but this level of increase is not expected to impact on the uncongested traffic flow conditions currently experienced nor impact on residents ability to safely manoeuvre in and out of their driveways. It should be noted that:

- This is a temporary impact.
- The driveways on Emmett Street are predominantly on the north side, which reduces the amount of potential conflict points.

It is recommended that the CTMP includes the following measures in relation to Emmett Street:

- Given the narrow width of Emmett Street, temporary removal of on street parking is recommended along the whole length of Emmett Street.
- Temporary 30 Km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Continuous communications with residents on Emmett Street will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes and in particular, of the existing right turn ban from Emmett Street to Shelly Beach Road and the need to use Tweed Street for this manoeuvre.

Curran Street (between Emmett Street and Sarsfield Street) transport impact

Of the existing daily Sarsfield Street eastbound flow of approximately 542 vehicles/day, 43% of this traffic was observed to have turned right from Curran Street onto Sarsfield Street and, as such, is already travelling on Curran Street and hence is not additional traffic. Therefore, the additional traffic on Curran Street as a result of the eastbound closure of Sarsfield Street would be up to 309 vehicles/day.

As indicated in Table 2.6 above, traffic flows on Curran Street are currently 8,179 vehicles day (with 654 heavy vehicles). As a result of the eastbound closure of Sarsfield Street, traffic volumes will increase to 8,488 vehicles/day which is an increase of 4%. This increase in vehicles is well within the range of typical day to day fluctuations in traffic flow of 5% to 10% that regularly occur on the road network. The negligible increase in daily traffic movements therefore should not result in a noticeable increase in congestion or unreasonable delays for road users on Curran Street, will not impact on bus journey times and reliability (since the increase in traffic is in the opposite direction) and is unlikely to impact on residents ability to access their properties. Therefore, the temporary eastbound closure of Sarsfield Street is considered to result in a less than minor impact on Curran Street.

It is recommended that the CTMP includes the following measures in relation to Curran Street:

- Temporary removal of on street parking is recommended along the whole length of Curran Street between Emmett Street and Sarsfield Street.

- Temporary 30 Km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Work with the school to establish whether any temporary crossing patrols are required to assist pedestrians crossing Curran Street.
- Continuous communications with residents on Curran Street and the Primary School will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes.

6.5.5.3 Transport impact of full closure and eastbound closure on Sarsfield Street

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	**Sarsfield Street Full closure** Sarsfield Street residents will, for circa 100 days, only be able to enter and exit their properties to and from Shelly Beach Road. The temporary diversion route outlined will need to be used to access to/from Curran Street. This will add an additional 560 m to 750 m journey distance or circa 1 minute additional journey time to/from Curran Street. This is considered minimal. Note # 28 and 30 Sarsfield Street driveways are off Curran Street and not directly impacted. **Sarsfield Street Eastbound closure** In addition to the above, for 147 days residents will be able to egress via Curran Street and hence the only movement that residents will not be able to make is ingress from Curran Street - the impact is considered to be minimal.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – no impact	**Sarsfield Street full and eastbound closure** Sarsfield Street north side footpath temporarily closed for a distance of 100 m east of Curran Street, as part of the Point Erin CI works. The effects of this closure have been assessed within the CI resource consent application. Raised platform on Sarsfield Street to be temporarily removed and reinstated upon completion of the works. Cyclists will need to use diversion route (or wheel their bike on the south side footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	Minimal	**Sarsfield Street full and eastbound closure** Footpath into Point Erin Park by Curran Street will be closed as part of the Point Erin CI works. Pedestrians will need to use the temporary park access proposed as part of the Point Erin CI works. For full closure, vehicular ingress to the Point Erin Park public car park and Point Erin Pool (open end of November to end of March) will be via Shelly Beach Road. Should drivers be accessing the car park to/from Curran Street then this will add an additional 560 m journey distance or circa 1 minute additional journey time to/from Curran Street. This is considered minimal.

		For eastbound closure vehicles will be able to egress from the pools to both Curran Street and Shelly Beach Road.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	**Sarsfield Street full and eastbound closure** Result in temporary loss of circa 100 m of on street parking on Sarsfield Street north side. Residential properties have off street parking but potential temporary impact on vehicles parking for Point Erin Park and Point Erin Pool.
Refuse/delivery access	Minimal	**Sarsfield Street Full closure** For the full closure, deliveries/refuse collection to Sarsfield Street only able to enter and exit the properties via Shelly Beach Road. This will add an additional 560 m – 750 m journey distance or circa 1 minute additional journey time to/from Curran Street. This is considered minimal. **Sarsfield Street Eastbound closure** For eastbound closure vehicles will be able to egress properties from both Curran Street and Shelly Beach Road.
Overall Assessment	**Less than minor impact on Sarsfield Street**	

6.5.6 SE01 Interception shaft installation and chamber construction (and EOP 195) - Sarsfield Street/Hamilton Road

- Description of work = SE01 Interception shaft and EOP 195 (following completion of main drive).
- Assumed duration of works = 50 days (Full closure 20 days, Partial closure 30 days).
- Full road closure:
  - Sarsfield Street/Hamilton Road intersection closed.
  - Resident only access to Hamilton Road (north) from Sarsfield Street (east).
  - North footpath closed (South footpath open).
- Partial road closure:
  - Intersection closed except for Sarsfield Street westbound left turn to Hamilton Road, ahead on Sarsfield Street and right turn into Hamilton Road north.
  - All Footpaths open.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting Hamilton Road (north) residents will have one lane for access east via Sarsfield Street.
Pedestrians and cyclists	Pedestrians – minimal Cyclists - minimal	For full closure north footpath closed but south footpath remains open. Raised platform to be partially removed and reinstated upon completion of the works. Cyclists temporarily unable to cycle on the AT designated Quiet Road of Sarsfield Street. However,

		cyclists can wheel their bikes the short distance of the road closure on the footpath or use the diversion route.
Pedestrian access to reserves/parks	No impact	Pedestrian access to Hamilton Beach Reserve retained
Public transport.	No impact	No existing PT services
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Sarsfield Street and Hamilton Road. Residential properties have off street parking. On street parking will remain available to use on Sarsfield Street and Hamilton Road either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion routes.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Sarsfield Street/Hamilton Road intersection, it is anticipated that traffic would be re-routed via Sentinel Road, Jervois Road or Curran Street. Figure 6.4 below, shows the diversion routes with closure of the Sarsfield Street/Hamilton Road intersection:

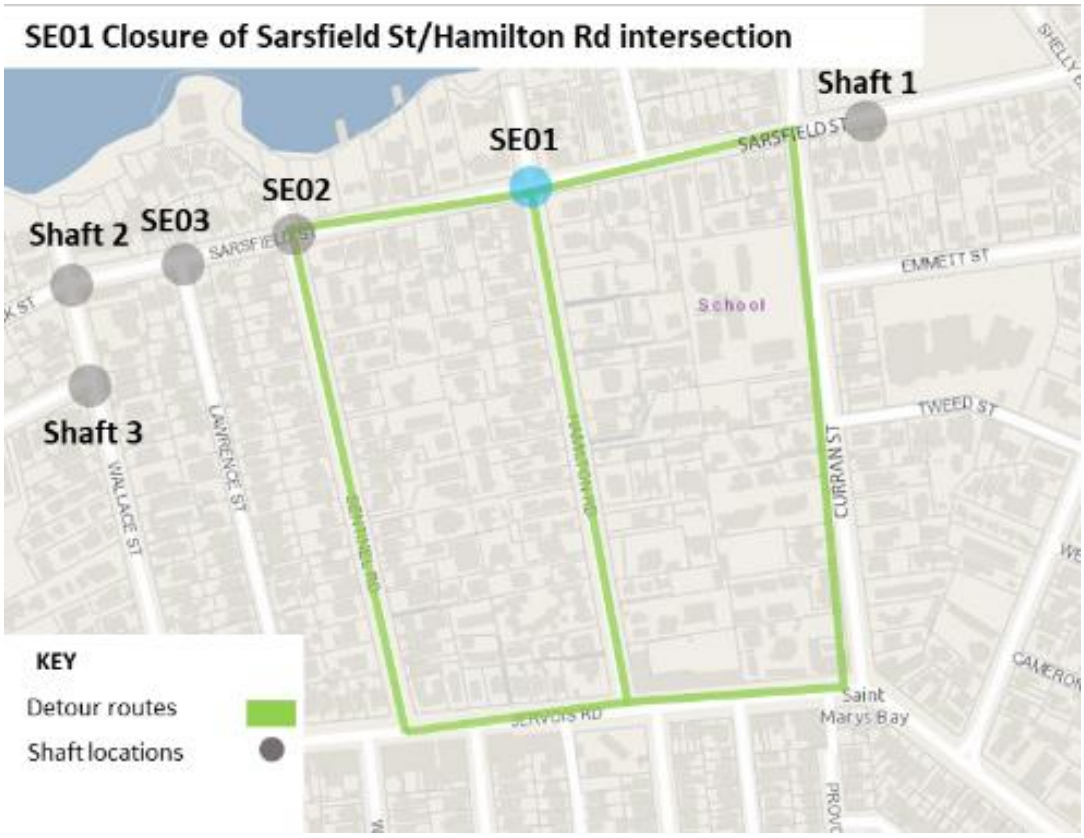

Figure 6.4: Sarsfield Street/Hamilton Road intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Sarsfield Street has a two-way daily flow of 3,940 and Hamilton Road of 1,866. Assuming conservatively that the daily flows occur predominantly within a 12 hour period, then this represents 5.5 vehicles/minute on Sarsfield Street and 2.6 vehicles/minute on Hamilton Road. When the full closure is in place, the diverted additional traffic could increase delays in the peak periods on Jervois Road and Curran Street. However, given the short duration (20 days)

of this full closure, the short section of Jervois Road impacted and the uncongested nature of these routes in the off peak, the impact is considered to be minimal. On the uncongested Sentinel Road, the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of this road and should not result in a noticeable increase in congestion or unreasonable delays for road users. Partial closure will result in westbound Sarsfield Street traffic being unaffected.

- Road safety impact - the number and severity of crashes on Sentinel Road and Curran Street is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, however given the short period of time for when the closure is in place then this additional traffic is considered to only have a minimal impact on the safety of Jervois Road.
- Overall assessment = less than minor impact.

6.5.7 SE02 Interception shaft installation and chamber construction (and EOP 200) - Sarsfield Street/Sentinel Street

- Description of work = SE02 Interception shaft and EOP 200 (following completion of main drive).
- Assumed duration of works = 55 days (Full closure 20 days, partial closure 35 days).
- Full road closure:
  - Sarsfield Street/Sentinel St Road intersection closed.
  - Residential access to Sentinel Road north from Sarsfield Street (west).
  - Footpaths open.
- Partial road closure:
  - Intersection closed except for Sentinel Street northbound left turn to Sarsfield Street and ahead from Sentinel Street south to north.
  - Residential access to Sentinel Road north from Sarsfield Street (west) and Sentinel Street south to north.
  - All Footpaths open.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting Sentinel Road (north) residents access via Sarsfield Street (East).
Pedestrians and cyclists	Pedestrians – no impact Cyclists - minimal	Footpaths remain open. Raised platform may be partially removed. Cyclists temporarily unable to cycle on the AT designated Quiet Road of Sarsfield Street. However, cyclists can wheel their bikes the short distance of the road closure on the footpath or use the diversion route.
Pedestrian access to reserves/parks	No impact	Pedestrian access to Sentinel Beach Reserve retained.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking. Residential properties have off street parking. On street parking will remain available to use on Sarsfield Street and Sentinel Street either side of the shaft construction.

Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Sarsfield Street/ Sentinel Road intersection, it is anticipated that traffic would be re-routed via Lawrence Street, Jervois Road or Hamilton Road. Figure 6.5 below, shows the diversion routes with closure of the Sarsfield Street/Sentinel Road intersection:

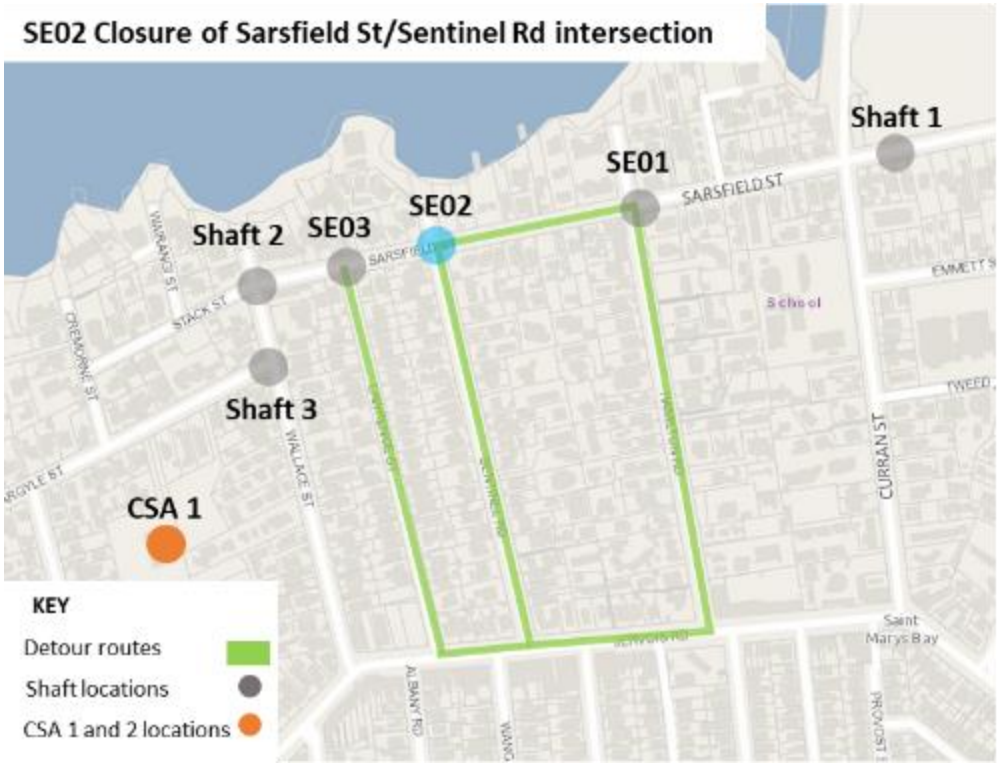

Figure 6.5: Sarsfield Street/Sentinel Road intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Sarsfield Street has a two-way daily flow of 3,940 and Sentinel Road of 1,242. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 5.5 vehicles/minute on Sarsfield Street and 1.7 vehicles/minute on Sentinel Road When the closure is in place, additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road. However, given the short duration (20 days) of this full closure, the short section of Jervois Road impacted and the uncongested nature of Jervois Road in the off peak, the impact is considered to be minimal. On the uncongested Lawrence Road and Hamilton Road, the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users. Partial closure will result in Sentinel Street northbound left to Sarsfield Street and ahead to Sentinel Street (north) being unaffected.
- Road safety impact – the number and severity of crashes on Lawrence Road and Hamilton Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois

Road, however given the short period of time for when the closure is in place, then this additional traffic is considered to only have a minimal impact on the safety of Jervois Road.

- Overall assessment = less than minor impact.

6.5.8 SE03 Interception shaft installation and chamber construction (and EOP 201) - Sarsfield Street/Lawrence Street

- Description of work = SE03 Interception shaft (following completion of main drive).
- Assumed duration of works =47 days (Full closure 20 days, partial closure 27 days).
- Full road closure:
  - Sarsfield Street / Lawrence Street intersection closed.
  - Footpaths open.
- Partial road closure:
  - Intersection closed except for Lawrence Street northbound left turn to Sarsfield Street.
  - Footpaths open.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 91 Sarsfield Street vehicle access diverted via existing footpath with access via Sarsfield Street (west).
Pedestrians and cyclists	Pedestrians – no impact Cyclists – minimal	Footpaths remain open. Cyclists temporarily unable to cycle on the AT designated Quiet Road of Sarsfield Street. However, cyclists can wheel their bikes the short distance of the road closure on the footpath or use the diversion route.
Pedestrian access to reserves/parks	No impact	No existing access to a reserve or beach.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Sarsfield Street and Lawrence Street. Residential properties have off street parking. On street parking will remain available to use on Sarsfield Street and Lawrence Street either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Sarsfield Street/ Lawrence Street intersection, it is anticipated that traffic would be re-routed via Sentinel Road, Jervois Road or Wallace Street. Figure 6.6 below, shows the diversion routes with closure of the Sarsfield Street/Lawrence Street intersection:

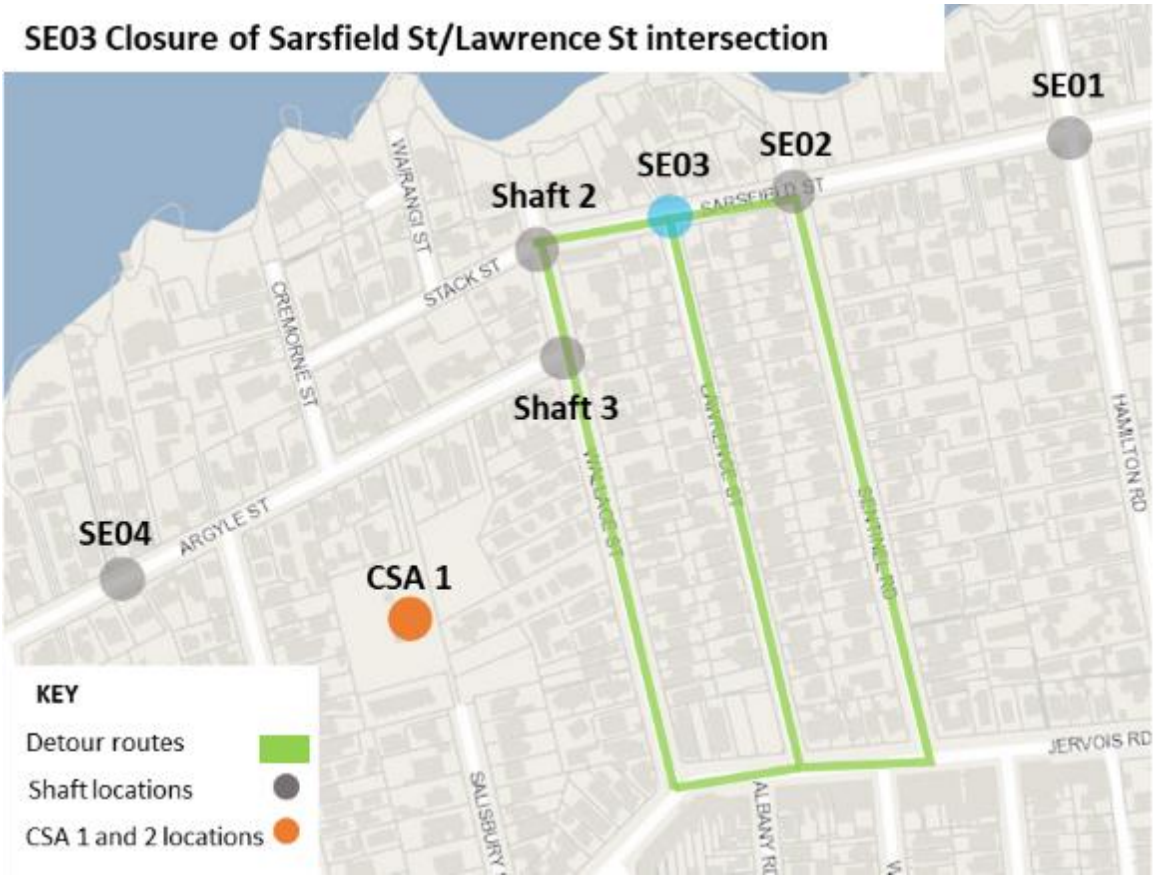

Figure 6.6: Sarsfield Street/Lawrence Street intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – As indicated in Table 2.4 and Table 2.6 above, Sarsfield Street has a two way daily flow of 3,940 and Lawrence Street of 1,197. Assuming conservatively that the daily flows occur predominantly within a 12 hour period, then this represents 5.5 vehicles/minute on Sarsfield Street and 1.7 vehicles/minute on Lawrence Street. For the short period of time when the closure is in place, then additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road. However, given the short duration of this full closure (20 days), the short section of Jervois Road impacted and the uncongested nature of Jervois Road in the off peak, the impact is considered to be minimal. On the uncongested Sentinel Road and Wallace Street, the additional traffic for a temporary period of 20 days is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users. Partial closure will result in Lawrence Street northbound left turn to Sarsfield Street being unaffected.
- Road safety impact – the number and severity of crashes on Sentinel Road and Wallace Street is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, however given the short period of time for when the closure is in place then this additional traffic is considered to only have a minimal impact on the safety of Jervois Road.
- Overall assessment = less than minor impact.

6.5.9 Shaft 2 construction and tunnelling (and EOP 1019) – Sarsfield Street/Wallace Street/Stack Street intersection

- Description of work = Shaft 2 construction and tunnelling.
- Assumed duration of works = 251 days (Full closure 120 days, partial closure 131 days).
- Full road closure:
  - Sarsfield St closed between Wallace Street and Lawrence Street (except for residential access).
  - Wallace Street closed between Sarsfield Street and Argyle Street (except for residential access).
  - Stack Street closed between Wairangi Street and Wallace Street (except for residential access).
  - Footpaths open.
- Partial road closure:
  - As full closure except Sarsfield Street westbound ahead to Stack Street and right turn to Wallace Street north available.
  - Footpaths open.

Criteria	Impact Assessment	Comments
Access to residential properties.	More than minor impact on 51 Wallace Street. Minimal for all other residents.	Access retained, noting 60 Wallace Street access via Stack Street. 51 Wallace Street access - may require access to be closed at certain times within working hours for safety. Proposal would be to open up outside of working hours and to liaise with occupants as required. .
Pedestrians and cyclists	Pedestrians – no impact Cyclists – minimal	Footpaths open. Raised platform may be partially removed. Cyclists temporarily unable to cycle on the AT designated Quiet Road of Sarsfield Street. However, cyclists can wheel their bikes the short distance of the road closure on the footpath or use the diversion route.
Pedestrian access to reserves/parks	No impact	Pedestrian access to Home Bay Beach Reserve retained.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Sarsfield Street, Wallace Street and Stack Street. Residential properties have off street parking. On street parking will remain available to use on Sarsfield Street, Wallace Street and Stack Street either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**More than minor impact**	

For the temporary closure of the Sarsfield Street/Wallace Street/Stack Street intersection, it is anticipated that traffic would be re-routed via Cremorne Street, Argyle Street, Wallace Street, Lawrence Street or Jervois Road. Figure 6.7 below, shows the diversion routes with closure of the Sarsfield Street/Wallace Street/Stack Street intersection:

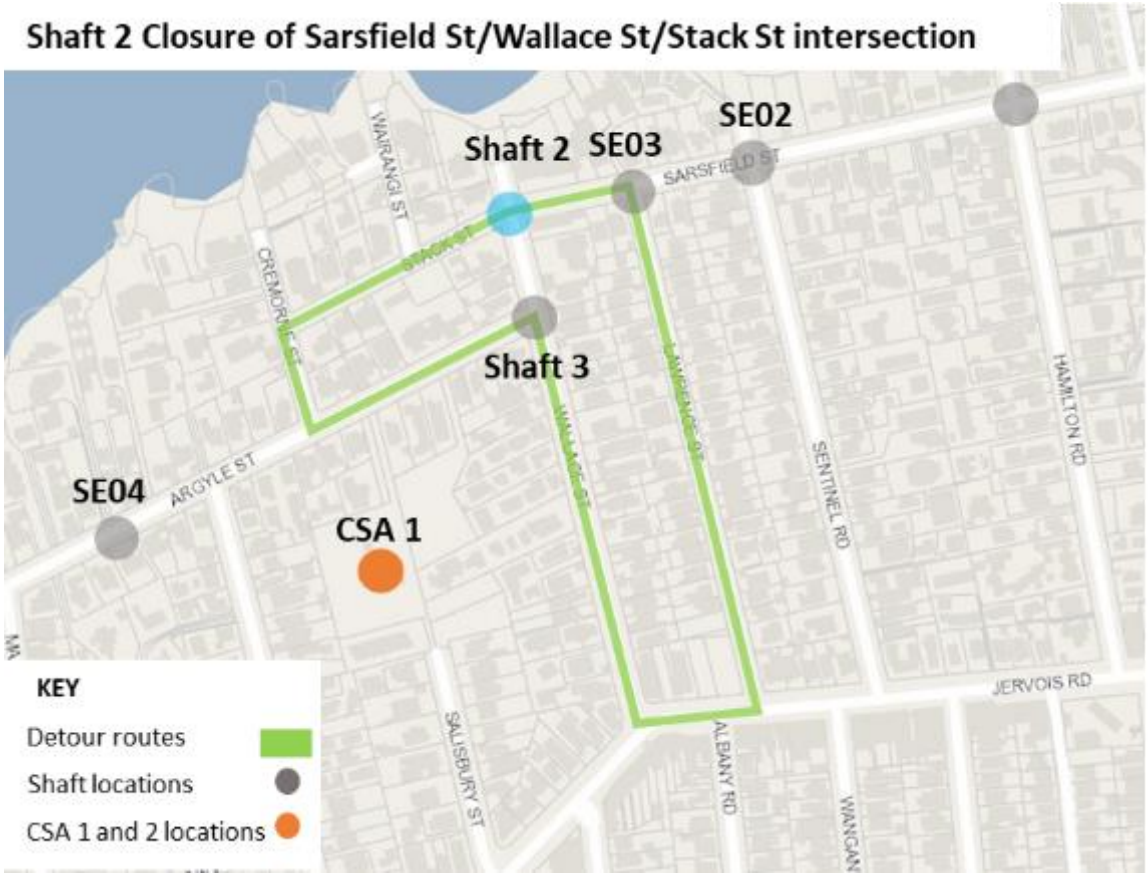

Figure 6.7: Sarsfield Street/Wallace Street/Stack Street intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – As indicated in Table 2.4 and Table 2.6 above, Sarsfield Street has a two way daily flow of 3,940, Wallace Street of 1,828 and Stack Street of 1,079. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 5.5 vehicles/minute on Sarsfield Street, 2.5 vehicles/minute on Wallace Street and 1.5 vehicles/minute on Stack Street. The full and partial closure will occur over a relatively long period of time (251 days) and the additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road although this will be over a short section of Jervois Road and during the off peak when there is no congestion. On this basis the impact is considered to be a temporary more than minor. On Cremorne Street, Argyle Street, Wallace Street and Lawrence Street, the additional traffic is considered to result in a temporary more than minor transport impact in terms of the increase in the overall volume of traffic for 251 days but this level of increase is not expected to impact on the uncongested traffic flow conditions currently experienced nor impact on residents ability to safely manoeuvre in and out of their driveways.
- Road safety impact – the number and severity of crashes on Cremorne Street, Argyle Street, Wallace Street and Lawrence Street is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, and since the full and partial closure will occur over a relatively long period of time (251 days) the impact of the additional traffic is considered to be a temporary more than minor impact.
- Overall assessment = more than minor impact.

6.5.10 Shaft 3 construction and tunnelling – Wallace Street/Argyle Street intersection

- Description of work = Shaft 3 construction and tunnelling.
- Assumed duration of works = 340 days.
- Road closures:
  - Wallace Street closed between Sarsfield Street and Jervois Road (except for residential access).
  - Argyle Street closed between Wallace Street and Cremorne Street(except for residential access).
  - Footpath from Argyle Street to Wallace Street (south) closed during shaft construction and open during tunnelling works.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 41 and 43 Wallace Street access from Wallace Street (north). • 50A Wallace Street access from Wallace Street.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Footpath from Argyle Street to Wallace Street (south) closed during shaft construction and open during tunnelling works. Raised platform may be partially removed. Cyclists temporarily unable to cycle on the AT designated Quiet Road of Sarsfield Street. However, cyclists can wheel their bikes the short distance of the road closure on the footpath or use the diversion route.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Wallace Street and Argyle Street. Residential properties have off street parking. On street parking will remain available to use on Wallace Street and Argyle Street either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of the Wallace Street/Argyle Street intersection, it is anticipated that traffic would be re-routed via Cremorne Street, Stack Street, Clifton Road, Lawrence Street or Jervois Road. Figure 6.8 below, shows the diversion routes with closure of the Wallace Street/Argyle Street intersection:

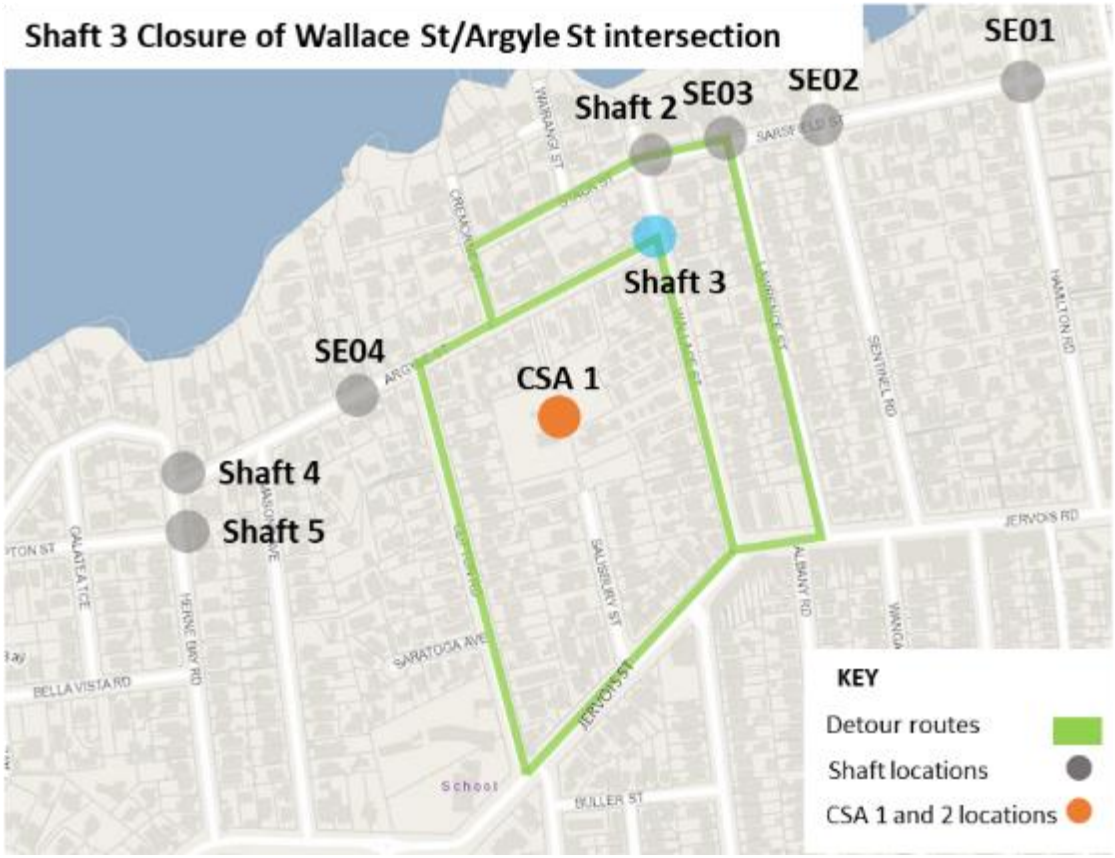

Figure 6.8: Wallace Street/Argyle Street intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Wallace Street has a two way daily flow of 1,828 and Argyle Street of 1,181. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 2.5 vehicles/minute on Wallace Street and 1.6 vehicles/minute on Argyle Street. The closure will occur over a relatively long period of time (340 days) and the additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road although this will be over a short section of Jervois Road and during the off peak when there is no congestion. On this basis the impact is considered to be a temporary more than minor. On Cremorne Street, Stack Street, Clifton Road and Lawrence Street, the additional traffic is considered to result in a temporary more than minor transport impact in terms of the increase in the overall volume of traffic for 340 days but this level of increase is not expected to impact on the uncongested traffic flow conditions currently experienced nor impact on residents ability to safely manoeuvre in and out of their driveways.
- Road safety impact – the number and severity of crashes on Cremorne Street, Stack Street, Clifton Road and Lawrence Street is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, and since the full and partial closure will occur over a relatively long period of time (340 days) the impact of the additional traffic is considered to be a temporary more than minor.
- Overall assessment = more than minor impact.

6.5.11 SE04 Interception shaft installation and chamber construction (and EOP 740) – Argyle Street west of Clifton Road

- Description of work = SE04 Interception shaft (following completion of main drive).
- Assumed duration of works = 37 days.
- Road closure:
  - Argyle Street closed between Clifton Road and Masons Ave (except for residential access).
  - South footpath closed.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 46 Argyle Street – eastbound out only. • 48 Argyle Street - westbound out only. • 45 Argyle Street – westbound out (temporary crossing). • 43 Argyle Street - eastbound out only.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Footpath on south side closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Argyle Street. Residential properties have off street parking. On street parking will remain available to use on Argyle Street either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Argyle Street, it is anticipated that traffic would be re-routed via Masons Avenue, Clifton Road or Jervois Road. Figure 6.9 below, shows the diversion routes with closure of Argyle Street between Clifton Road and Masons Ave:

Figure 6.9: closure of Argyle Street between Clifton Road and Masons Ave detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – As indicated in Table 2.4 and Table 2.6 above, Argyle Street has a two way daily flow of 1,181. Assuming conservatively that the daily flows occur predominantly within a 12 hour period, then this represents 1.6 vehicles/minute on Argyle Street. For the short period of time when the closure is in place, then additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road. However, given the short duration (37 days) of this closure, the short section of Jervois Road impacted and the uncongested nature of Jervois Road in the off peak, the impact is considered to be minimal. On the uncongested Masons Avenue and Clifton Road, the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users.
- Road safety impact – the number and severity of crashes on Masons Avenue and Clifton Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, however given the short period of time for when the closure is in place then this additional traffic is considered to only have a minimal impact on the safety of Jervois Road.
- Overall assessment = less than minor impact.

6.5.12 Shaft 4 construction and tunnelling (and EOP 197) – Argyle Street/Herne Bay Road intersection

- Description of work = Shaft 4 construction and tunnelling.
- Assumed duration of works = 201 days.
- Road closure:
  - Herne Bay Road closed between Upton Street and Galatea Terrace (except for residential access).
  - Argyle Street closed between Masons Ave and Herne Bay Road (except for residential access).

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 79 Argle Street - northbound out only. • 72 Argyle Street - eastbound out only.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Footpath on Herne Bay Road west side will be closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Argyle Street and Herne Bay Road. Residential properties have off street parking. On street parking will remain available to use on Argyle Street and Herne Bay Road either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Argyle Street and Herne Bay Road it is anticipated that traffic would be re-routed via Galatea Terrace, Masons Avenue, Bella Vista Road or Jervois Road. Figure 6.9 below, shows the diversion routes with closure of the Argyle Street/Herne Bay Road intersection:

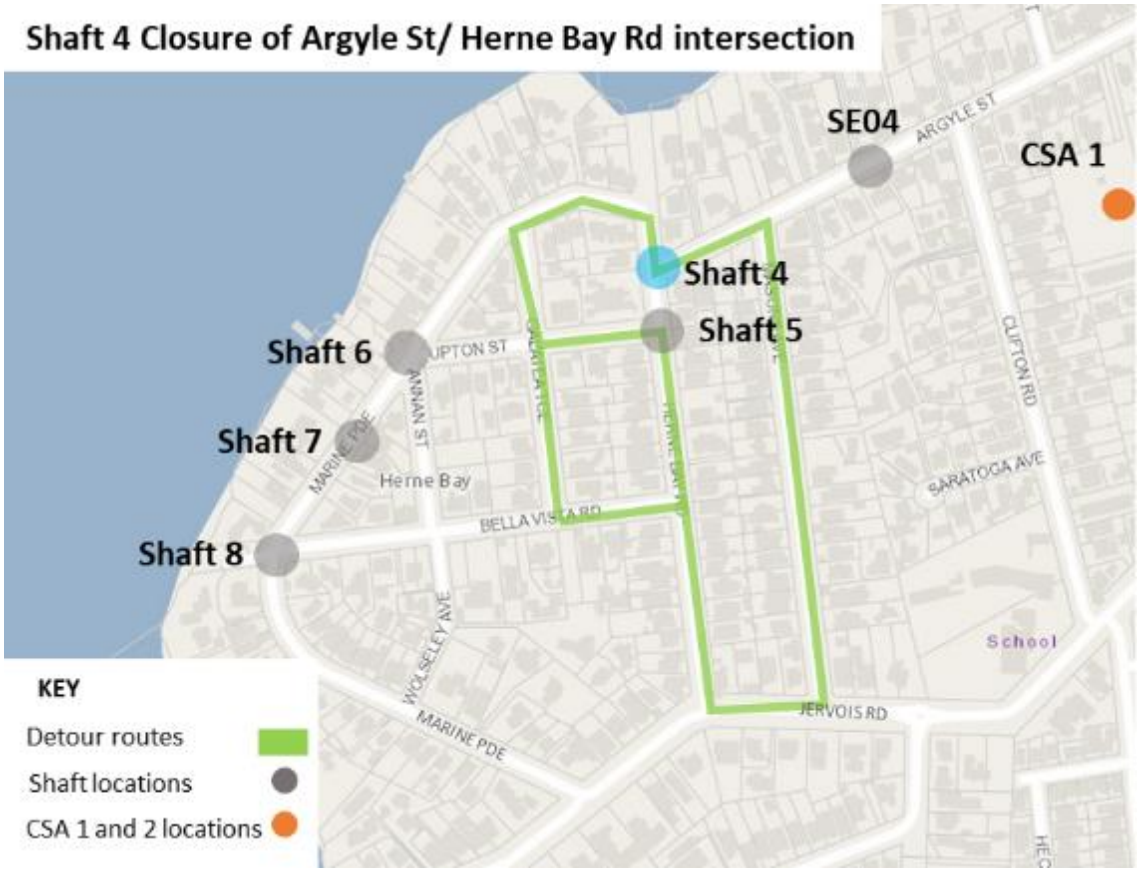

Figure 6.10: Argyle Street/Herne Bay Road intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – As indicated in Table 2.4- and Table 2.6 above, Argyle Street has a two way daily flow of 1,181, Herne Bay Road of 523 and Marine Parade of 314; Assuming conservatively that the daily flows occur predominantly within a 12 hour period, then this represents 1.6 vehicles/minute on Argyle Street, 0.7 vehicles/minute on Herne Bay Road and 0.4 vehicles/minute on Marine Parade.
- The closure will occur over a relatively long period of time (201 days) and the additional traffic from the diverted traffic could increase delays in the peak periods on Jervois Road although this will be over a short section of Jervois Road and during the off peak when there is no congestion. On this basis the impact is considered to be a temporary more than minor. On Galatea Terrace, Masons Avenue and Bella Vista Road, the additional traffic is considered to result in a temporary more than minor transport impact in terms of the increase in the overall volume of traffic for 201 days, but this level of increase is not expected to impact on the uncongested traffic flow conditions currently experienced nor impact on residents ability to safely manoeuvre in and out of their driveways.
- Road safety impact – the number and severity of crashes on Bella Vista Road, Masons Avenue and Clifton Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads. There are a large number of crashes on Jervois Road, and since the full and partial closure will occur over a relatively long period of time (340 days) the impact of the additional traffic is considered to be a temporary more than minor.
- Overall assessment = more than minor impact.

6.5.13 Shaft 5 construction and tunnelling – Upton Street/Herne Bay Road intersection

- Description of work = Shaft 5 construction and tunnelling.
- Assumed duration of works = 233 days.
- Road closure:
  - Herne Bay Road closed between Upton Street and Bella Vista Road (except for residential access).
  - Upton Street closed between Galatea Terrace and Herne Bay Road (except for residential access). Herne Bay Road closed between Argyle Street and Upton Street (except for residential access).
  - Due to Shafts Four and Five being so close to each other, Herne Bay Road between Argyle Street and Upton Street will be closed to accommodate storage and materials onsite.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 31 Herne Bay Road southbound only. • 72 Argyle Street Eastbound out only. • 36 Upton Street - east entry closed, westbound out of west entry.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Footpath on Upton Street north side will be closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Upton Street and Herne Bay Road. Residential properties have off street parking. On street parking will remain available to use on Upton Street and Herne Bay Road either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Herne Bay Road and Upton Street, it is anticipated that traffic would be re-routed via Galatea Terrace, Marine Parade and Bella Vista Road. Figure 6.11 below, shows the diversion routes with closure of the Herne Bay Road/Upton Street intersection:

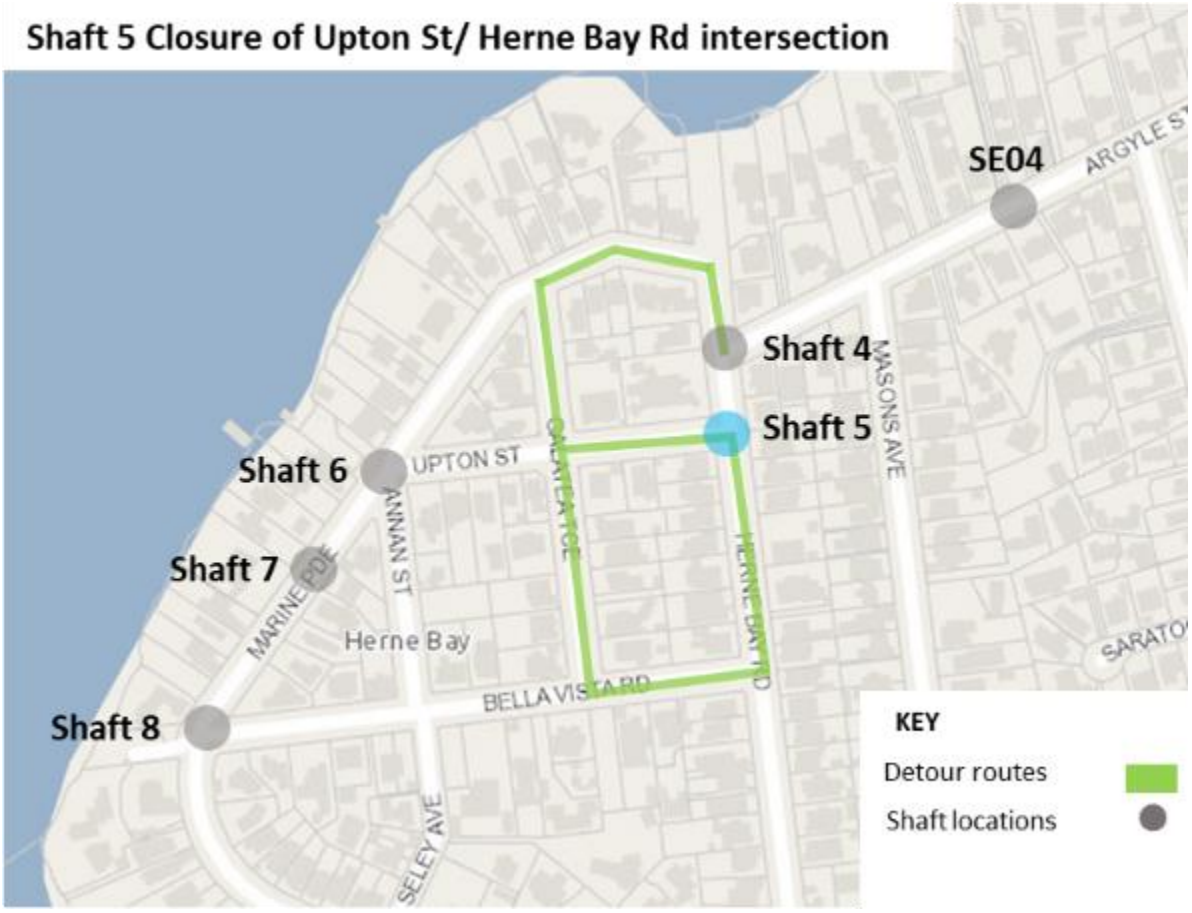

Figure 6.11: Herne Bay Road/Upton Street intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Herne Bay Road has a two way daily flow of 523 and Upton Street of 261. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 0.7 vehicles/minute on Herne Bay Road and 0.4 vehicles/minute on Upton Street. On the uncongested Galatea Terrace, Marine Parade and Bella Vista Road, the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users.
- Road safety impact – the number and severity of crashes on Galatea Terrace, Marine Parade and Bella Vista Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads.
- Overall assessment = less than minor impact.

6.5.14 Shaft 6 construction and tunnelling – Marine Parade/Upton Street/Annan Street intersection

- Description of work = Shaft 6 construction and tunnelling.
- Assumed duration of works = 170 days (Full closure 100 days, Partial closure 70 days).
- Full road closure:

  - Upton Street closed between Galatea Terrace and Marine Parade (except for residential access).
  - Marine Parade closed between Bella Vista Road and Galatea Terrace (except for residential access.
  - Annan Street closed between Bella Vista Road and Marine Parade (except for residential access).
- Partial road closure:
  - Intersection closed except for Upton Street left turn to Annan Street and ahead to Marine Parade (south) and for movements to/from Marine Parade south and Annan Street.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 14 Upton Street Eastbound out only. • 33A Marine Parade southbound out only. • 31 Marine Parade northbound out only.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Marine Parade west side footpath closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	Less than minor	Aim to keep pedestrian access to Marine Parade Reserve open if safe to do so during working hours. Outside of working hours access unlikely to be restricted
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Marine Parade, Upton Street and Annan Street. Residential properties have off street parking. On street parking will remain available to use on Marine Parade, Upton Street and Annan Street either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Marine Parade, Annan Street and Upton Street it is anticipated that traffic would be re-routed via Galatea Terrace and Bella Vista Road. Figure 6.12 below, shows the diversion routes with closure of the Marine Parade/Annan Street/Upton Street intersection:

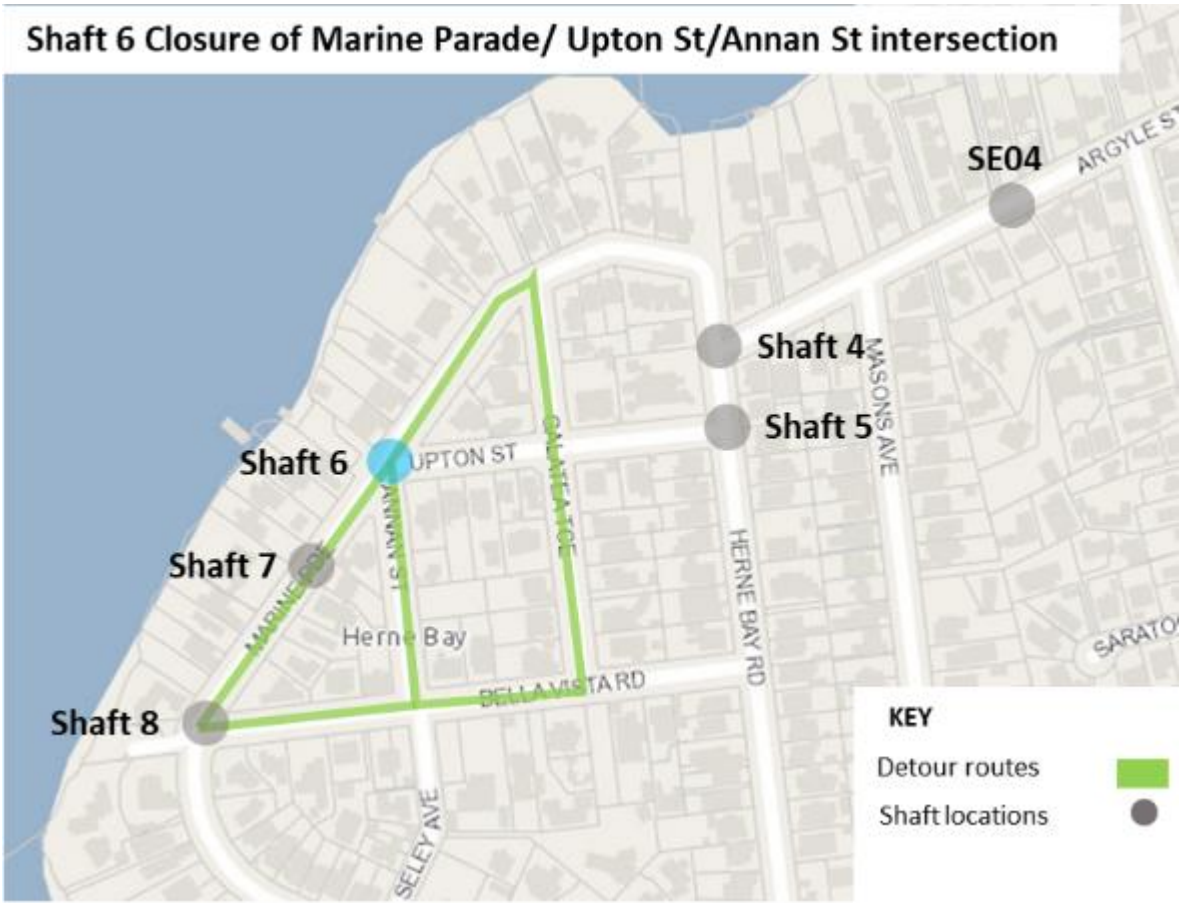

Figure 6.12: Marine Parade/Annan Street/Upton Street intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Upton Street has a two way daily flow of 261, Annan Street of 104 and Marine Parade of 314. Assuming conservatively that the daily flows occur predominantly within a 12 hour period, then this represents 0.4 vehicles/minute on Upton Street, 0.1 vehicles/minute on Annan Street and 0.4 vehicles/minute on Marine Parade. On the uncongested Galatea Terrace and Bella Vista Road, the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users.
- Road safety impact – the number and severity of crashes on Galatea Terrace and Bella Vista Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads.
- Overall assessment = Less than minor impact.

6.5.15 Shaft 7 construction and tunnelling (and EOP 198) – Marine Parade

- Description of work = Shaft 7 construction and tunnelling.
- Assumed duration of works = 94 days.
- Road closure =-Marine Parade closed between Annan Street and Bella Vista Road.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minimal	Access retained, noting: • 22 Marine Parade southbound out only. • 39 Marine Parade northbound out only. • 41 Marine Parade southbound out only.
Pedestrians and cyclists	Pedestrians – minimal Cyclists – minimal	Footpath on east side to be closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services.
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking on Marine Parade. Residential properties have off street parking. On street parking will remain available to use on Marine Parade either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.
Overall Assessment	**Less than minor impact**	

For the temporary closure of Marine Parade, it is anticipated that traffic would be re-routed via Bella Vista Road and Annan Street. Figure 6.13 below, shows the diversion routes with Marine Parade closed between Annan Street and Bella Vista Road:

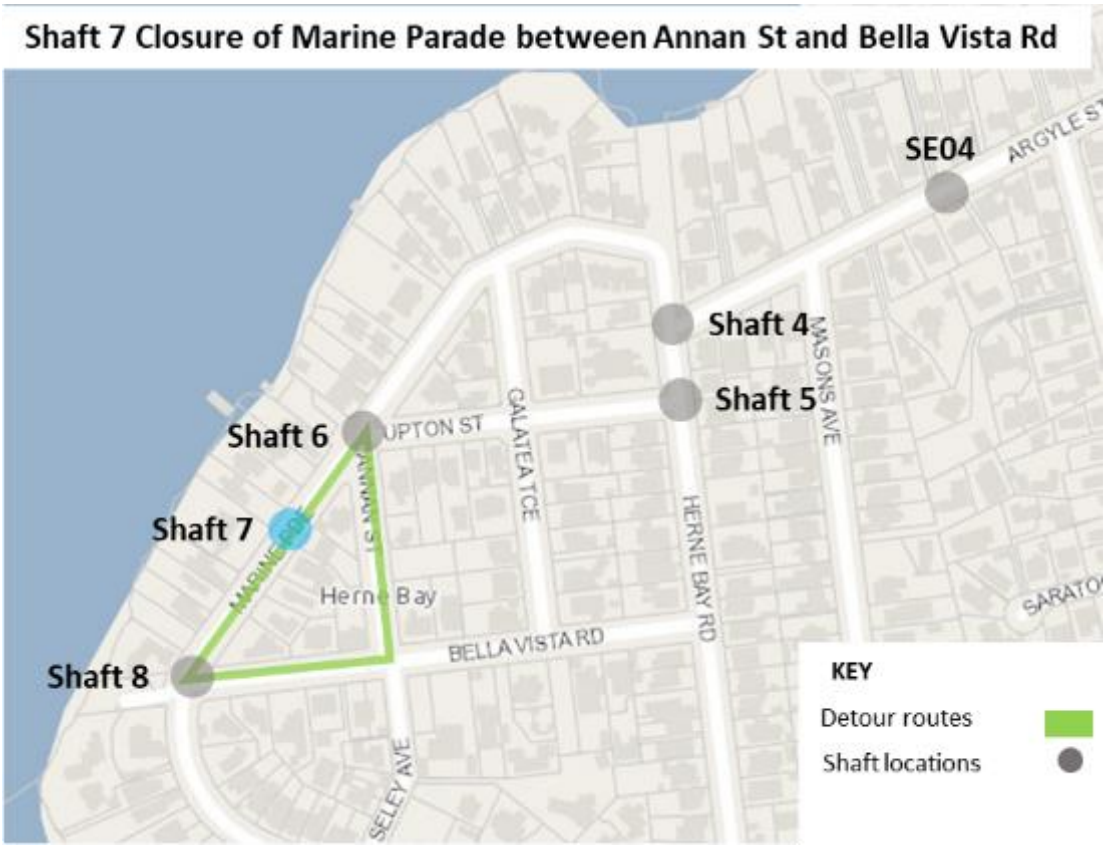

Figure 6.13: Closure of Marine Parade between Annan Street and Bella Vista Road detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Marine Parade has a two way daily flow of 314. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 0.4 vehicles/minute. On the uncongested Annan Street and Bella Vista Road the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users.
- Road safety impact – the number and severity of crashes on Annan Street and Bella Vista Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads.
- Overall assessment = less than minor impact.

6.5.16 Shaft 8 construction and tunnelling (and EOP 199) – Marine Parade/Bella Vista Road

- Description of work = Shaft 8 construction and tunnelling.
- Assumed duration of works = 60 days.
- Road closure = Marine Parade/ Bella Vista Road intersection.

Criteria	Impact Assessment	Comments
Access to residential properties.	Minor impact	Access to private property will be temporary affected, and will need to be managed individually as trenching passes in front of each property with the owners and occupiers to reduce disruption . The effects of this disruption to property access during these works will be significant, however they will be short term – estimated to be up to five days per property, or a total of 30 days for the full trenching programme and 30 days for the construction of Shaft Eight. Watercare and the Project constructors will engage with these property owners early to ensure that access is managed sufficiently, which is likely to involve providing a temporary platform over the excavated trench before and after construction hours. This will ensure that some access to the affected properties is still provided during these works.
Pedestrians and cyclists	Pedestrians – minimal Cyclists - minimal	One side of the Marine Parade footpath will be closed. Cyclists will need to use diversion route (or wheel their bike on the footpath). Note this section of road is not part of the AT classified quiet road for cycling.
Pedestrian access to reserves/parks	No impact	No existing access to beach or reserve.
Public transport.	No impact	No existing PT services
On street parking.	Minimal	Will result in temporary loss of small amount of on street parking Marine Parade and Bella Vista Road. Residential properties have off street parking. On street parking will remain available to use on Marine Parade and Bella Vista Road either side of the shaft construction.
Refuse/delivery access	Minimal	Use diversion route.

Overall Assessment	**Minor impact**	

For the temporary closure of Marine Parade/Bella Vista Road intersection, it is anticipated that traffic would be re-routed via Bella Vista Road, Wolseley Road and Annan Street. Figure 6.14 below, shows the diversion routes with closure of the Marine Parade/Bella Vista Road intersection:

Figure 6.14: Marine Parade/Bella Vista Road intersection closure detour routes.

In terms of traffic impact:

- Traffic impact of additional diverted traffic – as indicated in Table 2.4 and Table 2.6 above, Marine Parade has a two way daily flow of 314. Assuming conservatively that the daily flows occur predominantly within a 12 hour period then this represents 0.4 vehicles/minute. On the uncongested Annan Street and Bella Vista Road the additional traffic for a temporary period is considered to only have a minimal impact on the capacity of these roads and should not result in a noticeable increase in congestion or unreasonable delays for road users.
- Road safety impact - the number and severity of crashes on Annan Street and Bella Vista Road is considered to be low and it is considered that there are no inherent safety issues present. Therefore, the additional traffic for a temporary period is considered to only have a negligible impact on the safety of these roads.
- Overall assessment = less than minor impact.

6.6 Summary of transport effects

Based on the assessments detailed in sections 6.1 to 6.5 above, the following is concluded in terms of transport effects:

Transport effect assessed	Effect rating
Traffic impact of the additional construction vehicles on the surrounding road network (usual construction hours)	Less than minor
Traffic impact of the additional construction vehicles on the surrounding road network (outside of usual construction hours).	Less than minor
Road safety impact of the additional construction vehicles on the surrounding road network	Less than minor
Compliance with Auckland Unitary Plan (AUP) Transport Rules	Complies

Transport effect assessed by location/construction activity

Salisbury Reserve CSA1	Less than minor
94A and 94B Shelly Beach Road CSA2	Less than minor
Service investigations and diversions	Less than minor
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Full closure of Sarsfield Street - Emmett Street transport impact	Significant adverse
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Full closure of Sarsfield Street Curran Street (between Emmett Street and Sarsfield Street) transport impact	Significant adverse
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Eastbound closure of Sarsfield Street - Emmett Street transport impact	More than minor
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Eastbound closure of Sarsfield Street Curran Street (between Emmett Street and Sarsfield Street) transport impact	Less than minor
SE01 Interception shaft installation and chamber construction (and EOP 195)	Less than minor
SE02 Interception shaft installation and chamber construction (and EOP 200)	Less than minor
SE03 Interception shaft installation and chamber construction (and EOP 201)	Less than minor
Shaft 2 construction and tunnelling (and EOP 1019)	More than minor
Shaft 3 construction and tunnelling	More than minor
SE04 Interception shaft installation and chamber construction (and EOP 740)	Less than minor
Shaft 4 construction and tunnelling (and EOP 197)	More than minor
Shaft 5 construction and tunnelling	Less than minor
Shaft 6 construction and tunnelling	Less than minor
Shaft 7 construction and tunnelling (and EOP 198)	Less than minor
Shaft 8 construction and tunnelling (and EOP 199)	Minor

7 Conclusions and recommendations

7.1 Conclusions

7.1.1 Overall construction methodology approach to reduce the transport impact

- Two CSAs will be established. These will act as hubs for the satellite sites (i.e., where the shafts are being constructed) and enable short term storage of plant, materials and spoil. This will enable a reduction of materials and equipment stored at each satellite site and reduce the size and number of trucks on the local residential street network. Large trucks will primarily be routed on Arterial roads and SH1 (whose role and function is primarily efficient movement of traffic).
- At each satellite site, a construction site will be established with the footprint minimised by using the CSAs for material and plant storage thus minimising the impact on local resident vehicle and pedestrian access.
- As works are completed at each satellite site, then the construction site will be de-established and returned to public use, thus minimising the number of construction sites open at any one time.

7.1.2 Additional construction vehicles - it is anticipated that on a typical day

- On the residential streets on the Project, east of Salisbury Reserve there will be an increase of up to 46 vehicles/day with the construction traffic. Over a 12 hour working day this represents four vehicles per hour or one vehicle approximately every 15 minutes.
- On the residential streets on the Project, west of Salisbury Reserve there will be an increase of up to 21 vehicles/day with the construction traffic. Over a 12 hour working day this represents under two vehicles per hour.
- On key Arterial and Collector roads such as Curran Street, Sarsfield Street and Shelly Beach Road, there will be an increase of up to 23 vehicles/day with the construction traffic. Over a 12 hour working day this represents just under two vehicles per hour or 1 vehicle approximately every 30 minutes.
- On SH1 and on/off ramps at Onewa interchange, there will be an increase of up to 15 vehicles/day with the construction traffic. Over a 12 hour working day this represents just over one vehicle per hour.

7.1.3 Transport effects

The following is concluded in terms of transport effects with mitigation:

Transport effect assessed	Effect rating
Traffic impact of the additional construction vehicles on the surrounding road network (usual construction hours)	Less than minor
Traffic impact of the additional construction vehicles on the surrounding road network (outside of usual construction hours).	Less than minor
Road safety impact of the additional construction vehicles on the surrounding road network	Less than minor
Compliance with Auckland Unitary Plan (AUP) Transport Rules	Complies

Transport effect assessed by location/construction activity

Salisbury Reserve CSA1	Less than minor
94A and 94B Shelly Beach Road CSA2	Less than minor
Service investigations and diversions	Less than minor
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Full closure of Sarsfield Street - Emmett Street transport impact	Significant adverse
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Full closure of Sarsfield Street Curran Street (between Emmett Street and Sarsfield Street) transport impact	Significant adverse
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Eastbound closure of Sarsfield Street - Emmett Street transport impact	More than minor
Shaft 1 construction and tunnelling (including cumulative assessment with Point Erin CI works) Eastbound closure of Sarsfield Street Curran Street (between Emmett Street and Sarsfield Street) transport impact	Less than minor
SE01 Interception shaft installation and chamber construction (and EOP 195)	Less than minor
SE02 Interception shaft installation and chamber construction (and EOP 200)	Less than minor
SE03 Interception shaft installation and chamber construction (and EOP 201)	Less than minor
Shaft 2 construction and tunnelling (and EOP 1019)	More than minor
Shaft 3 construction and tunnelling	More than minor
SE04 Interception shaft installation and chamber construction (and EOP 740)	Less than minor
Shaft 4 construction and tunnelling (and EOP 197)	More than minor
Shaft 5 construction and tunnelling	Less than minor
Shaft 6 construction and tunnelling	Less than minor
Shaft 7 construction and tunnelling (and EOP 198)	Less than minor
Shaft 8 construction and tunnelling (and EOP 199)	Minor

7.2 Recommendations - Construction Traffic Management Plan

7.2.1 Background and objectives

It is recommended that a condition is imposed on any resource consent for a CTMP to be submitted for certification prior to any works commencing. The objectives of the CTMP are to:

a Ensure construction traffic movements on the transport network are appropriately managed.

b Provide for the safety of everyone at all times.

c Minimise disruption and maintain pedestrian and vehicle access to/from surrounding residential properties.

d Minimise disruption from construction traffic on the travelling public and road users along the identified sections of the construction routes.

e Seek to avoid full road closures and minimise any partial or managed closures.

f Manage integration with other construction projects and Auckland Transport/Waka Kotahi projects.

Specific project issues that the CTMP will need to address include:

7.2.2 Construction traffic routing

- Traffic to and from the Satellite Sites will be from Sarsfield Street, Argyle Street, Herne Bay Road, Upton Street or Marine Parade only.
- Traffic to and from the Sarsfield Reserve CSA1 will be from Argyle Street (east of the CSA and Sarsfield Street).
- Ingress to CSA2 94A and 94B Shelly Beach Road will be from the Curran Street on ramp. Egress will be onto the Curran Street on ramp and should vehicles need to travel south, then they will need to turn around at the Onewa Road interchange.

7.2.3 CSA1 and 2 site access

- All temporary accesses into the CSAs will be designed in accordance with relevant AT and Waka Kotahi design standards (including sight lines, accessway widths and gradients).
- CSA2 94A and 94B Shelly Beach Road - the design of the access shall ensure it does not impact on the effective, efficient and safe operation of the Curran Street SH1 on ramp.

7.2.4 CSA operation

- All CSAs will be securely fenced to prevent public access.
- Existing east footpath at Salisbury Reserve to be fenced off to prevent public access. Once the works are complete, the footpath will be reinstated.
- Salisbury Reserve CSA1 - Traffic Management (TM) supervisor to ensure safe movement of truck ingress and egress at Argyle Street.
- 94A and 94B Shelly Beach Road CSA2 - TM supervisor to ensure ingress/egress does not impact on the effective, efficient and safe operation of the Curran Street SH1 on ramp. This could involve temporary traffic management to make drivers aware of the CSA ingress and egress (e.g., through warning signs, lane narrowing and potentially a temporary reduction in the existing 80 km/h speed limit). To minimise impacts of the CSA vehicle movements in the peak periods, it is proposed that ingress and egress to the site will only be permitted outside of the weekday AM peak (0700-0900) and PM peak (1600-1800) periods. Construction vehicles will exit the site to the north on to SH1 beyond the existing on ramp signals. To ensure trucks and other vehicles are exiting the site safely, the Site Traffic Management Supervisor (STMS) will ensure a vehicle can leave safely and is not conflicting with general traffic.
- Wheel wash facilities to be set up at the exit points of the CSA 1 and 2.

7.2.5 Construction staff and visitor car parking

- Contractor to provide staff and visitor parking within the CSA 1 and 2.

7.2.6 Satellite sites – pedestrians and cyclists

- For all satellite sites where works impact on existing footpaths, temporary footpaths shall be provided that meet mobility impaired standards, where practicable. Where footpaths are closed, fencing will be used to prevent access to any closed off sections of the footpath and diversion signs will be provided. These temporary measures should be safe, clearly identifiable and seek to minimise significant detour.
- Signage should be provided on the section of Argyle Street and Sarsfield Street (from the Salisbury Reserve to the Curran Street shared path) to advise cyclists using this AT designated quiet road cycle route, of alternative routes when there are road closures.

7.2.7 Satellite sites – residents access

- Where required, design and provide temporary accessways and vehicle crossings to residential properties (for instance on road berms/footpaths) and site fencing to ensure residents have 24 hour access to their homes.

7.2.8 Satellite sites – management of construction traffic

- Site Traffic Management Supervisor will safely manage the movements of construction traffic to and from the road network to ensure the safety of all road users is maintained and that construction vehicles can negotiate access and egress to avoid any additional queueing on the adjacent road network in the peak periods on Collectors, Arterials and SH1.
- Site Traffic Management Supervisor will co-ordinate (for example via radio control) trucks accessing the Satellite sites to ensure that construction vehicles arriving and departing the sites can do safely and that a suitable truck layover area is provided within the Salisbury Reserve CSA1 where required, for example for concrete delivery trucks.
- At each Satellite site, as activities change and the type of plant is replaced, the traffic management will be revised accordingly to ensure traffic disruptions are minimised and to allow the safe movement of vehicles and people. When the works are complete traffic management and site fencing will be removed.
- The CTMP will implement a construction driver education programme given the close proximity to residential properties and pedestrians.
- Where raised platforms are removed they will be reinstated to a design standard agreed with AT.
- For raised platforms not removed, but where construction traffic passes over these, should any damage occur as a result of the construction vehicles, then remedial works will be carried out by the Contractor.
- All final reinstatement and remedial works will be carried out at the completion of the project to ensure no damage to any of the reinstated works occurs.
- Movements of specialised machinery or large components (e.g., cranes and the TBM removal) will not occur on a day to day basis. Separate to the Resource Consent application, bespoke SSTMPs and CARs will be developed once exact details of the machinery and vehicles required is known, as they have successfully been carried out for other key waste water projects. Agreement with Auckland Transport and (where relevant) Waka Kotahi will be required and over-dimension rules and associated permitting processes will need to be complied with.

7.2.9 Satellite sites – communications

- Communication campaigns should be undertaken in relation to traffic management activities throughout construction activities (including letter drops to affected residents, flier drops, project signage, web based resources, etc).

- Appropriate temporary traffic management measures should be incorporated by AT to advise other road users of the construction traffic.

7.2.10 Shaft 1 Sarsfield Street temporary closure - Emmett Street

- Vehicle tracking of the Project and Point Erin CI construction vehicles will need to be carried out and any temporary physical works improvements at the Emmett Street intersections with Shelly Beach Road and Curran Street will need to be identified and implemented prior to the temporary closure taking effect. This could include temporary removal of on street parking on Curran Street and Shelly Beach Road to assist vehicles turning at the intersections and to provide improved sight lines.
- Given the narrow width of Emmett Street, then to accommodate this level of traffic, temporary removal of on street parking is recommended along the whole length of Emmett Street.
- Temporary 30 Km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Continuous communications with residents on Emmett Street will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes and in particular, of the existing right turn ban from Emmett Street to Shelly Beach Road and the need to use Tweed Street for this manoeuvre.

7.2.11 Shaft 1 Sarsfield Street temporary closure - Curran Street (between Emmett Street and Sarsfield Street)

- Vehicle tracking of the Project and Point Erin CI construction vehicles will need to be carried out and any temporary physical works improvements at the Sarsfield Street/Curran Street intersection will need to be identified and implemented prior to the temporary closure taking effect.
- To accommodate this level of traffic, temporary removal of on street parking is recommended along the whole length of Curran Street between Emmett Street and Sarsfield Street.
- Temporary 30 Km/h speed limit is implemented to reduce vehicle speeds and hence injury severity in the event of an accident.
- Work with the school to establish whether any temporary crossing patrols are required to assist pedestrians crossing Curran Street.
- Provisions for restricting movements of construction traffic during peak school drop-off and pick-up times (for example 0815-0900 and 1445 and 1515).
- Continuous communications with residents on Curran Street and the Primary School will be essential to rapidly address any traffic issues should they arise.
- Clear signing of the diversion routes.

7.2.12 Generic issues that the CTMP should also address include:

- Routes to be used to and from the sites and CSA's for times of the day, days of the week.
- Heavy vehicle load sizes.
- Over dimension (O/D) and over weight (O/W) permits if applicable.
- Temporary traffic control.
- Temporary speed limits.
- Road controlling authority approvals.

7.3 Overall conclusion

Based on the above assessment of the transport effects and the associated recommendations, it is concluded that there are no transport engineering or transport planning reasons that would preclude construction works associated with the proposed Herne Bay Trunk Sewer. Any effects can be appropriately managed and mitigated through the measures outlined above as required through conditions relating to a CTMP.

Overall, the increase in construction traffic from the Project on the surrounding road network is considered to be minimal and is considered to have a minimal road safety impact. In terms of specific transport effects at each individual CSA and satellite site (e.g., resident access, pedestrian/cycle impacts) and possible temporary diversion routes, it is considered the impacts are largely less than minor. There are some locations where the impact will be minor or more than minor. By employing standard traffic management procedures, construction traffic vehicles can be safely accommodated within the site and on the adjacent road network.

There will be a temporary significant adverse transport impact on Emmett Street and Curran Street (between Emmett Street and Sarsfield Street) as a result of the temporary closure of Sarsfield Street (between Shelly Beach Road and Curran Street) during the construction of Shaft 1 which will increase traffic on these roads. This has taken into account the cumulative impact with the Point Erin CI construction traffic. There is also expected to be a temporary more than minor impact On Emmett Street with the eastbound closures of Sarsfield Street and also related to diverted traffic as a result of Shafts 2, 3 and 4 construction. Mitigation measures have been identified for inclusion in the CTMP to reduce any potential road safety impact.

8 Applicability

This report has been prepared for the exclusive use of our client Watercare Services Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application for resource consent and that Auckland Council will use this report for the purpose of assessing that application.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

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Appendix A Traffic count survey – Curran Street/Sarsfield Street

CURRAN ST/ SARSFIELD ST INTERSECTION PEAK PERIOD TRAFFIC SURVEY (4/4/23)

FIGURE 1: MOVEMENT FLOW SUMMARY

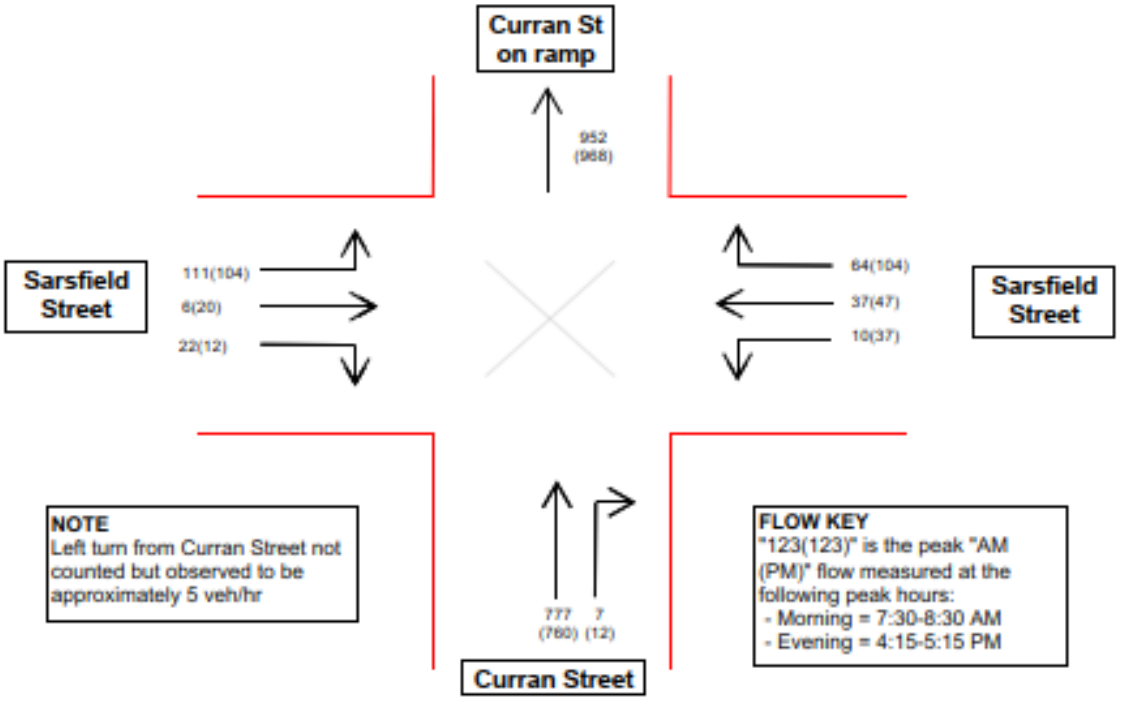
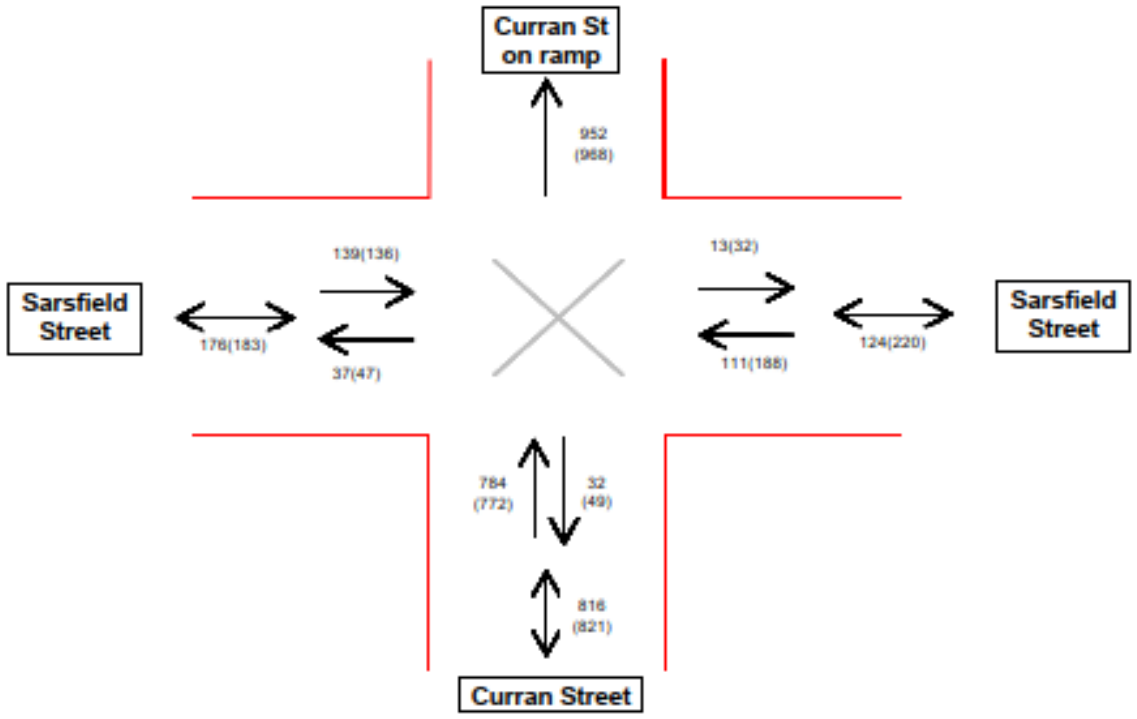
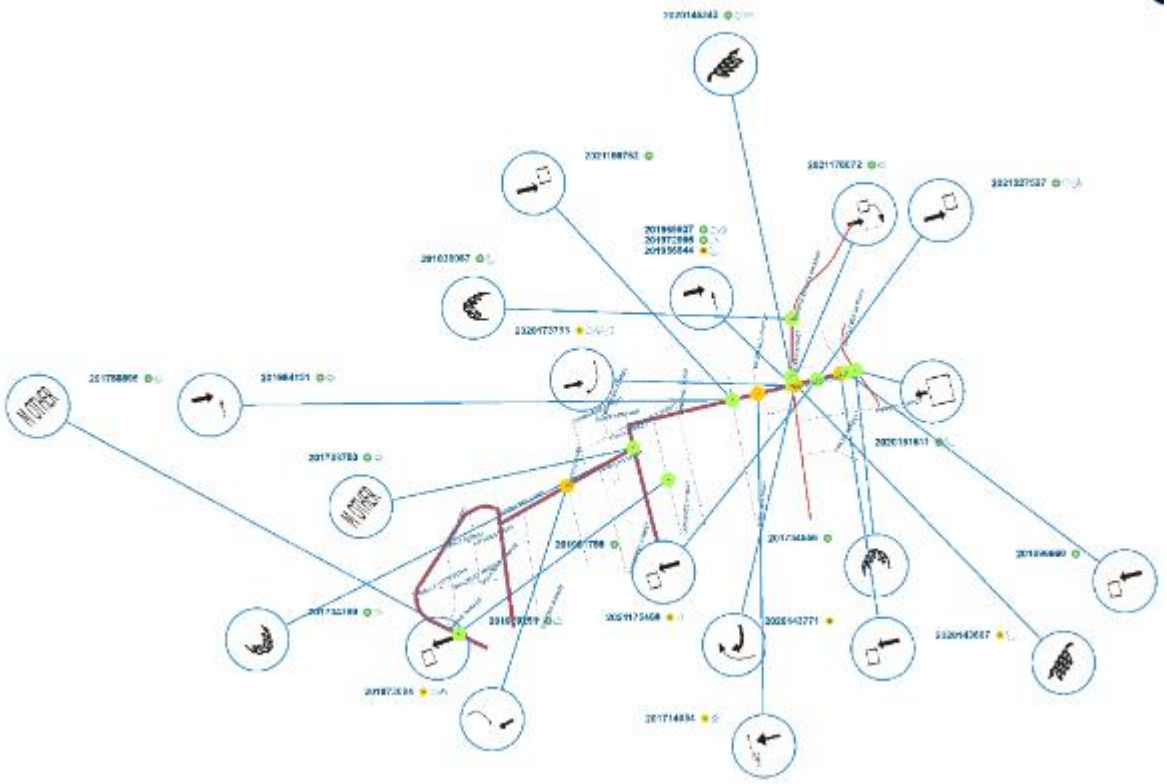
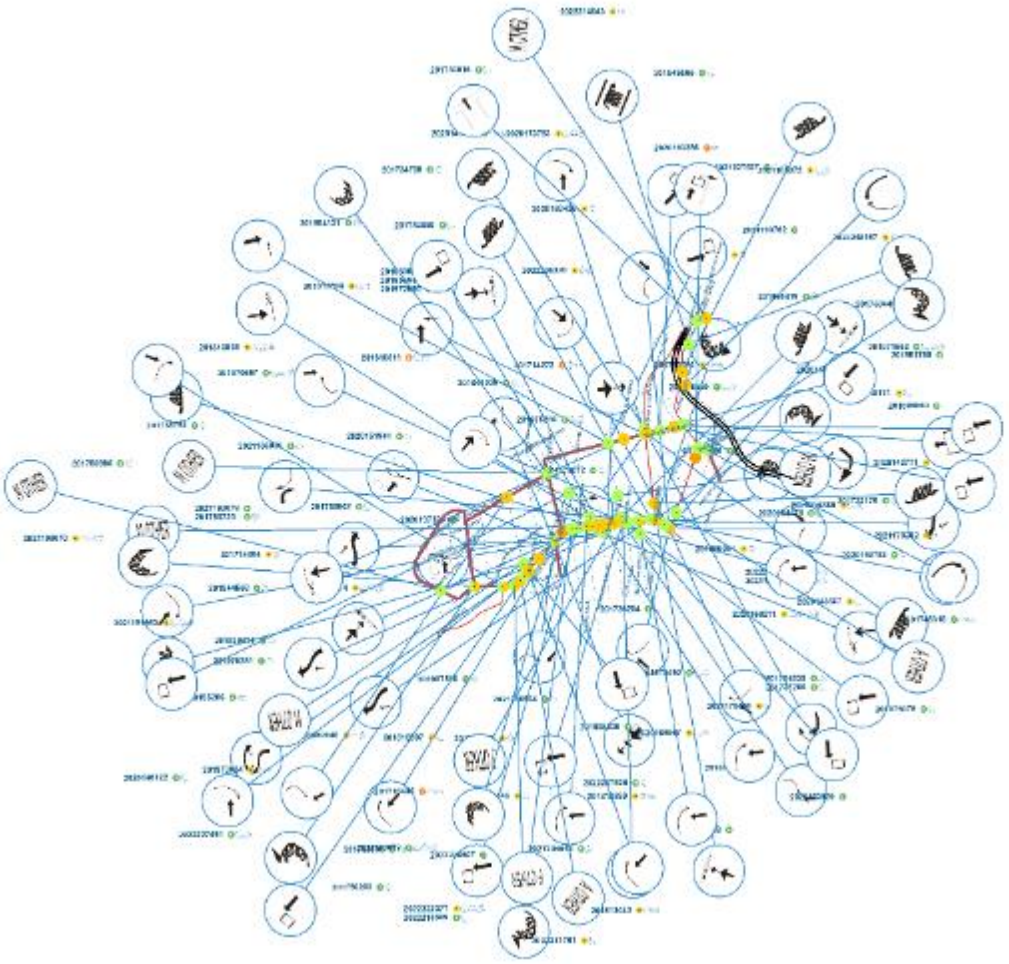


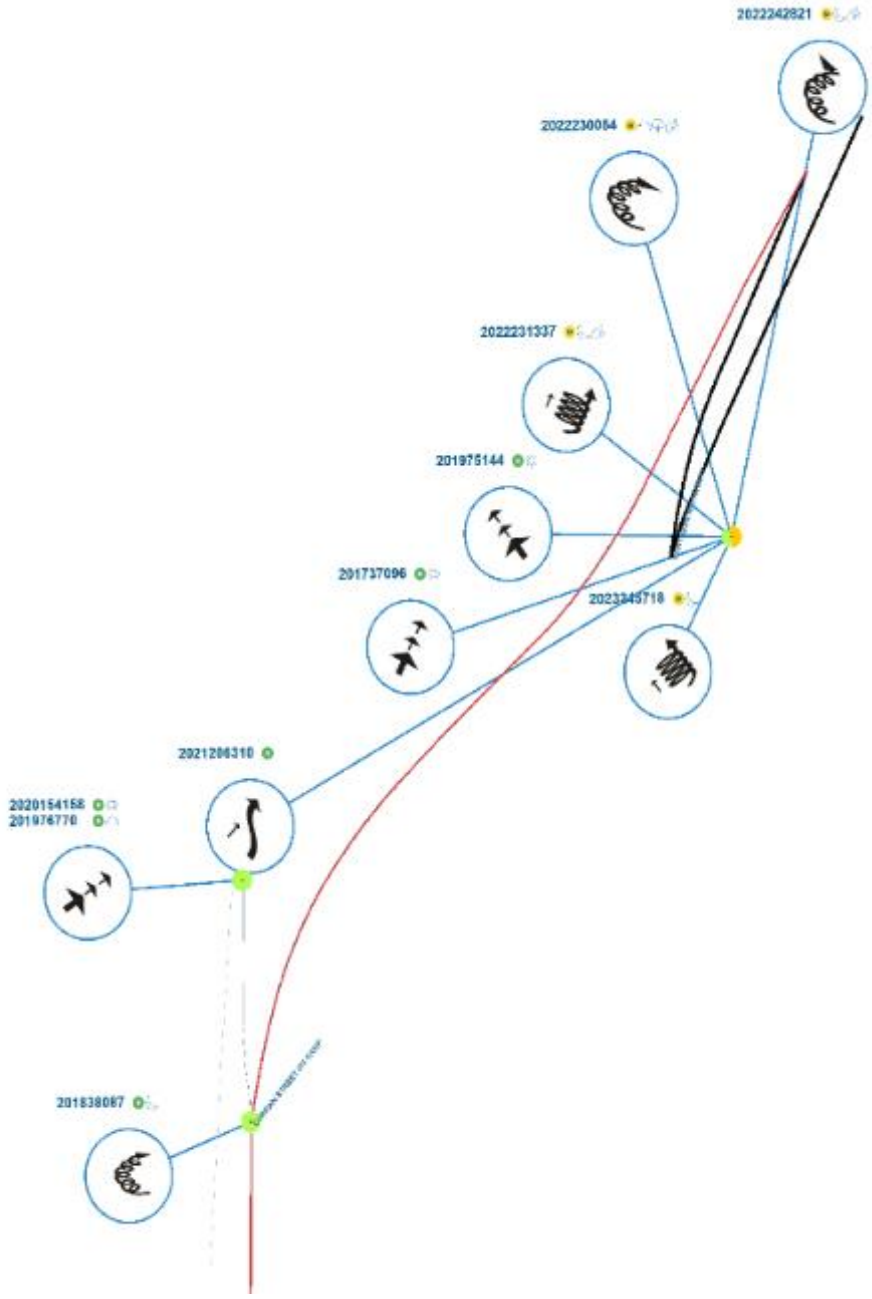
FIGURE 2: LANE FLOW SUMMARY



Appendix B Crash data



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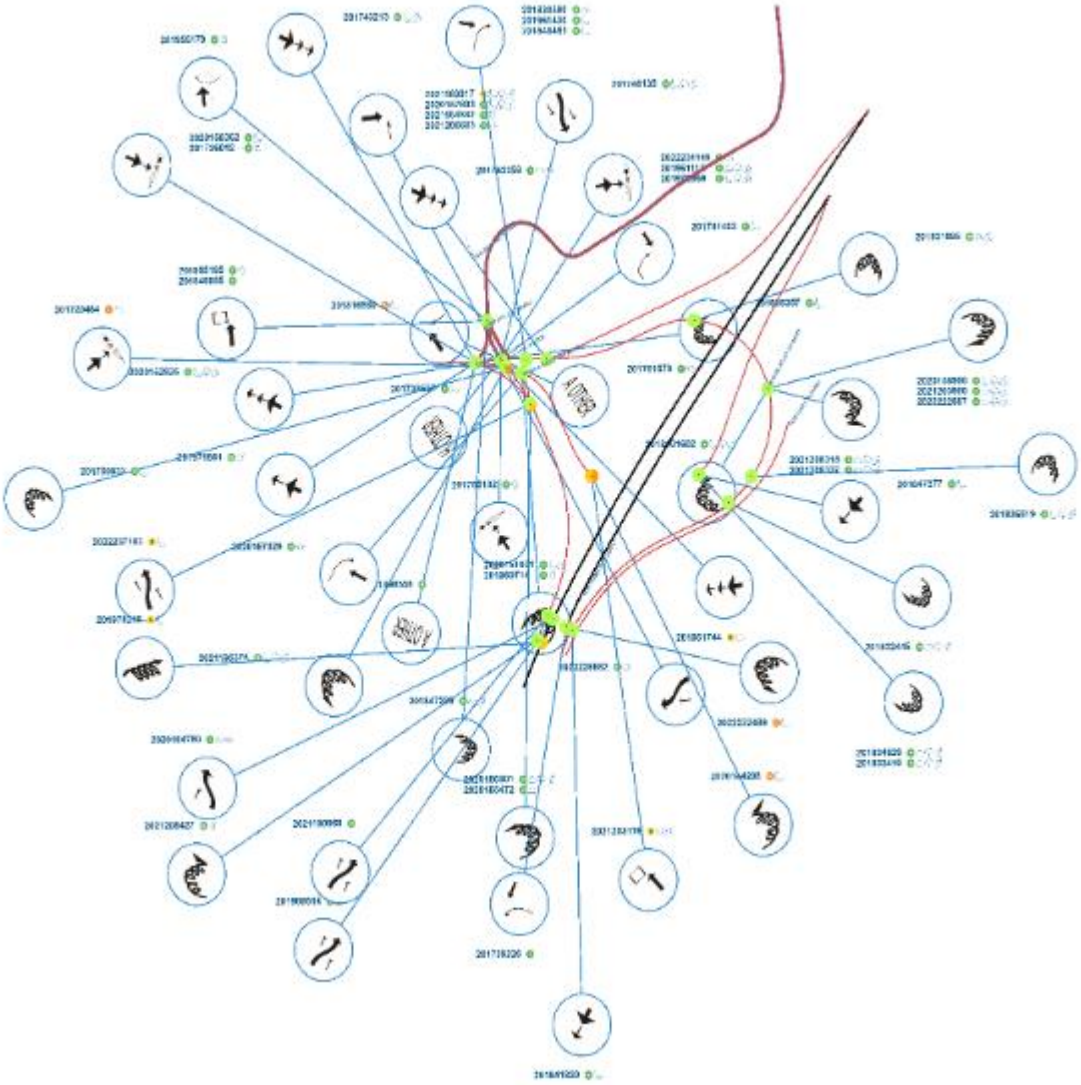


Appendix C Construction methodology

Memorandum

To	Technical Specialists
Copy	WSL and WSP Project Teams
From	Tony Sage
Office	c/- Auckland
Date	29 June 2023
Subject	Project Briefing and Request for Technical Assessments – Herne Bay Trunk Sewer, Watercare Services Limited

1 Construction Information

The following section provides details on the proposed construction method of the Herne Bay Trunk Sewer Line. It is broken down to work elements that are repeated along the alignment. The pipeline is constructed via a series of shafts from which a Tunnel boring machine (TBM) is launched (Thrust Shafts) and retrieved (Receiving shafts) as the TBM progresses along the alignment sections of pipe are placed in the thrust shaft and then jacked in behind the TBM as it progresses.

Figure 1: Proposed alignment of the Herne Bay Trunk Sewer

3.5m diameter interception shafts are required to allow for the construction of connecting pipes to the engineered overflow points.

1.1 Construction Hours

General construction works are proposed to occur between 7am and 6pm, Monday to Friday and 8am – 6pm on Saturdays. No works are proposed on Sundays or public holidays.

Site mobilisation and pack down works are proposed to occur 30 minutes before and after these windows.

The following works are operationally required to occur outside of these hours:

- TBM tunnelling works;
- Emergency works, or works due to unforeseen circumstances;
- Where work is specifically required to be planned to be carried out at certain times; or
- Deliveries of large equipment, or specialist deliveries required outside of this window due to traffic management requirements.

1.2 Duration

A start date of May 2024 is proposed for the project, with works targeting a completion date of May 2026. The programme is to be further co-ordinated with the proposed Central interceptor project to ensure alignment with this adjoining project.

Work is primarily intended to be carried out during the day although there are some cases where work will fall outside of this, as described above. Large plant will be delivered early in the morning or later in the evening to avoid peak traffic volumes and any live cut over work with service relocations and connections will be carried out at night to mitigate service disruptions and while flows are low.

As works are completed in each area the local site will be disestablished and returned to public use as soon as practical.

1.3 Traffic Management

Shafts are typically located in road intersections, during construction of these shafts the intersections will be closed to through traffic. During the tunnelling works, within the shafts it is envisaged these intersections can be partially reopened with at least one lane available to the public. It is expected that with the low traffic volumes and alternative routes being available that this will not cause undue traffic issues. Where residents have no alternative such as the North end of Wallace St (2 residents affected) residents' access will be managed with temporary driveways on the road berms and where necessary liaise with residents to close access within work hours to ensure safety.

The interception shafts and EOP connections (as described in Table 1 above) will only be constructed later when access is restored around the primary shafts to ensure continuous access for the local residents.

1.4 Construction staging, equipment, and activities

Overall, the tunnel will progress from Point Erin Park along the alignment to Marine Parade Shafts are required at the changes in direction to provide entry for the TBM (Thrust shafts) and retrieve the TBM (Receiving shafts) and will be constructed as the project progresses ensuring there is a receiving shaft as the TBM commences a drive towards it.

Following completion of the main drive the interception shafts can be constructed adjacent to the main tunnel and the connections to the EOP's either drilled with trenchless technology or laid in open trenches as feasible.

Interception lines and EOP connections are planned to be constructed as follows:

Table 1: Proposed construction method for interception lines and EOP connections

Shaft Name	Location	Methodology	Distance	Depth to Invert	End Depth
SE01	59 Hamilton Road	Steel Casing			**17.8m**
EP202	69 Hamilton Road	Horizontal Drill	85m	1.1m	11.5m
EP195	59 Hamilton Road	Open trench Excavation	6.4m	2.0m	2.3m
SE02	80 Sarsfield Street	Steel Casing			**13.4m**
EOP200	28 Sentinel Road	Open trench Excavation	184m	4.0m	4.7m
SE03	91 Sarsfield Street	Steel Casing			**9m**
EOP201	91 Sarsfield Street	Open trench Excavation	4.3m	4.1m	4.5m
Shaft 2		Secant Pile			14m
EOP1019	11 Cremorne Street	Open trench Excavation	55m	2m	5m
EOP1019 WWMH01	12 Stack Street	Horizontal Drill	85m	7.3m	8.7m
EOP1019 WWMH02	1 Wairangi Street	Horizontal Drill	80m	5m	7.3m
SE04	45 Argyle Street	Steel Casing			**7m**
EOP740A	45 Argyle Street	Open trench Excavation	7m	4.1m	5m
Shaft 4		Secant Pile			**17m**
EOP197	1 Marine Parade	Horizontal Drill	65m	3.6m	14.5m
Shaft 7		Trench box			**6m**
EOP198	22 Marine Parade	Open trench Excavation	3.5m	4.7m	4.9m
Shaft 8		Trench box			**2.5m**
EOP199A	Bella Vista Road x Marine Parade	Open trench Excavation	26.5m	1.8m	2.3m

The following table outlines the construction elements, with associated activities and plant required for the Project.

Table 2: Construction Staging

Part 1 Construction Staging and Activities		
Construction Elements	Activities	Equipment/ vehicles/ materials
Establishment	Main Site established –Salisbury Park • Central Construction support compound set up • Worker welfare facilities established • Temporary traffic management set out	• Trucks • Fencing • Portacabin • Portaloo • Containers • 25kVA generator • Hardfill site area
Enabling	Enabling works • Pot hole services throughout the route • Service diversions	• 6 wheeler truck • Fencing • 5t Excavator

		• Hydrovac • Concrete saw
Satellite Site Establishment	• Traffic & Fencing Management • Environmental controls • Hardfill • Plant Delivery	• Traffic attenuators • Hiab • 4t Roller • Low loader • 12t Excavator • Spoil truck
Shaft Piling	Piling Shaft construction • Temporary excavation support – either Sheet Piling, Casing Shaft or Secant Piling. • Removal of spoil	• 45t Piling rig for secant shafts or steel casing shaft, • 75t tracked crane • Hiab • Tremmie Rack • 12t Excavator • Hydrovac/ sucker truck • Spoil & Concrete trucks • Diesel generator 10kVa
Shaft construction	Shaft Construction • Concrete breaking back • Excavation • De-water shafts • Concrete construction	• Spoil & Concrete trucks • Concrete Pump • 25 to 50t mobile crane • 200cfm Compressor & conc breakers • 2t & 23t excavators • Muck skips • Diesel generator 10KVa • Dewatering pumps
Interception Shafts	Interception shaft construction • Construct drilling platform • Drill 3.5m diam casing • Cut into main sewer	• 75t Piling rig • 75t tracked crane • 12 excavator • 6 wheeler truck • Diesel generator 10KVa
Tunnelling	Tunnelling • Set up tunnelling rig/ equipment • Tunnel boring • Removal of spoil • Install pipes	• Tunnel boring machine (TBM) • 300t crane TBM delivery • 20 foot TBM power pack container • Cooling and lubrication plant • 25t mobile crane • Flatbed truck for pipe deliveries • 6 wheeler truck for spoil removal • Pipe delivery • Ventilation fan • 850 (tbc) kVa Diesel generator • 8t Excavator • Muck skips
Manhole construction	Manhole Construction • Install manholes within shafts • Progress backfilling of shaft around manhole • Removal of sheet piling or casing shaft as required • Break down concrete of secant shaft 1m below ground • Reinstatement of surrounding Roadway	• Spoil & Concrete trucks • 23t Excavator & Breaker • 500kg Compactor • 20t mobile crane • Manholes • Generator 10KVa

Direction Drilling	Directional drill • Excavate drill pits with trench shields • Drill bore • Pull through drainage line	• 12t Excavator • HDD drilling rig • PE welding machine • 10kVa Generator
Open trenching	Open trench construction (limited section as needed) • Temporary excavation support – trench shields • Removal of spoil – to be loaded onto truck and removed from site • Install bedding and then new pipe, manhole backfill • Reinstatement works • Activities will be undertaken during daytime hours.	• Concrete saw • Spoil & Concrete trucks • 23t Excavator • Trench shield • Hydrovac/ sucker truck • 500kg Compactor • 8t Roller • Aggregate, pipes, manholes
Reinstatement	Road reconstruction • Concrete break out and excavation • Kerbing • Traffic Islands & footpaths • Asphalt • Line marking	• 23t excavator & breaker • Spoil & Concrete trucks • Road Miller • Paving plant

2 Construction elements

2.1 Construction Support Areas

Two construction support areas ('CSA's) will need to be established. These will act as hubs for the satellite sites at each shaft and enable short term storage of materials and plant. This will enable a reduction of materials and equipment stored at each shaft location and reduce the size of vehicles and truck movements on the local road network.

Salisbury Reserve is the proposed central hub ('CSA1'), with 94A - B Shelley Beach Road to be used as a secondary compound ('CSA2'). Salisbury Reserve will act as a central site providing immediate support to the work sites, central office compound and worker welfare facilities. The second site at either 94A-B Shelley Beach Rd will be able to provide for access to larger truck & trailers movements will enable better handling of bulk materials and to further reduce truck movements on the local network. These CSAs will be used for the following combined purposes:

- Bulk Delivery and removal of materials and
- Storage of materials (pipes and manholes, piling equipment)
- Storage of diesel (up to 2,000L at any one time)
- TBM spare parts and lubricants storage
- Crane parking
- Loading bay for truck loading and unloading
- Worker welfare facilities
- Main Site office

The proposed locations of the CSAs for the project is shown in Figure 2. The final layouts are to be determined pending availability and adjacent stakeholder requirements.

Each of these sites will be hardfilled to provide an all-weather surface and suitable environmental controls in place along with a security fence, gate controls and semi-

permanent traffic management. Where possible, services will be connected to the grid for the duration of the construction works.

Figure 2: Locality map of proposed CSAs and satellite sites

Figure 3: CSA-1 at Salisbury Reserve

Figure 4: CSA-2 at 94a – b Shelley Beach Road Establishment

The CSAs will be established with fixed hoardings and fencing to secure the site. Topsoil will be removed and replaced with hardfill, compacted to provide a secure, trafficable compound. Site offices will be set up with the intention of permanent local water, sewer and power

connections to reduce service vehicle movements and use of generators and tankers. A Wheel wash will be set up at the exit points and stockpile bins located.

The intention will be to centralise all management and planning staff at CSA-1 Salisbury Reserve with limited management personnel located away from the central location.

2.2 Enabling work and service investigations

At each shaft location service investigations and then service diversions will be undertaken. This will require small construction sites typically involving, a hydrovac, small tip trucks (4t) and 5t excavators unearthing and diverting the existing services at each of the shaft locations. These diversions require smaller site footprints than the shaft construction and will have minimal disruption on the local stakeholders, with typically only shoulder and footpath closures required. Dealing with multiple service providers and potential delays these are undertaken in advance of the main works to ensure there are no delays to the larger project works.

2.3 Satellite Construction Sites

At each shaft location a satellite construction site (CS) will be established with the footprint minimised by using the central compound for material & plant storage. These will be established as the site project progresses and dis established as soon as no longer required to minimise the number of CS's open at any one time.

Each CS will be established and set up for the activities as noted in Table 2. As activities change within each site and the type of plant replaced the traffic management will be revised to ensure traffic disruptions are minimised. That is, when is feasible and safe traffic management and site fencing will be retracted, reopening the road to traffic. When work is complete in an area the road and kerbing will be fully reinstated and a temporary paving surface laid. On completion of all the works the permanent paving will be reinstated across all the construction areas.

A typical CS set up (Shaft 4 in this instance) is shown below in Figure 3.

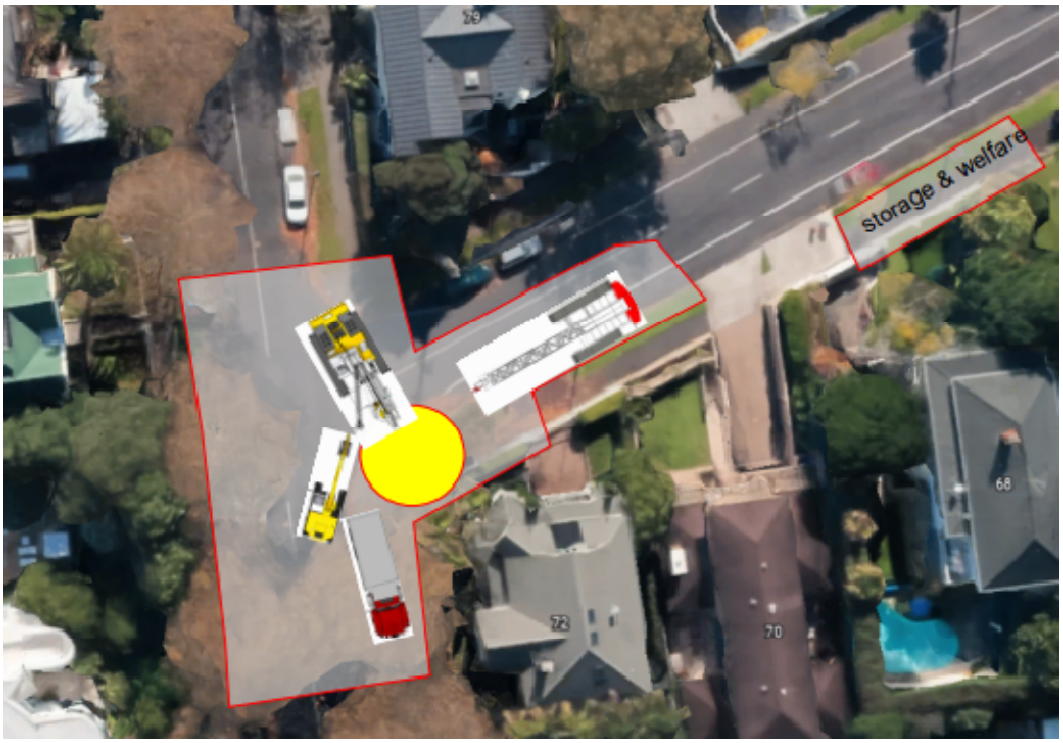


Figure 5: Typical CS set up (Shaft 4)

2.4 Piling shaft construction

Piling will be undertaken with the secant pile shaft being constructed with a bored pile rig and crane. Steel casings and tooling will be stored on site and reused while pile cages will be stored and prepared at CSA-2 to be brought to the site as and when ready to be lifted direct from the truck and into the pile bore. These will then be concreted, with the CSA being used as a marshalling yard for where there is no capacity onsite for waiting concrete trucks.

Figure 7 Typical Secant Pile construction

2.5 Shaft Construction

The piled shaft will then be excavated, breaking down the top of the piles and constructing a capping ring beam. The rest of the shaft will be dug out using a 23t excavator, a 2t excavator in the shaft with a muck bin being lowered and remove by a mobile 25t crane.

At the bottom of the shaft a concrete base will be poured and a thrust block (Thrust shafts) and soft eye poured on the shaft walls.

2.6 Tunnelling

Tunnelling will be carried out using a tunnel boring machine (TBM), this will be lowered into the shaft built up to then bore along the tunnel alignment. As it progresses Pipe sections will be lowered in and jacked behind the TBM. The Earth Pressure Balance (EPB) TBM will remove cuttings into a muck bin behind a locomotive and hauled back into the shaft where the

Figure 6 Typical Secant Pile shaft under Excavation

muck bin being lifted out and loaded on a truck to a spoil stockpile

2.7 Manhole construction

On completion of the tunnel through the shaft and removal of the TBM the shaft can be decommissioned with the installation of the permanent manhole. The annulus of the shaft and manhole can be backfilled with hardfill, and holes punched into the shaft walls to allow migration of ground water. The shaft walls will then be broken down to 1m below road surface and the road reinstated over.

2.8 Interception Shaft

On completion of the main drives the interception shafts will be installed. The drill rig will be remobilised to site and commence drilling the shaft, as it progresses, a 3.5m diam steel casing will be installed. This temporary casing is for securing the shaft while creating a connection to the main pipeline and constructing a manhole. On completion of the manhole the casing will be recovered, and the shaft annulus backfilled.

Figure 8 Interception shaft Casing installation

2.9 Directional drilling

Directional drilling will be used when feasible to limit disruption to the area. A drilling and receiving pit will be excavated and shored within trench shields. Once complete the Directional drill rig will be mobilised to site. The rig will drill a bore using a bentonite slurry recirculation then a PE line will be pulled back into the bore and the annulus grouted.

2.10 Open trenching

Open trench drainage will be traditional construction with the use of trench shields or shoring slide rail systems; 6-wheeler spoil trucks and a 23t excavator will be used. Work will be co-ordinated with the residents to ensure access to their properties as required, utilising road plates or temporary spot backfilling to do so.

2.11 Reinstatement

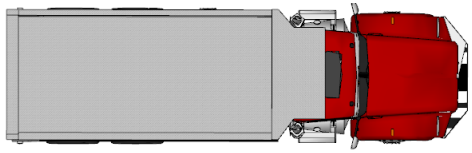
Final reinstatement of the carriageway will be carried out as work at each of the shafts is completed. The kerbing and footpaths reinstated along with speed humps and traffic islands reconstructed and a temporary paving surface laid.

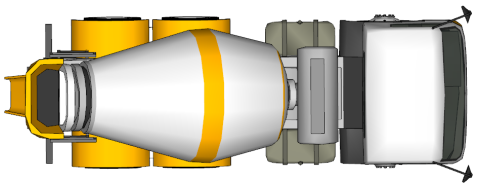
Once all works are complete permanent repaving of all the sites will be carried out in one or two nights, or if traffic movements allow during the day.

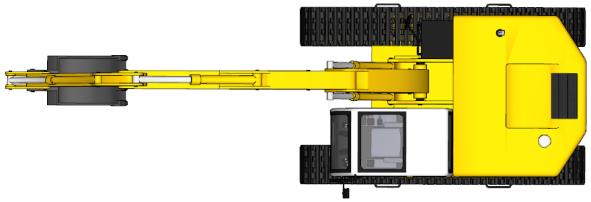
WW00001099 WIWQIP Herne Bay WW Branch 5 Upgrade

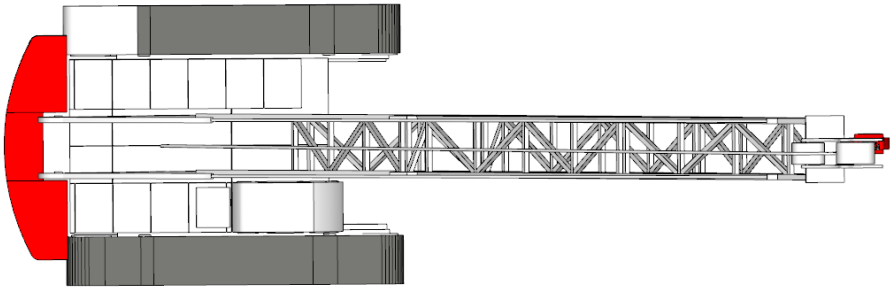
Herne Bay Construction footprints and concept traffic plans

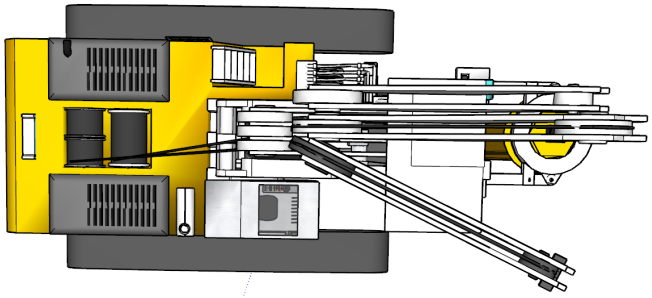
09/05/23 Concept site plans

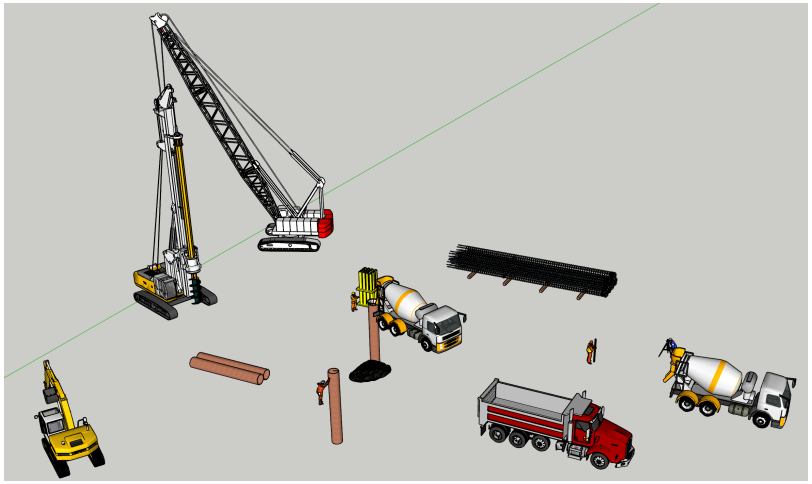


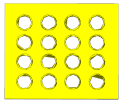


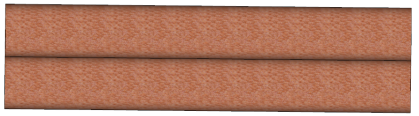


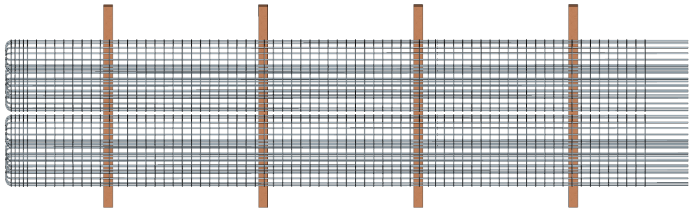












These sketches are not to scale and intended for cut-and-paste into simple 2D mark-ups. Accurate, scaled 3D models are available on request

No.	Date	Revision	By
		FOR REVIEW	??

Design			
Drawn			
Dwg Chk	–	–	
Dwg Chk	–	–	
Approved For Construction	–	–	
	By	Date	

Fletcher

PROJECT: 2D Plan View Plant

TITLE: Tremmie Pile Setup

FCI DRAWING No: SKETCH

REVISION:

STAMP: FOR REVIEW

DATE PLOTTED:

BY: Toby Parsons

ORIGINAL SIZE A1 : DO NOT SCALE

IF IN DOUBT ASK

CAD FILE PATH:

PLAN

SCALE 1:2000 @ A1

NOTES:

1. REFER TO SHEET W-SL007.002 FOR PROPOSED TRUNK SEWER LONG SECTION
2. COORDINATES ARE IN TERMS OF NEW ZEALAND TRANSVERSE MERCATOR 2000 CIRCUIT.
3. LEVELS ARE IN TERMS OF METRES AUCKLAND 1946 LOCAL VERTICAL DATUM.
4. DIMENSIONS / DISTANCE ARE IN METRES UNLESS STATED OTHERWISE.
5. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL EXISTING SERVICES PRIOR TO CONSTRUCTION.
6. DESIGN AT CONCEPT STAGE AND SUBJECT TO CHANGE THROUGH DESIGN PROCESS.
7. NO SURVEY OF THE EXISTING UTILITIES AND FEATURES HAVE BEEN CARRIED OUT.
8. TUNNEL ALIGNMENT SHOWN WITH 2.5m WIDE CORRIDOR EITHER SIDE OF PROPOSED ALIGNMENT.

KEY:

- PARCEL BOUNDARY
- EXISTING WATER SUPPLY (W)
- EXISTING LOCAL SEWER (WSL)
- EXISTING TRANSMISSION SEWER
- EXISTING STORMWATER (SW)
- EXISTING GROUND PROFILE
- EXISTING EOP
- PROPOSED LOCAL SEWER
- PROPOSED TUNNEL SEWER
- PROPOSED SEWER MANHOLE
- PROPOSED SHAFT
- PROPOSED HERITAGE BUILDING
- PROPOSED NOTABLE TREE
- TUNNEL 2.5m WIDE CORRIDOR
- PROPOSED CONSTRUCTION AREA

1:2000 @ A1
1:4000 @ A3
0 20 40 60 80 100 120 140 160 180 200 m

ISSUE	DATE	AMENDMENT	BY	APPD.
1	16.02.23	DRAFT ISSUED FOR CONSENT APPLICATION	GI	MK

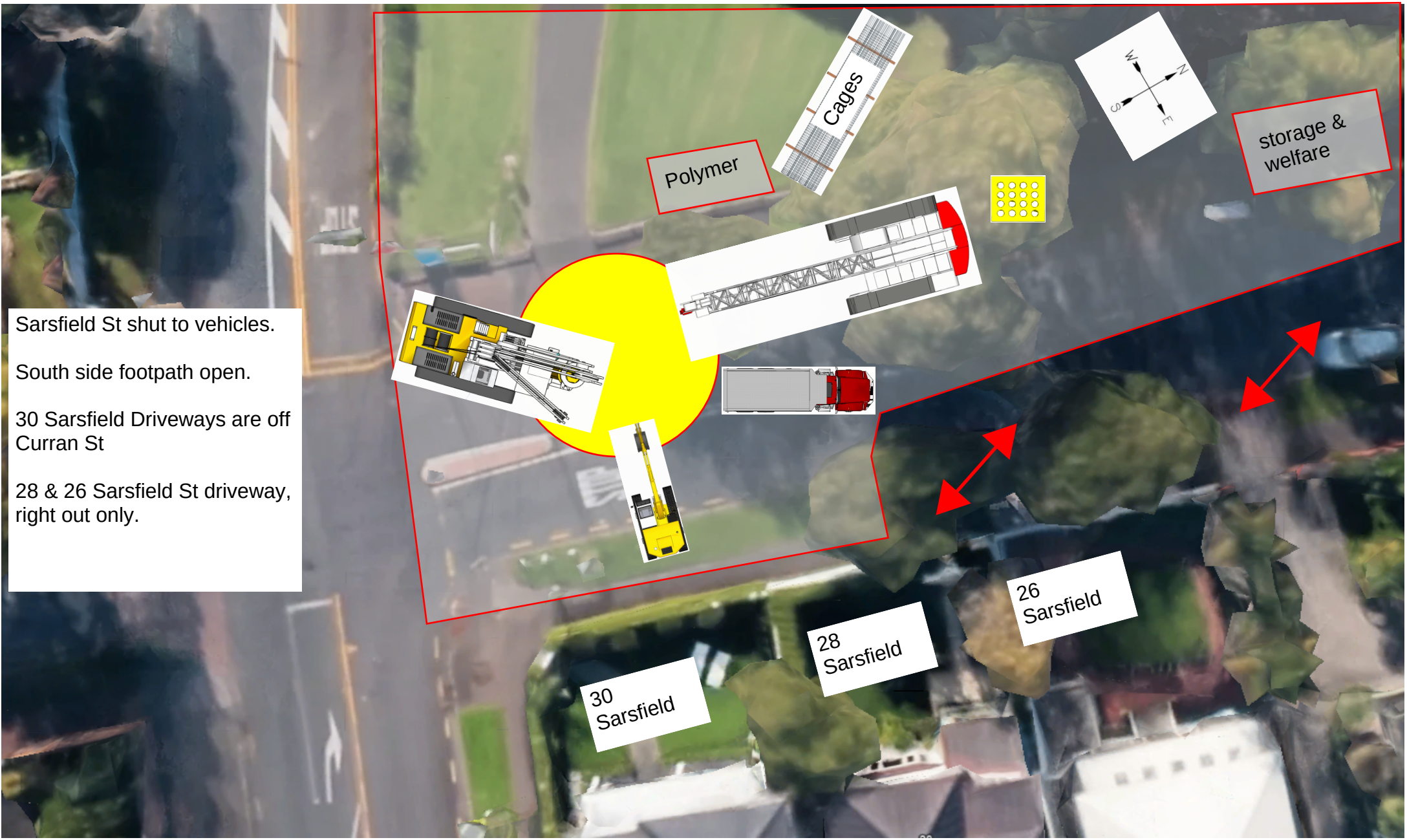
DESIGNED	G.IP	02-23
DES. APPROVED	C.STOKES	02-23
DRAWN	G.IP	02-23
DWG. APPROVED	M.KUDOIC	02-23
WSL DESIGN MGMT.	B.DEVILLIERS	–
WSL PROJ. LEAD	–	–
	BY	DATE

Watercare

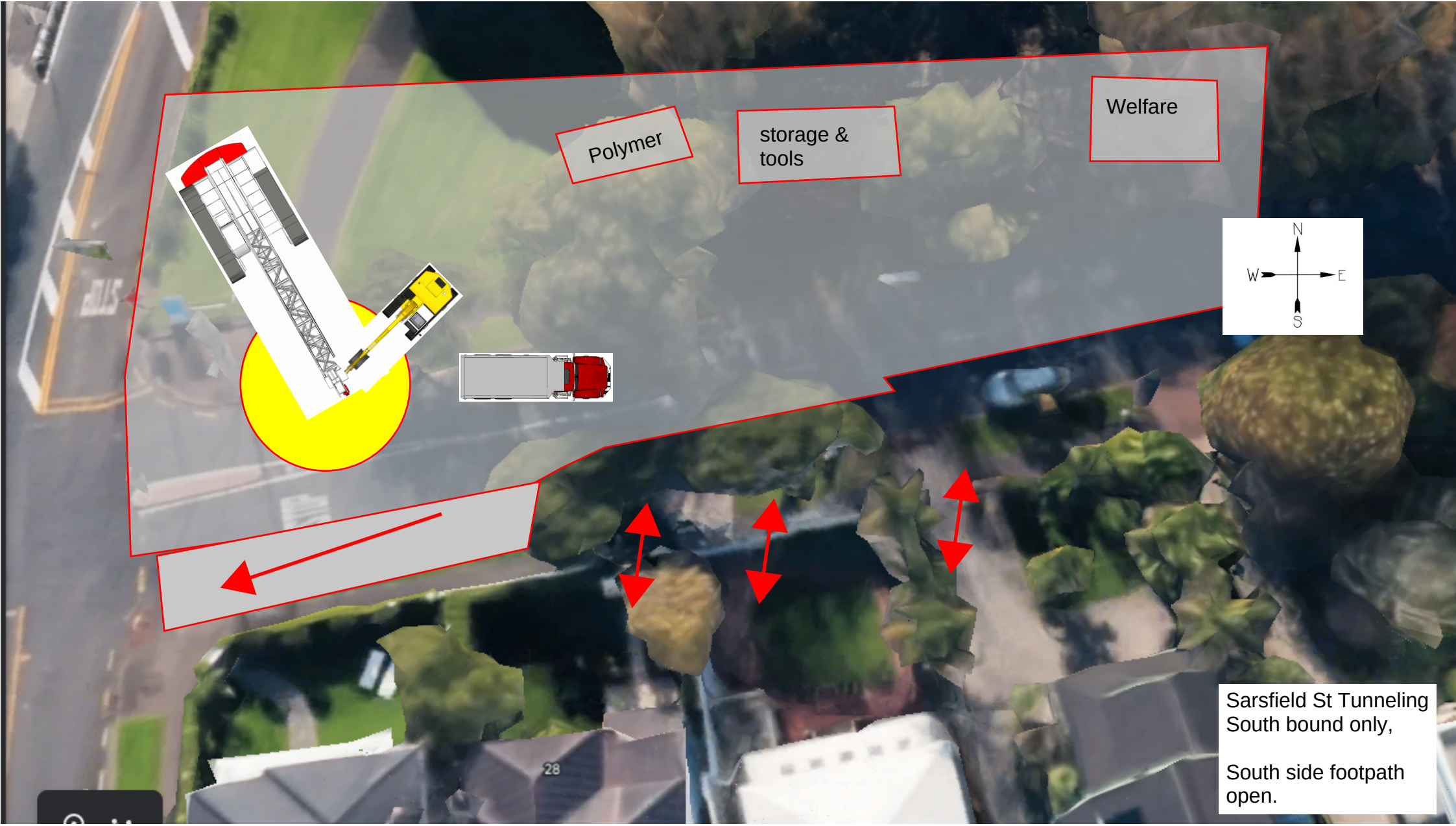
HERNE BAY TRUNK SEWER UPGRADE
MARINE PARADE TO PT ERIN
PROJECT OVERVIEW – PLAN

DRAFT

CAD FILE W-SL007.001	DATE 16-02-2023
ORIGINAL SCALE A1 1:2000	CONTRACT No. 1
REF. No. W-SL007.01	
DWG. No. W-SL007 001	ISSUE 1



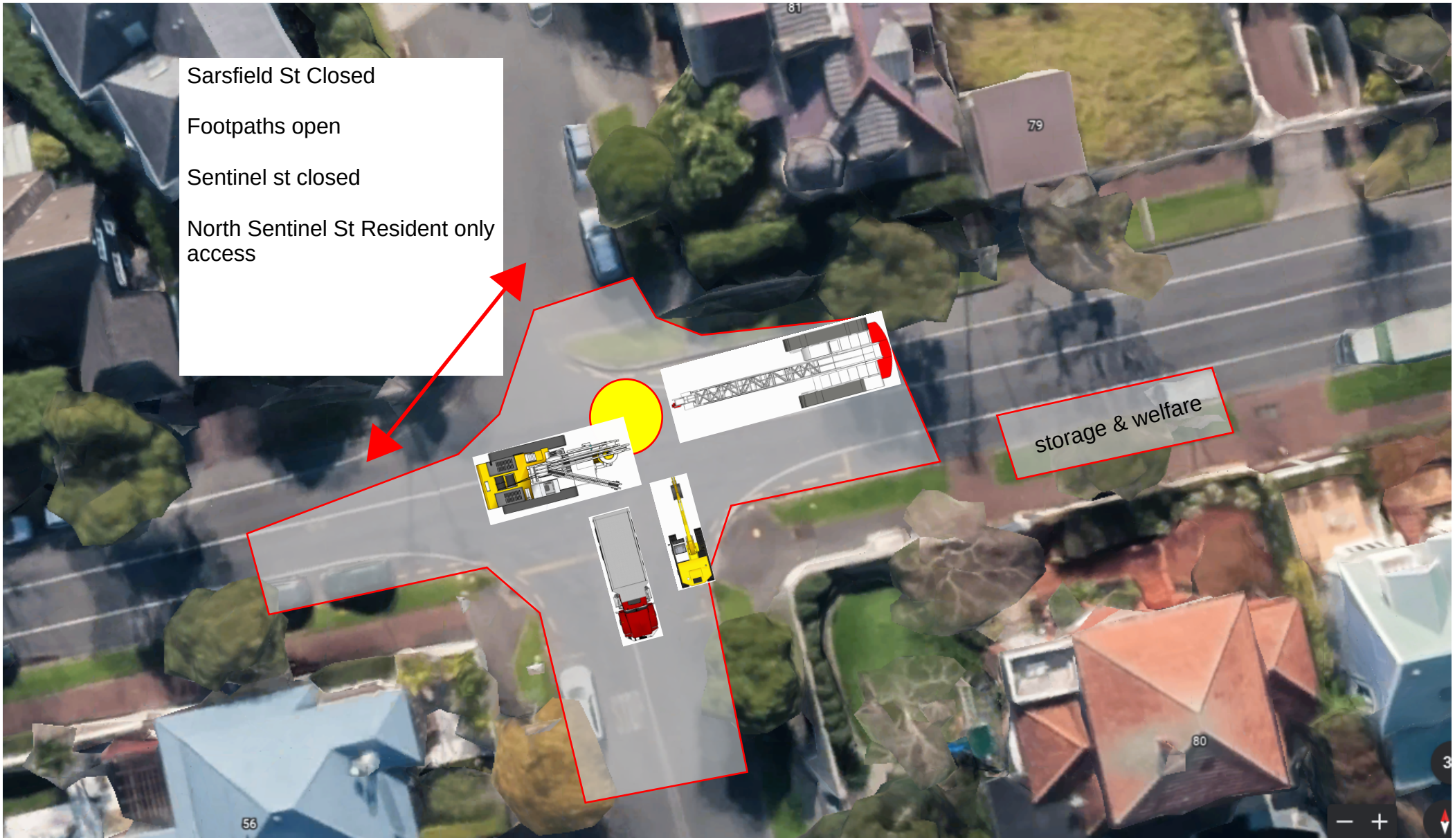
Shaft 1 Pt Erin - Shaft Construction



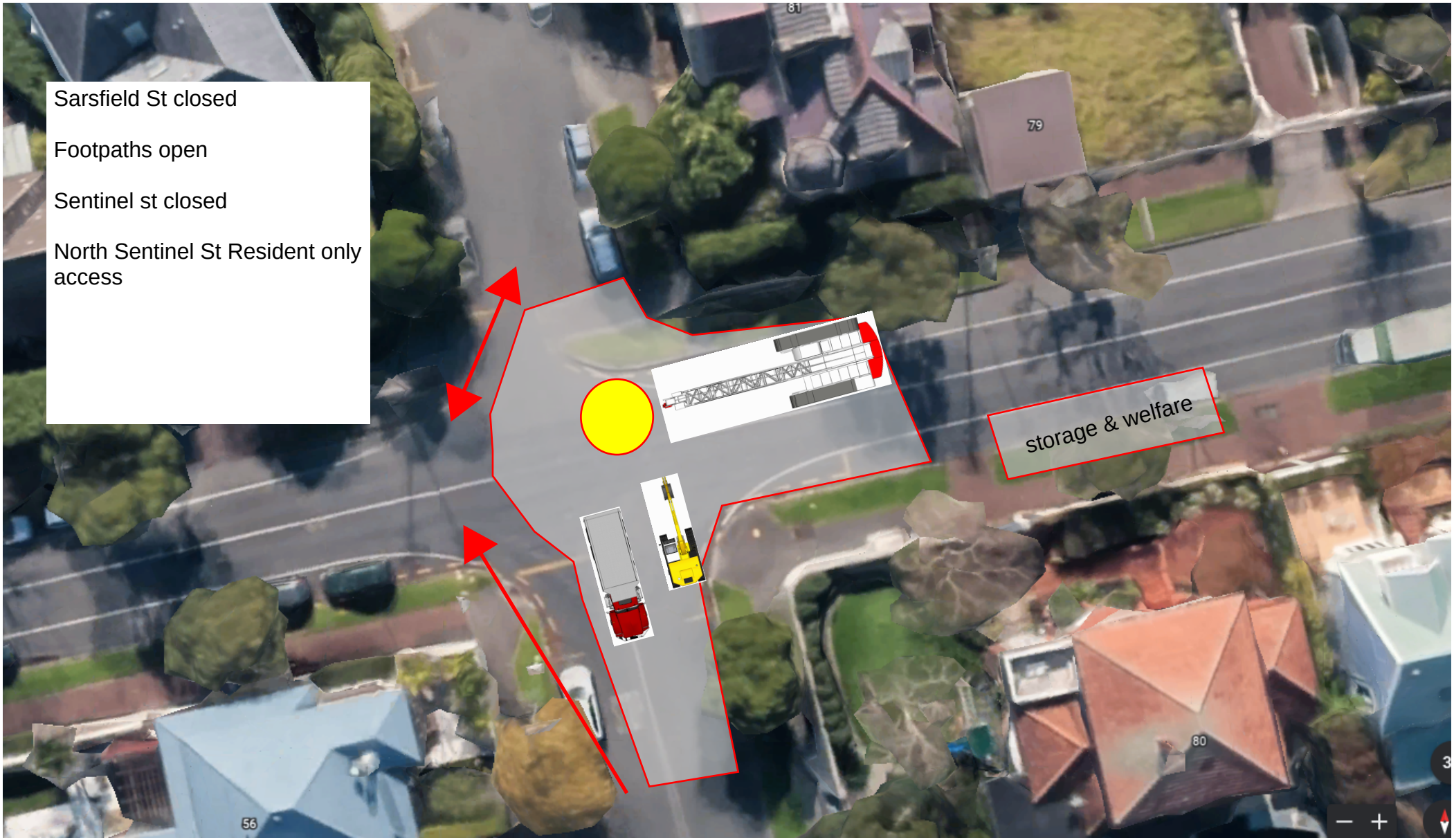
Shaft 1 Pt Erin - Tunneling

SE01 - Hamilton St - Shaft Construction

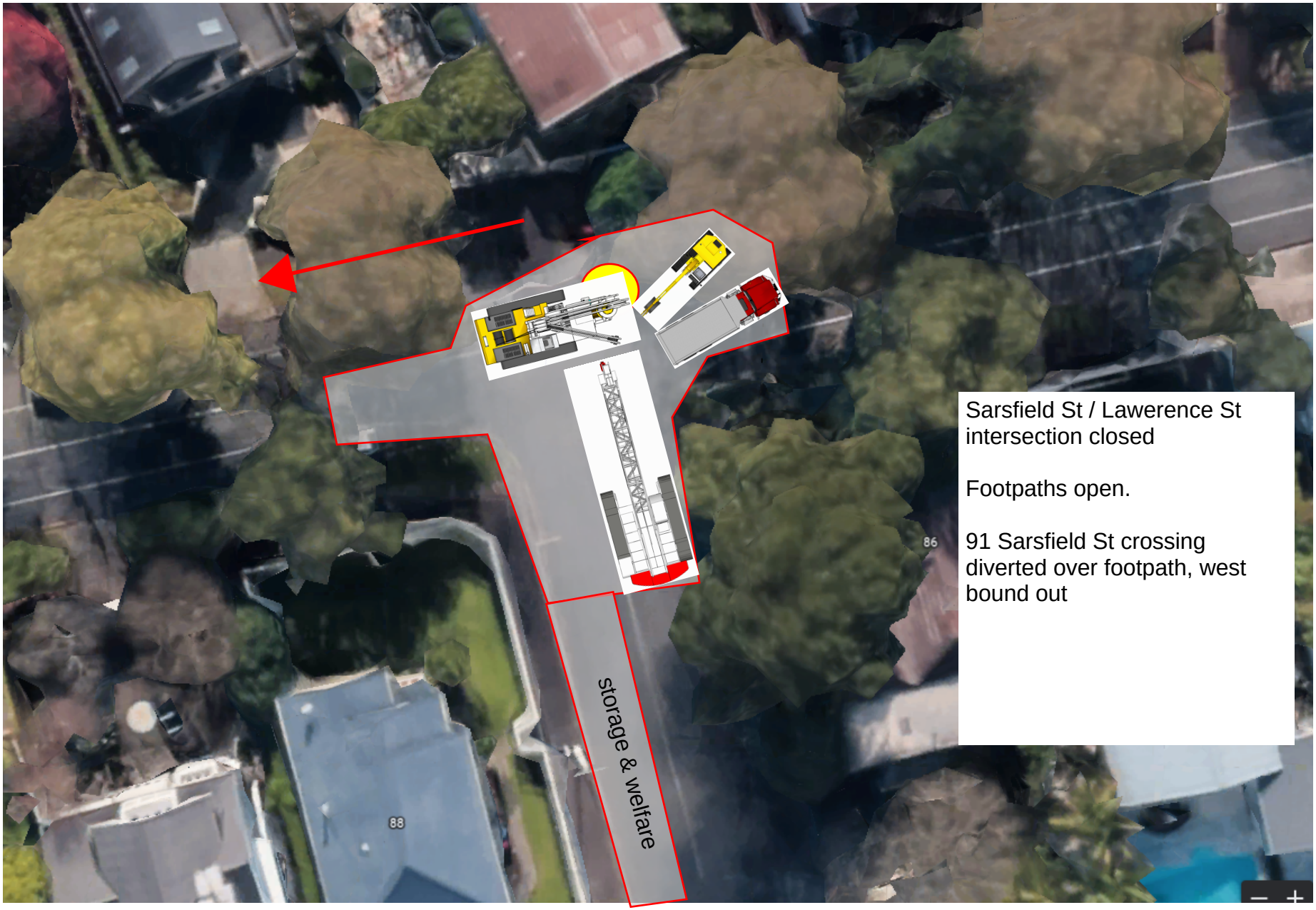
SE01 - Hamilton St
Chamber Construction



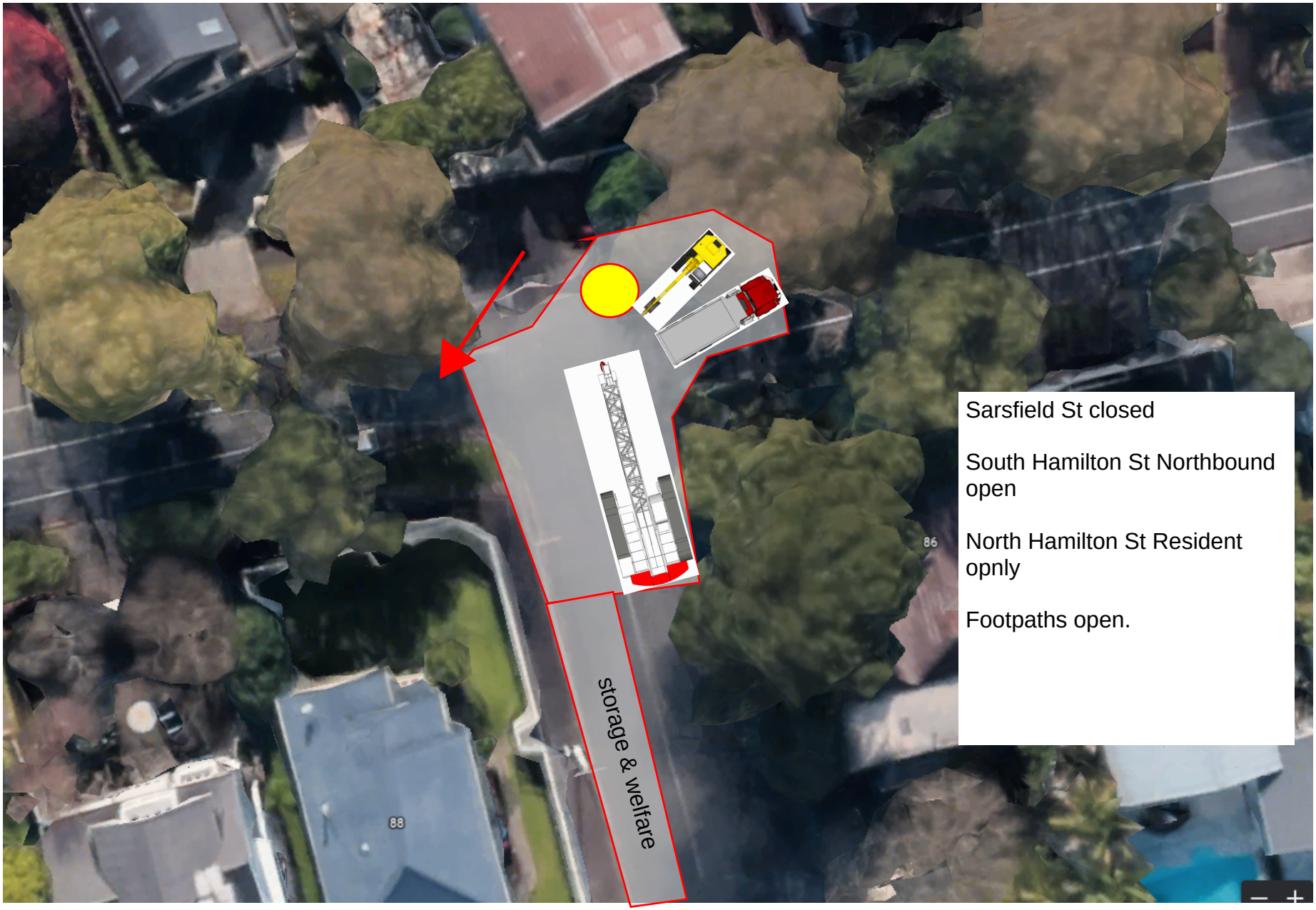
SE02 - Sentinel St - Shaft Construction



SE02 - Sentinel St -
Chamber construction



SE03 - Lawerence St
Shaft Construction



SE03 - Lawerence St
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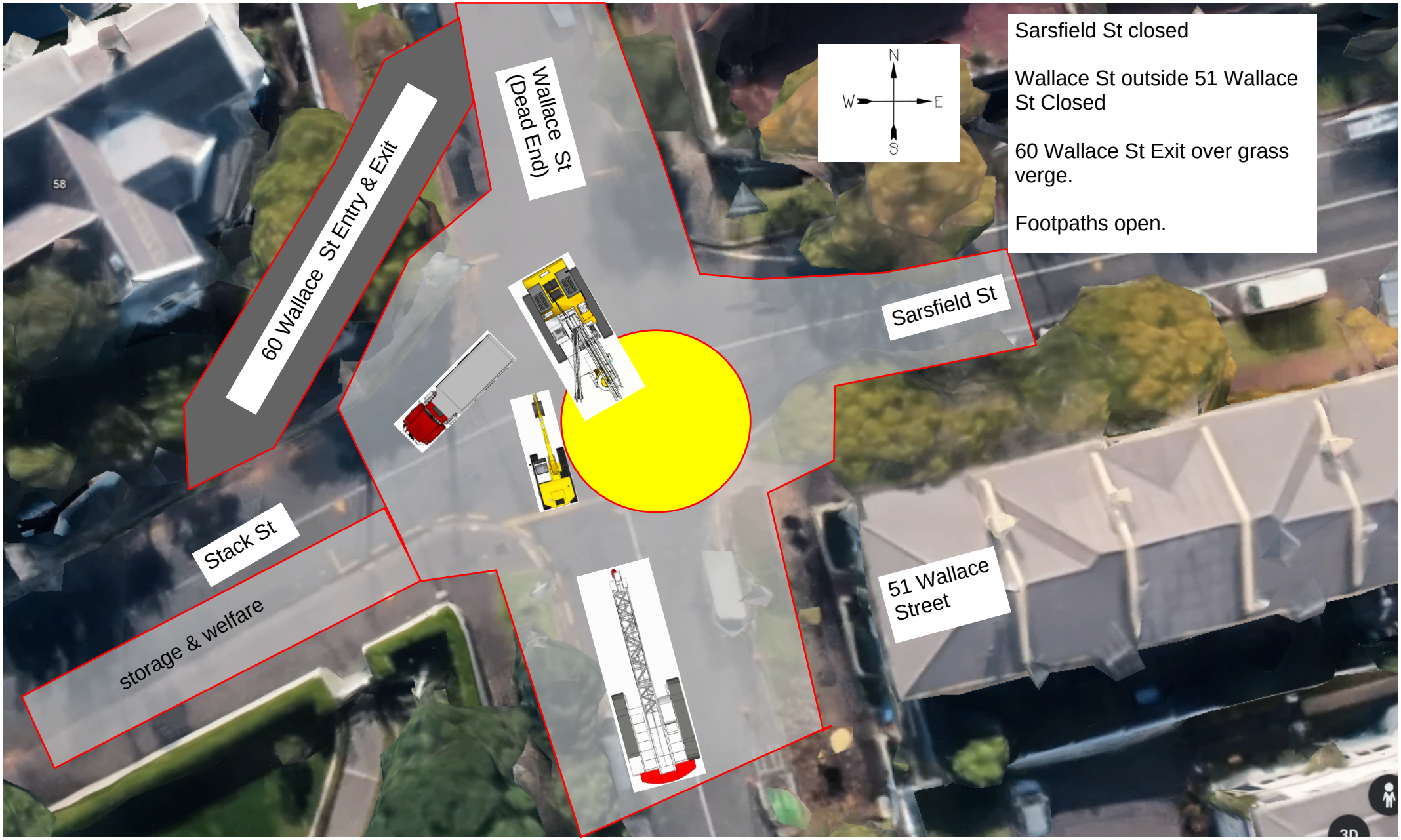
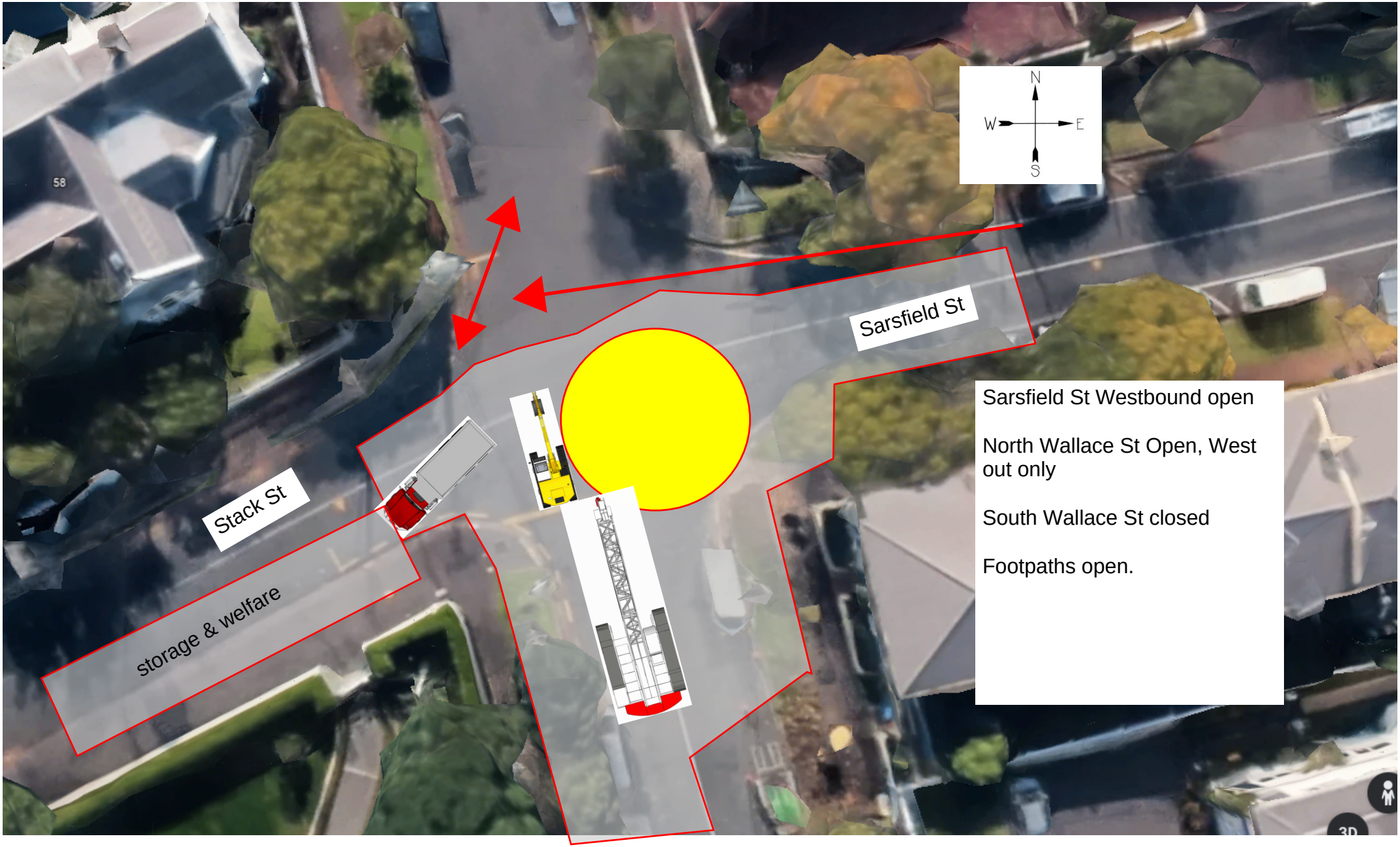
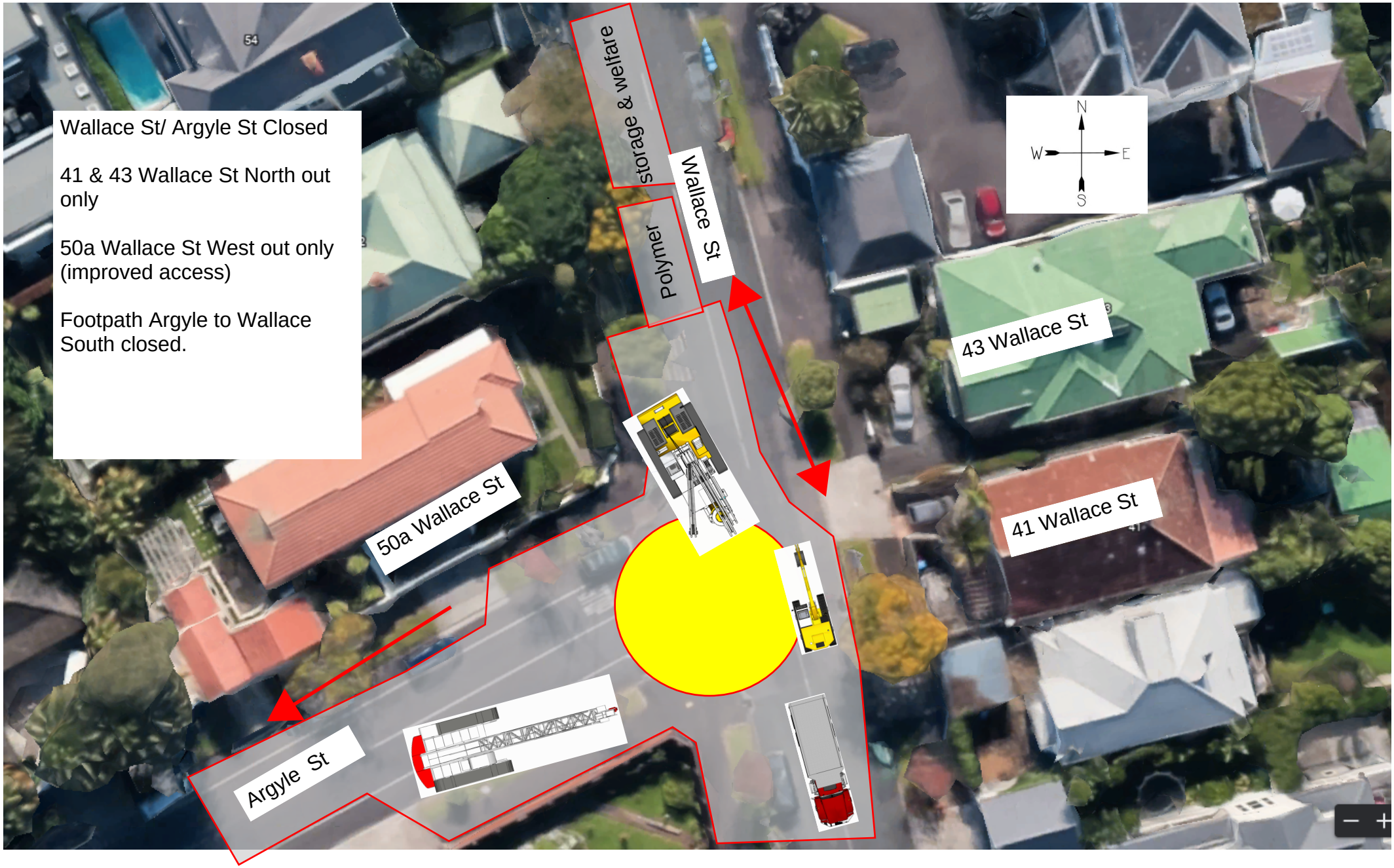


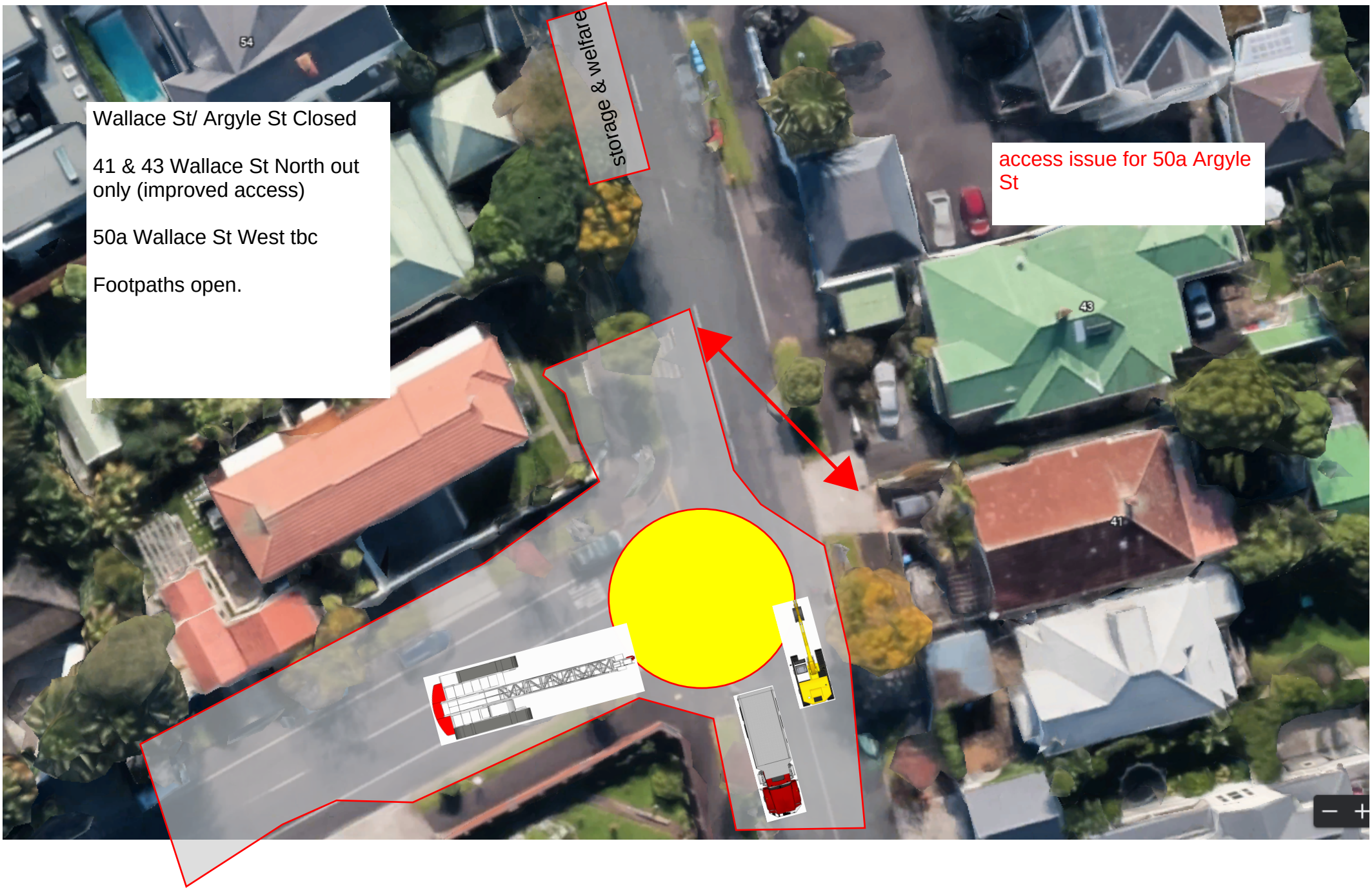
Shaft 2 Wallace & Sarsfield St - Shaft Construction



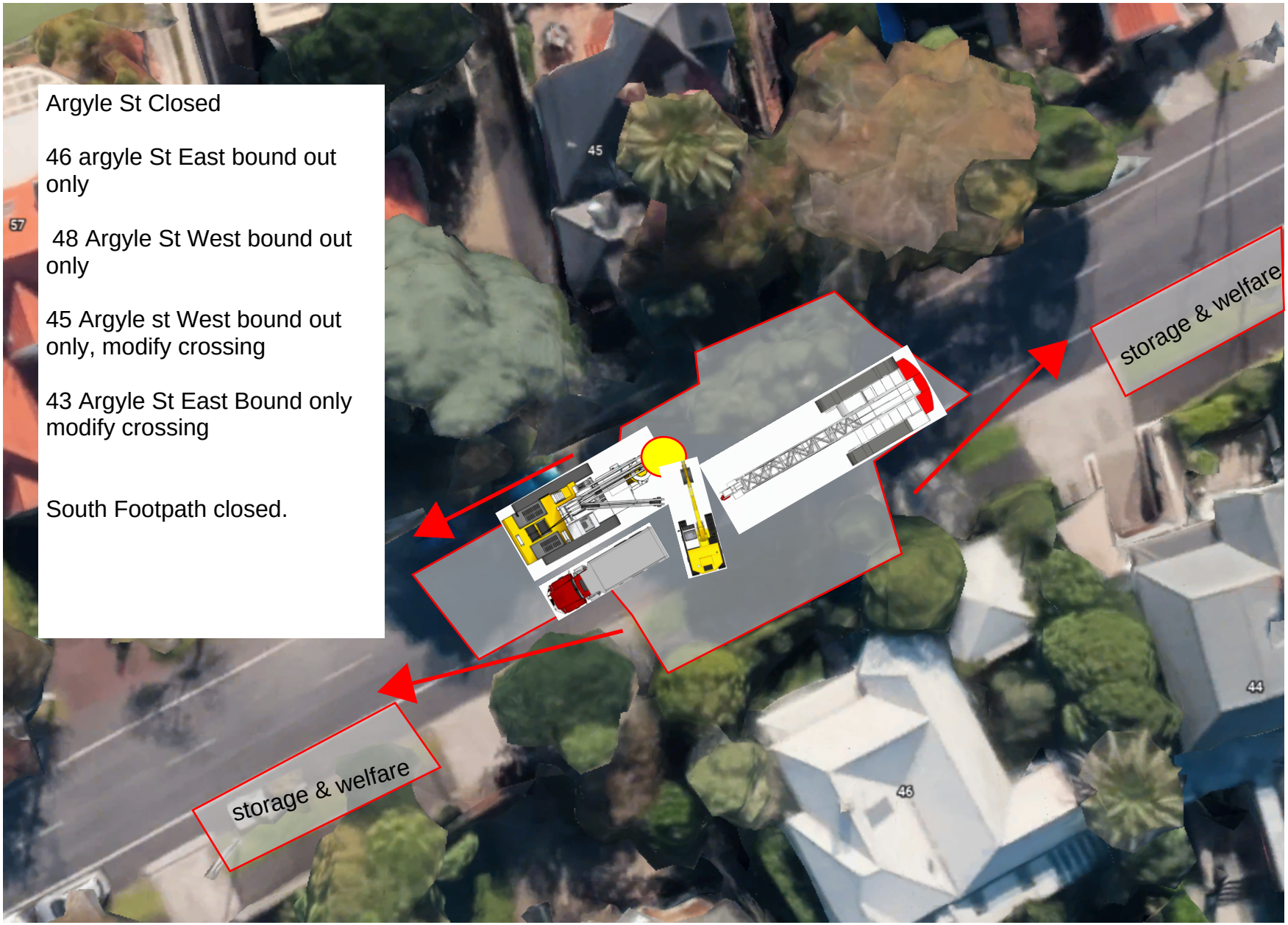
Shaft 2 Wallace & Sarsfield St - Tunneling



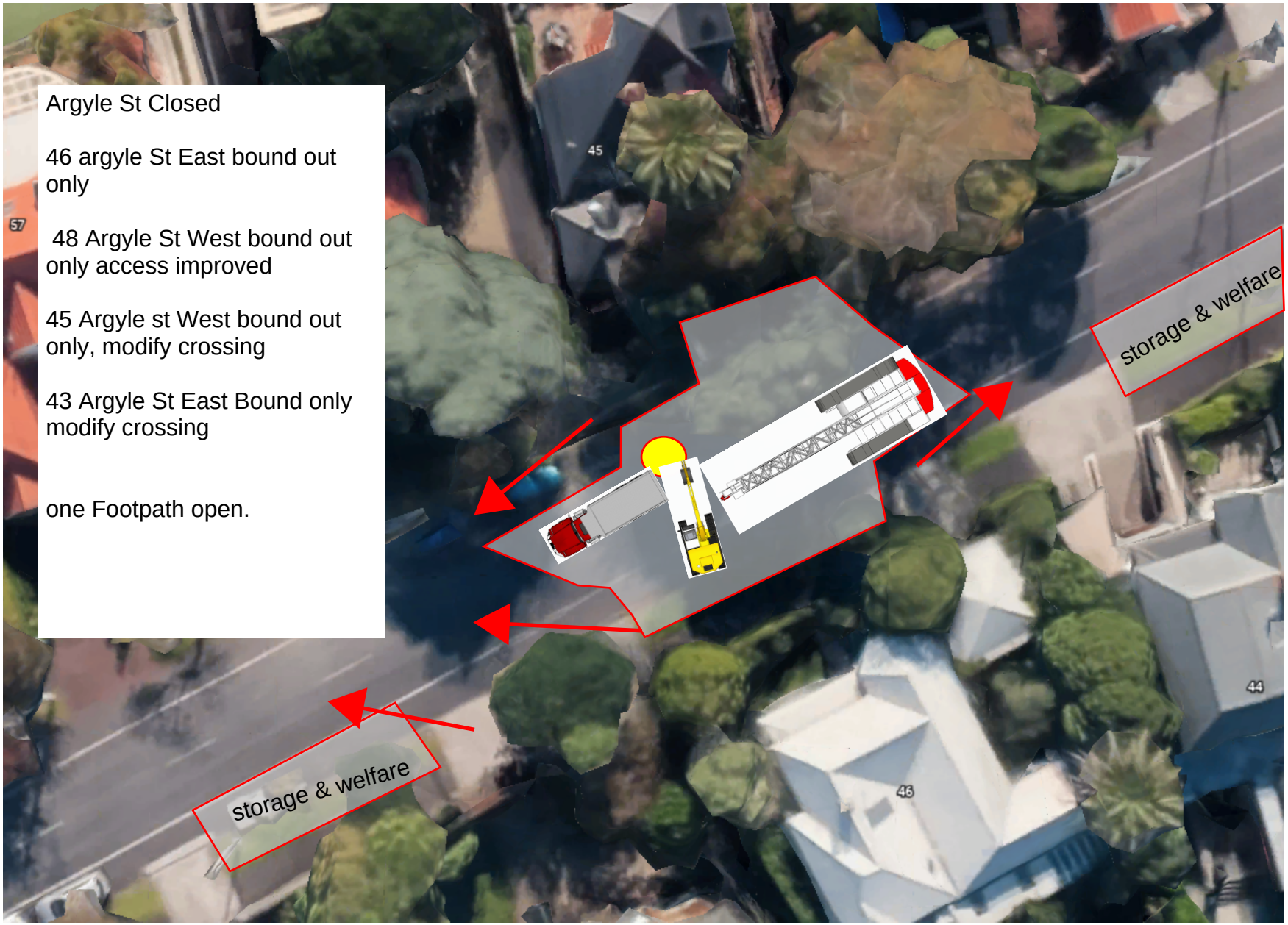
Shaft 3 Wallace & Argyle St - Shaft Construction



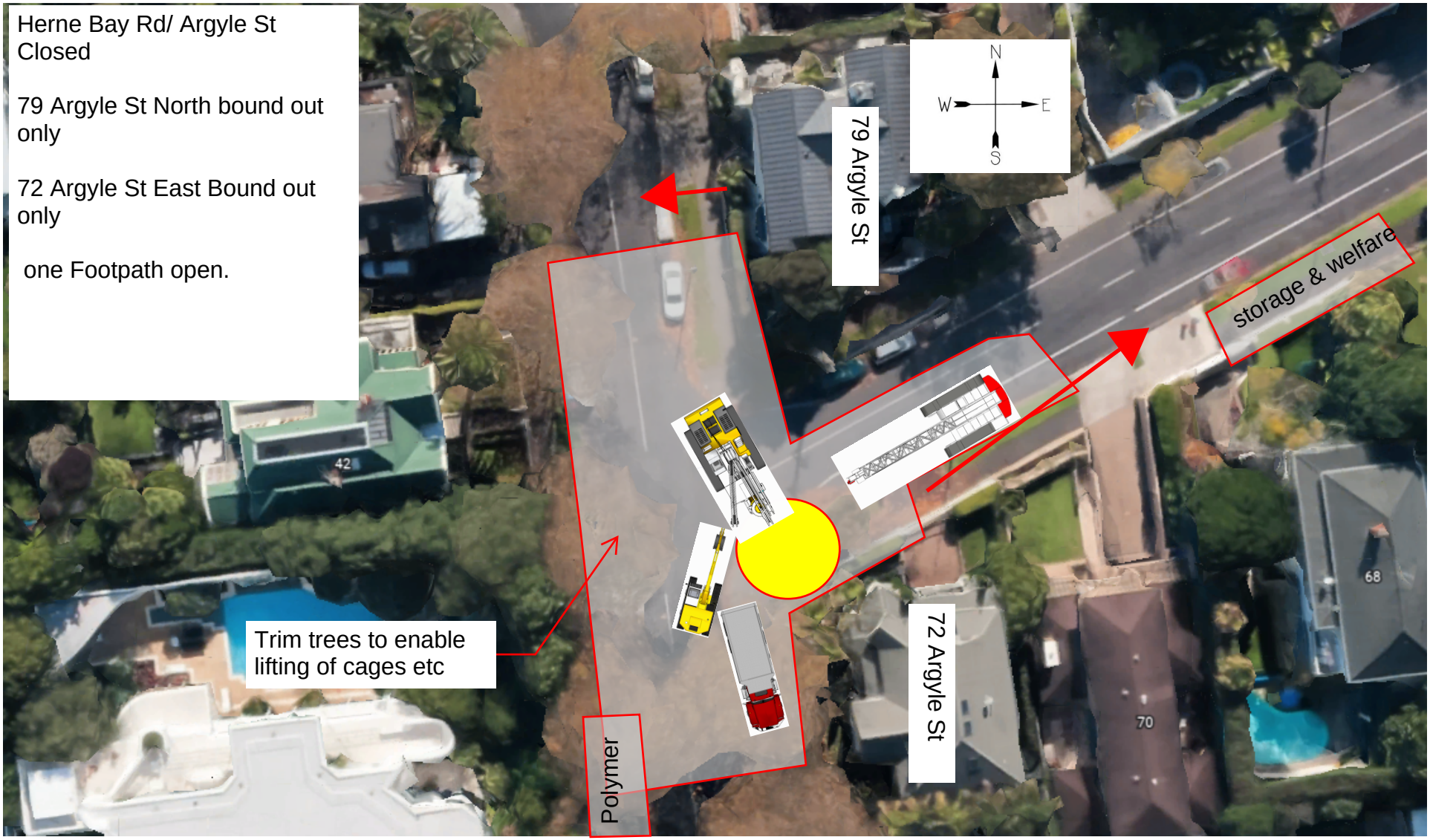
Shaft 3 Wallace & Argyle St - Tunnelling



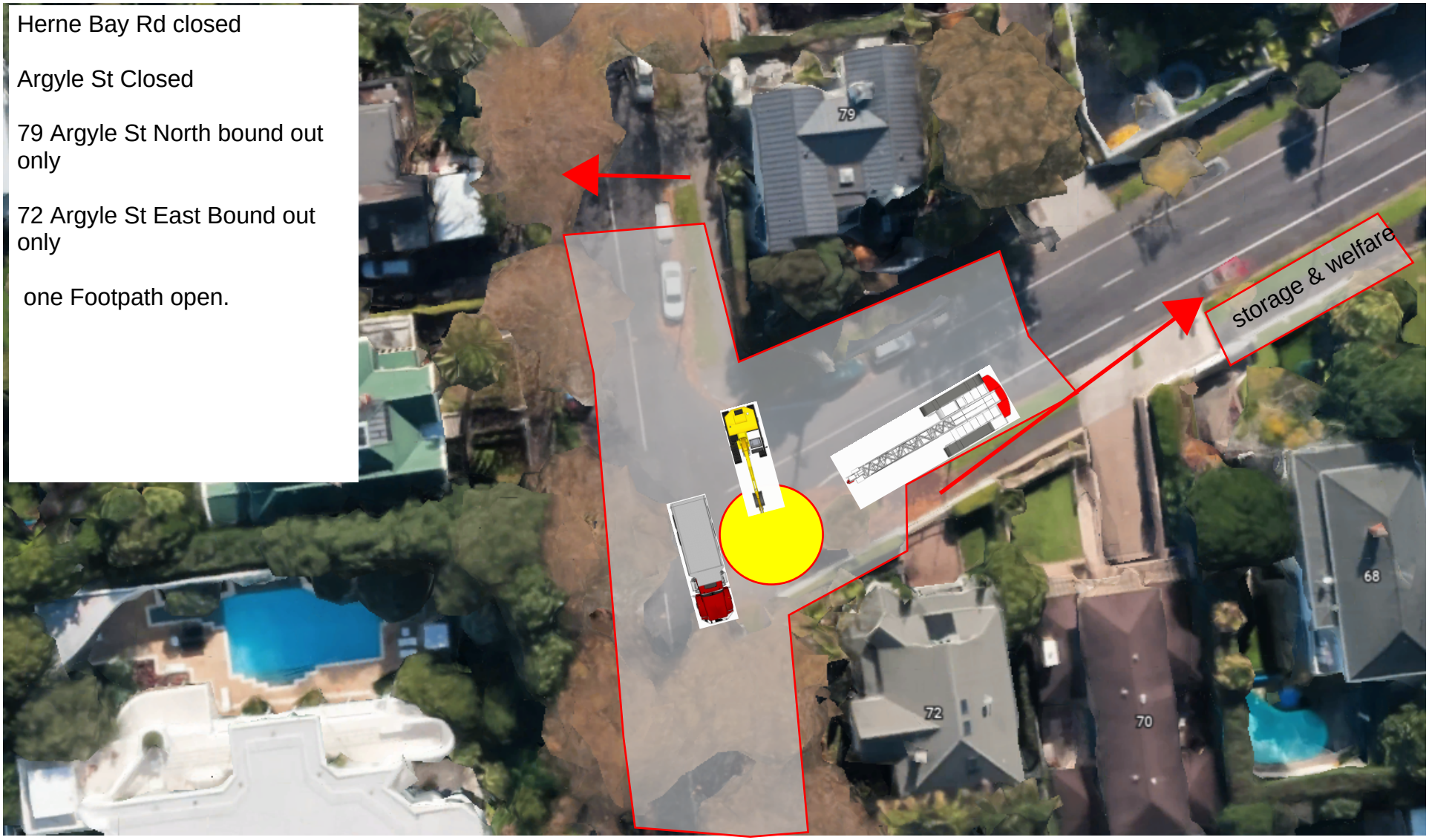
SE04 - Argyle / Clifton Rd - Shaft Construction



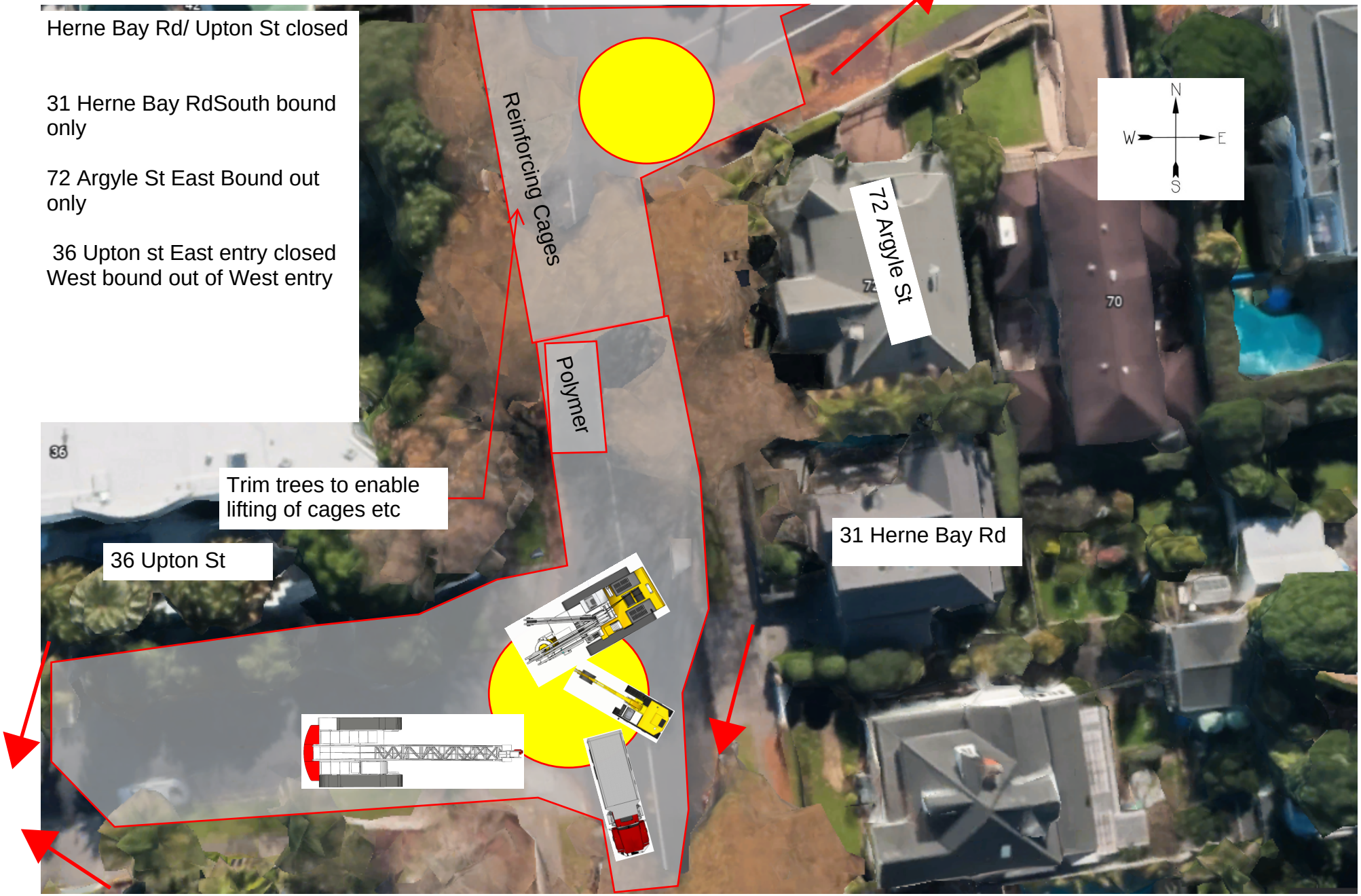
SE04 - Argyle / Clifton Rd - Chamber Construction



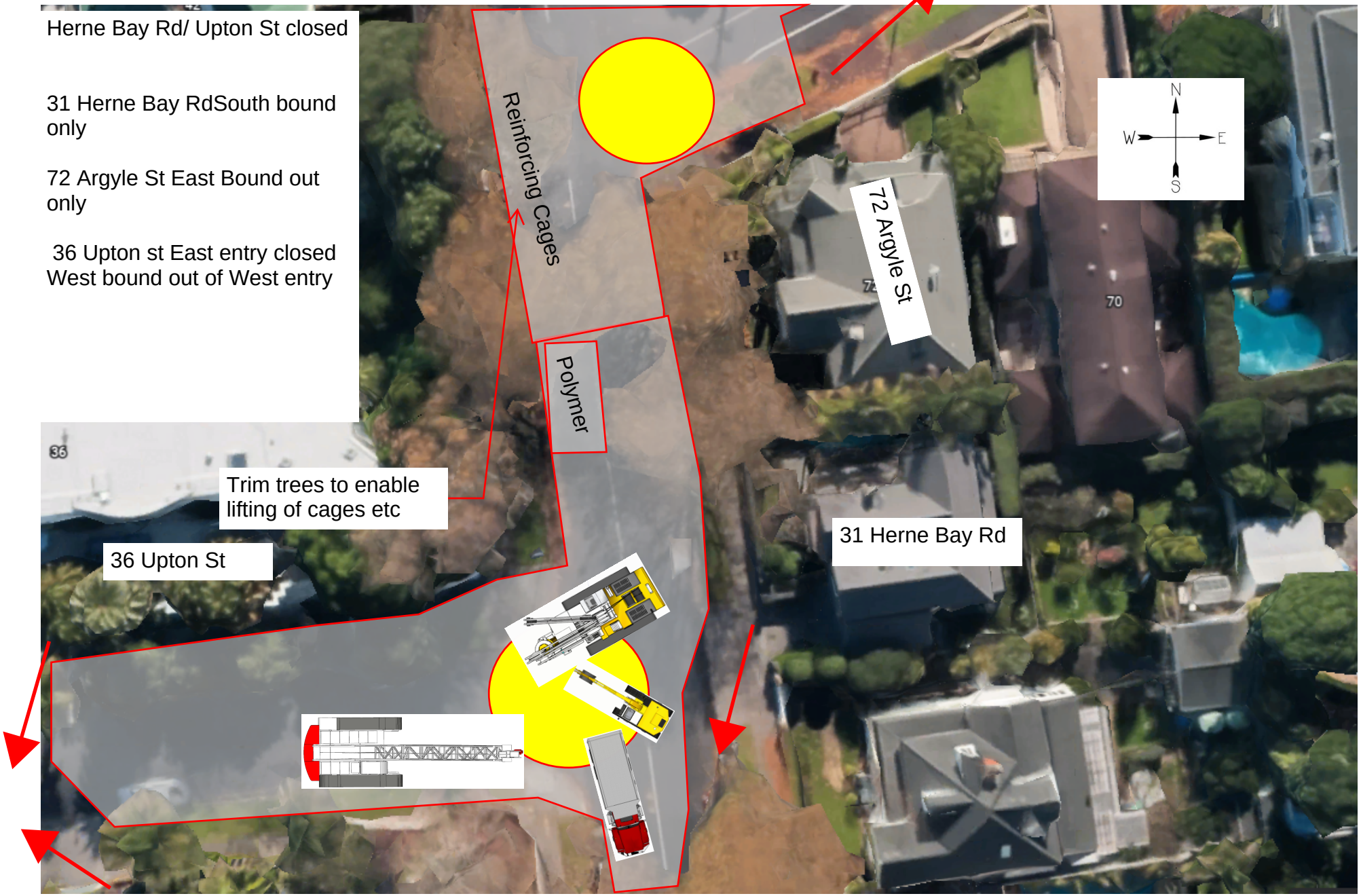
Shaft 4 - Herne Bay Rd / Argyle St Shaft Construction



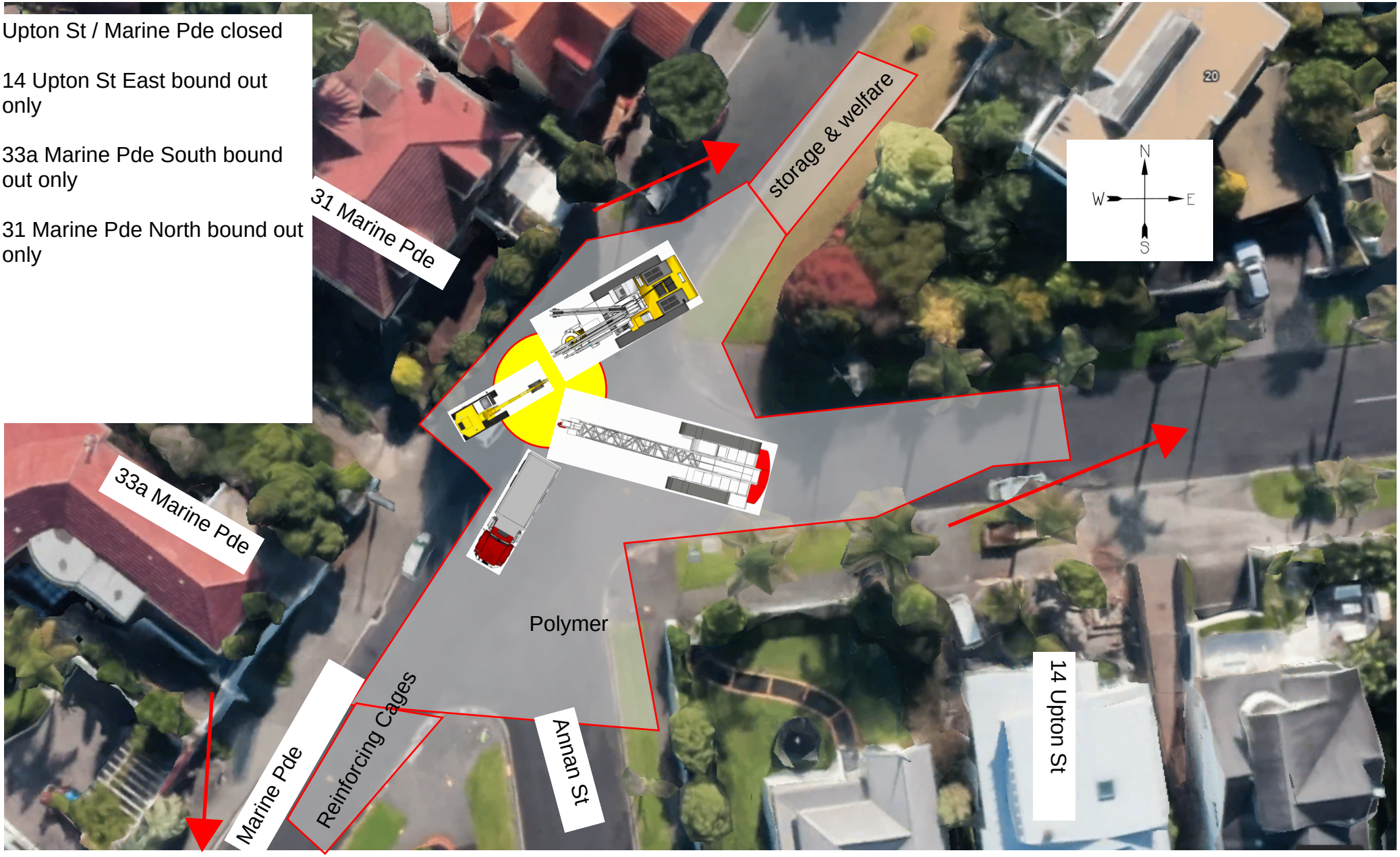
Shaft 4 - Herne Bay Rd / Argyle St Tunneling



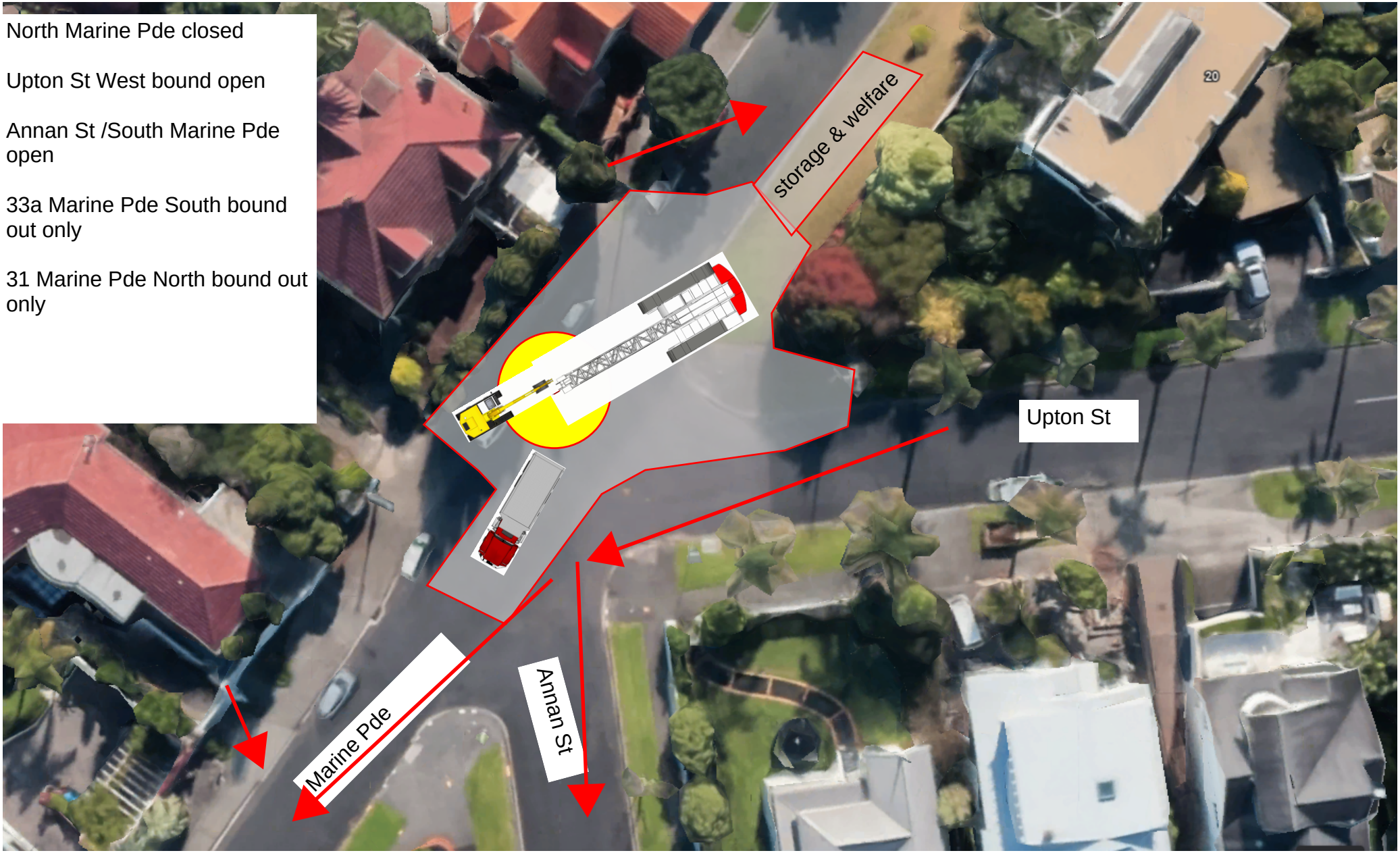
Shaft 4&5 - Herne Bay Rd / Upton St shaft Construction



Shaft 4&5 - Herne Bay Rd / Upton St tunnelling



Shaft 6 - Marine Pde / Upton St shaft Construction



Shaft 6 - Marine Pde / Upton St tunneling

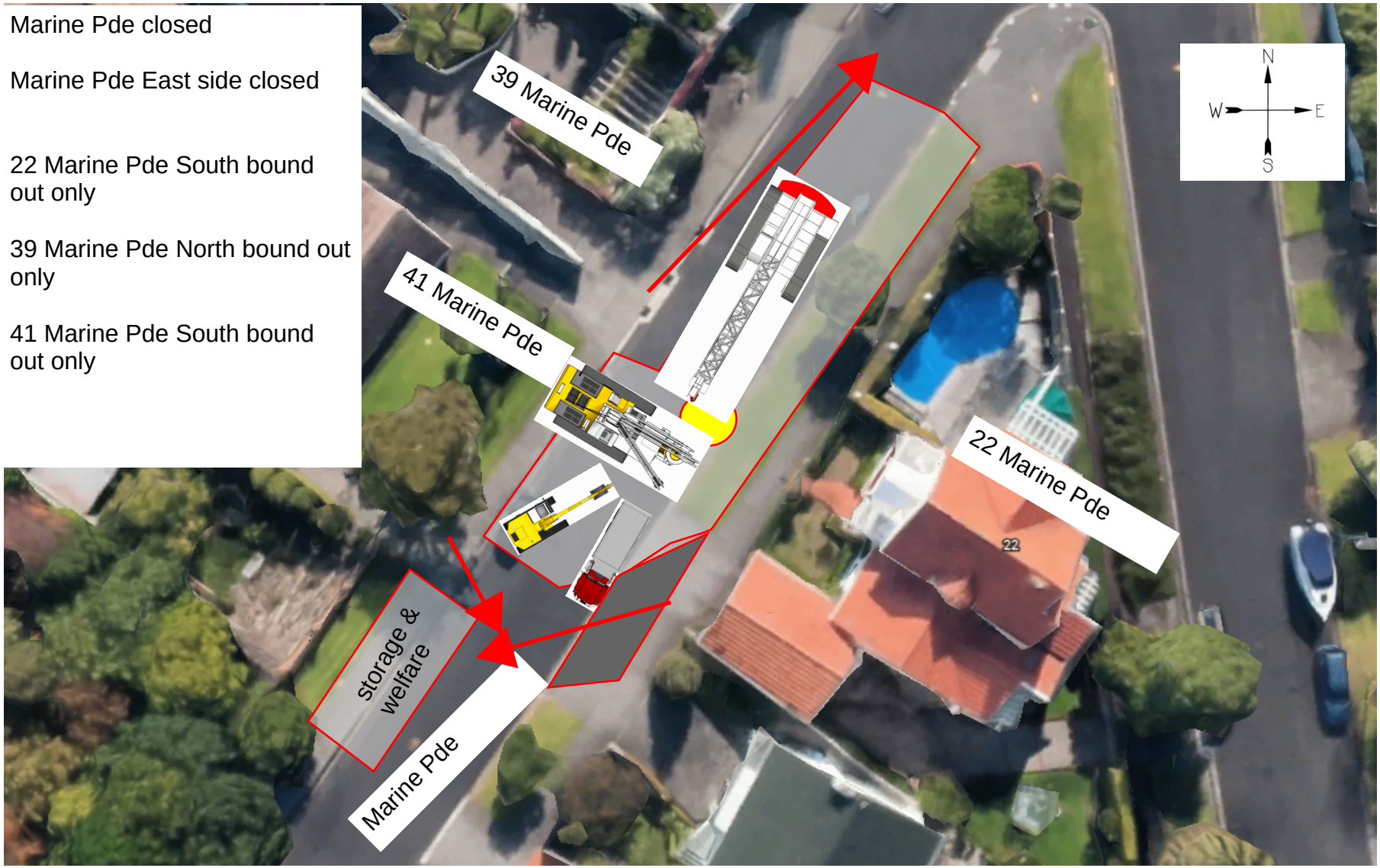
Marine Pde closed

Marine Pde East side closed

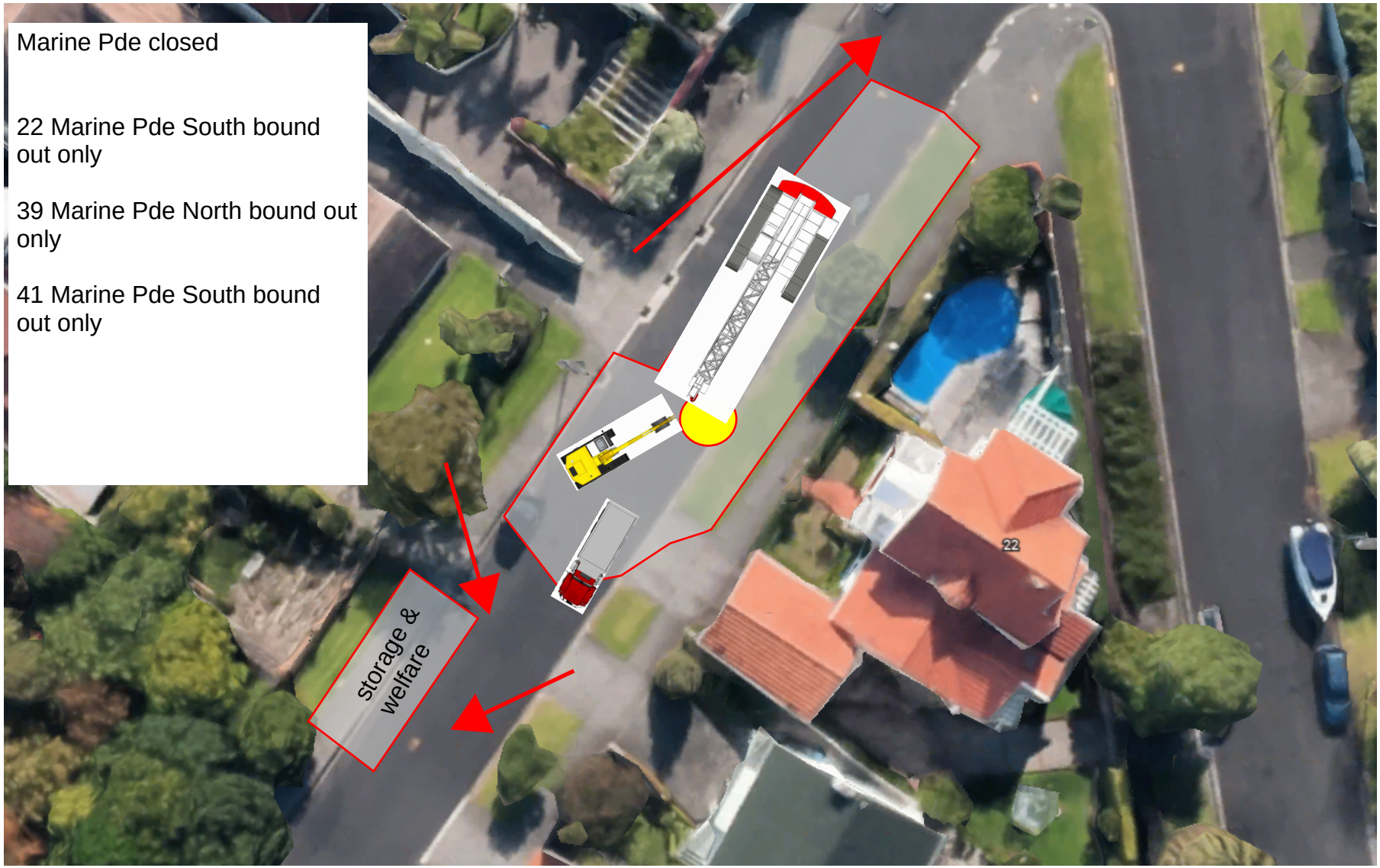
22 Marine Pde South bound out only

39 Marine Pde North bound out only

41 Marine Pde South bound out only



Shaft 7 - Marine Pde Shaft construction



Shaft 7 - Marine Pde Tunneling

Trenching - Marine Pde

Trenching - Marine Pde
Shaft 8 & EOP199a

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