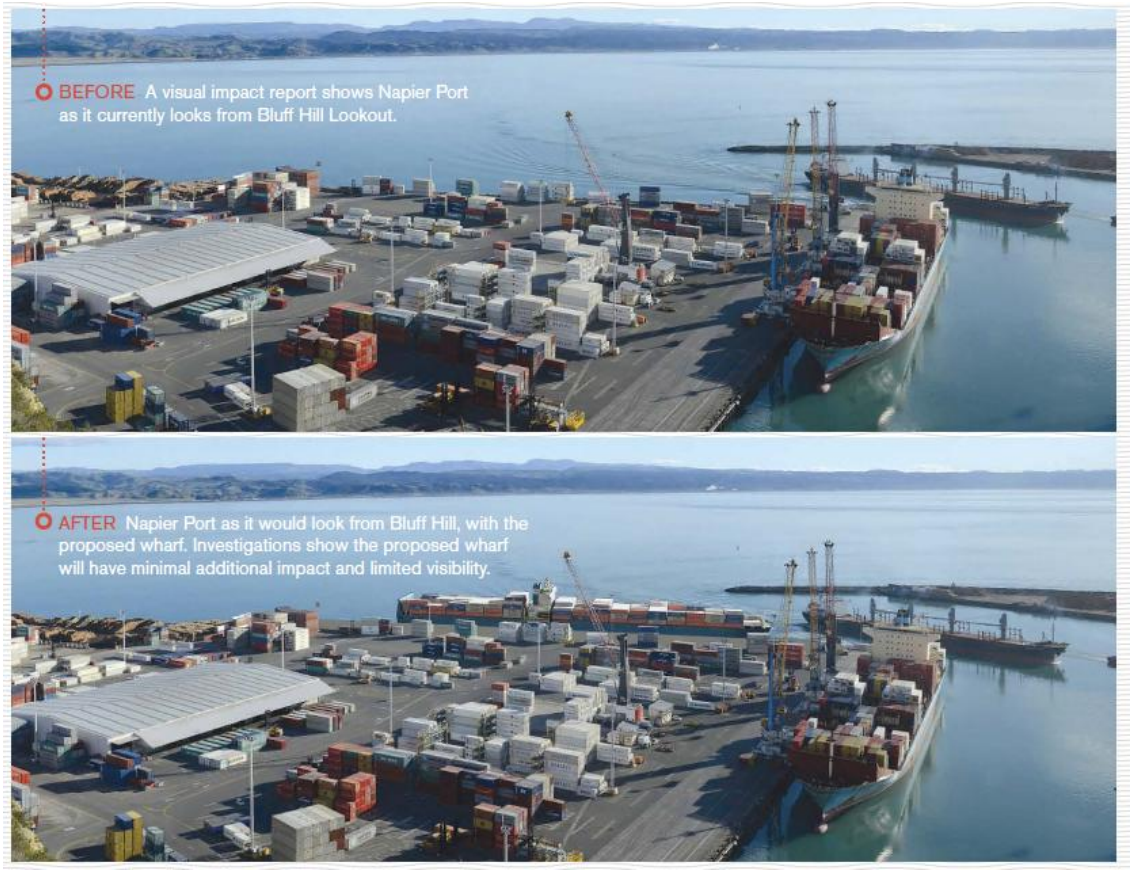
# Napier Port Proposed New Wharf and Dredging Project




## Traffic Impact Assessment

for Stantec New Zealand Ltd
(formerly MWH New Zealand)

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# Executive Summary

MWH now part of Stantec were requested to provide a Traffic Impact Assessment (TIA) to understand the traffic effects of the proposed construction of a new wharf (number 6) facility at Napier Port with associated dredging.

The new wharf number 6 will be approximately 350 metres in length. No “reclamation” is involved and it is proposed that the concrete working surface of the wharf will be constructed on top of new concrete piles driven into the seabed.

Traffic surveys and localised modelling were completed to identify any traffic issues that may affect the performance of the immediately surrounding road network prior to construction, during construction and when the new wharf is operating.

Projected traffic growth based on Napier Port’s operational forecasts has also been assessed and modelled to advise on the future capacity of the Port’s intersections with State Highway 50 (SH50) Breakwater Road, initially for a ten year design frame (2027) and with design life testing for a 30 year horizon.

The investigations have concluded that there will be minor reductions in the operational level of service for traffic using the Western Port entrance during the construction period. The levels of service at this location based on traffic surveys in July 2016 are very good and will remain good or very good throughout the construction period and into the medium to long term based on predicted growth at the Port arising from the proposed wharf development. Accordingly the existing Port access intersections on SH50 can continue to operate with satisfactory capacity for the medium to long term.

In terms of safety there are some concerns around the interaction of heavy vehicles with pedestrians/cyclists at the Western access. In addition the proximity of the rail line results in heavy vehicles short stacking both over the rail line and onto the state highway. Some minor improvements have been recommended as part of a recent safety review of the intersection, however should this problem remain then a longer term solution may need to be investigated, such as signalisation.

# TRAFFIC IMPACT ASSESSMENT

# Napier Port Proposed New Wharf and Dredging Project

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# Part 1 – BACKGROUND INFORMATION

# 1 Introduction

Napier Port is located at the northeast corner of Bluff Hill in Napier, Hawkes Bay.

Napier Port's assets are becoming insufficient to meet the Port's needs in the immediate short-term future as well as in the longer term. This is due to growing trade and the pressures for larger vessels for the shipping industry. Hawke's Bay is seeing substantial investment in new export ventures and regional infrastructure projects that will continue to see export freight grow. Maintaining and increasing peak season capacity is critical to the long term success of the Port's business.

Longer term, the Port will need to invest in wharf capacity and additional cargo-handling equipment, as well as supporting services such as logistics and ship schedules and planning, in order to provide the level of productivity that customers demand and more importantly the ability to handle the volume required over the peak months.

The trend toward larger vessels (longer, wider and deeper) will continue at a faster pace than in the previous 25 years. This is already evident with larger vessels aiming to visit New Zealand ports over the next decade. Coupled with the high number of cruise vessel visitors per annum, this industry can continue to grow only if Napier Port has increased berth capacity at the scale required.

Accordingly Napier Port proposes to expand and upgrade its facilities to meet the increased demand. The new wharf number 6 is Napier Port's first priority. This has been designed to accommodate larger vessels in the future, including the berth pocket of the maximum 14.5 m depth that is eventually likely to be required, and will allow for more large vessels visiting the Port simultaneously. As needed, the swinging basin, fairway and approach channel will be progressively deepened and widened. In the case of the channel, this will involve capital dredging in a location hitherto unaffected by dredging.

The development at Napier Port will meet the region's current and future growth projections and is a critical strategic asset for the wider Hawke's Bay and lower North Island customers and communities

Napier Port plans to seek resource consents for its phased dredging programme and the subsequent disposal of dredge material, andl to build one new berth within its existing operational footprint at the northern end of the container terminal. This will be long enough (350 metres) and deep enough to handle larger vessels and will require the dredging of a berth pocket and swing basin. This may require the Port to deepen and extend the shipping channel in stages from its current consented maximum of 12.8 metres to 14.5 metres. Figure 1-1 shows a summary of the proposed changes.

This traffic impact assessment has been prepared to assess the impact of the Port's proposal on Napier City Council's (NCC) and the New Zealand Transport Agency's (NZTA) transport network.

The Port's eastern (southern) access is Gate 1, which is the main non-containerised cargo entrance to the Port. It is reserved mainly for inbound and outbound fertiliser and logging trucks together with traffic (mainly shuttle buses to and from Napier's "iSite") associated with cruise ships. The access extends east and then runs parallel to Marine Parade and Napier beach before obtaining access via the Port's security entrance.

Gate 2 is permanently locked and not in current use.

Gate 3 is the main container cargo entrance is also the Port security entrance and is located at the western edge of the existing port operational area on Breakwater Road/State Highway 50.
A separated access to the Main Office and Administration Buildings at the Gate 3 provides access to the main Port operational area. As these buildings are located on port land yet outside of the port operational areas, access and security is safer and easier for visitors to the Port.

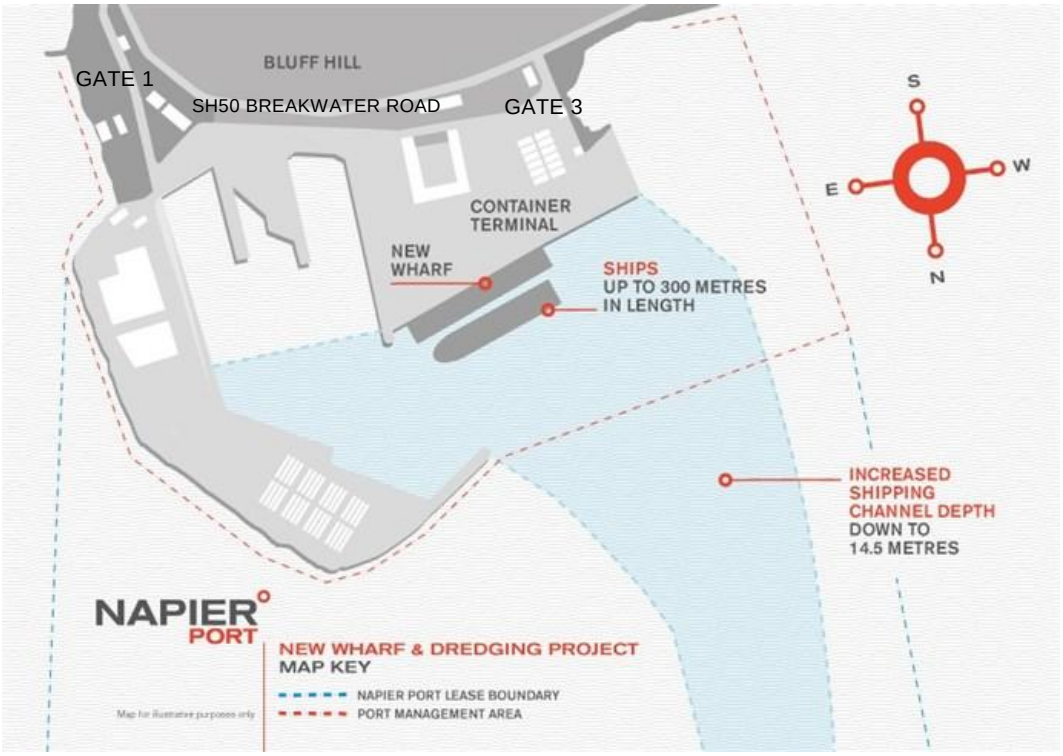


**Figure 1-1: Proposed Wharf and Dredging Project**

In terms of existing public bus services there are none that currently travel along Breakwater Road past the Port. The nearest bus route is 15 servicing Bay View, Westshore and Ahuriri. The inbound service travels along Hardinge Road and onto Shakespeare Road while the outbound route leaves the Napier Bus Terminus along Shakespeare Road turning left into Battery Road. The service runs approximately every hour weekday daytime and Saturday daytime every two hours. The distance from the Shakespeare Road/ Battery Road intersection to the Western Gate is approximately 0.4 km.

All goBay buses are fitted with bike racks that can carry up to two bikes at one time and are free and easy to use, thus enabling some Port workers to bike from the Bus Terminus to the Port[1].

# 2 Current Operational Environment

Both of Napier Port's main traffic gateways are currently Give Way controlled "T" intersections with SH 50 Breakwater Road. There is also a storage facility accessed from SH50 between the road and Bluff Hill. The storage facility is used intermittently when required and has not been assessed as part of this study due to the already highly controlled use of this site.

The layout of the western Port access intersection with Breakwater Road was re-designed, with construction completed, during 2014. This has provided additional inbound and outbound lanes, primarily for heavy vehicle movements and also serves as the main access for the Port's Office accommodation and associated car parking for staff and visitors.

[1] The distance from the library to the Western Gate is approximately 2.7 km and to the Eastern Gate approximately 1.0 km. The distance from the Customs Quay / Bridge Street rotary to the Western Gate is approximately 1.4 km.

**Figure 2-1: Western access** (Source: NCC GIS, 2015 aerial)

A new vehicle booking system has been incorporated into the Port layout, which has significantly reduced congestion at the Port entrance.

**Figure 2-2: Driver using the vehicle booking system**

While the Western access intersection with SH50 is in NZTA road reserve, it is understood that Napier City Council is responsible for the parking and shared path, while KiwiRail operates the single rail track corridor between SH 50 and the PortThe rail corridor ends just to the north of the eastern (southern access) shown in the figure below.

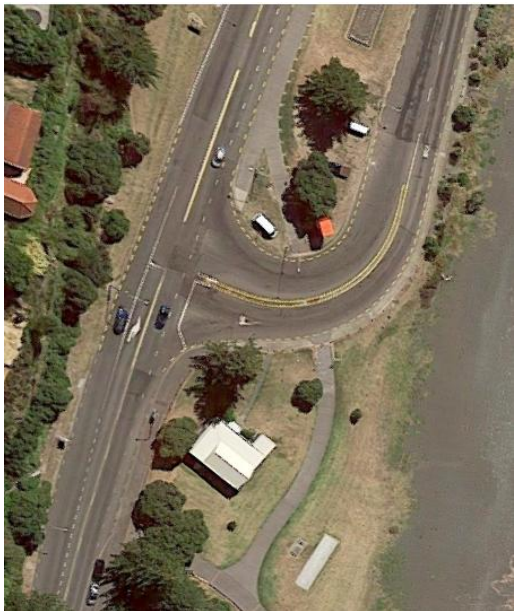

**Figure 2-3: Eastern access** (Source: NCC GIS, 2015 aerial)

The map included as Appendix A shows the road network in the Napier area where the majority of Port related heavy vehicle traffic is accommodated.

Container storage facilities situated within the Onekawa and Pandora Industrial Areas generate truck movements between these sites and the Port's western gate; SH50 and Prebensen Drive provide the main routes for these related trips.

Port traffic to/from SH2 and SH5 north and west of Bayview is via SH2 to Westshore Bridge and West and Customs Quays linking to SH 50.

Port traffic to/from SH2 south of Hastings is via the SH50A Hawkes Bay Expressway and SH50 passing through the 3 leg roundabout at the intersection of SH2 Pandora Road and SH50 Hyderabad Road.

Port traffic to/from Napier CBD is generally via Marine Parade.

The rail corridor accesses the Port from Ahuriri and the north. In the vicinity of the Port, the rail runs parallel to the Ahuriri Bypass and Chatham Street before crossing Breakwater Road/SH 50 where it then runs more or less parallel to the Port on the seaward side of Breakwater Road. The rail corridor passes Gate 3 before terminating adjacent to the Port's security entrance for road vehicles by Gate 1.

A shared cycle and pedestrian pathway extends for the entire length of the rail corridor along the SH50 Breakwater Road reserve; it continues along the short southern non-state highway portion of Breakwater Road south of the Eastern Access. Users of the shared pathway are required to give way to all traffic entering and exiting the Port.

# 3 Associated Transportation Networks

Napier Port is connected to the National State Highway network by SH50, which has been upgraded in the past to provide an effective route for heavy vehicles to avoid having to travel through residential areas. Appendix A provides an overview of existing road connections for the Port.

Marine Parade between the Port's Eastern gate and SH2 is managed by Napier City Council and is currently the only non-State Highway used regularly by trucks to and from the Port.

A rail spur from the line between Palmerston North and Gisborne provides rail access for the Port. Prior to the impact on CentrePort of the Kaikoura earthquakes in November 2016 there were in the region of 8 train movements per day, with approximately double that number since. The Napier to Gisborne rail line north of Wairoa is currently not operational and resurrection of the service does not appear likely in the short to medium term. Therefore this report focusses on road based traffic demands and forecasts.

Napier's cycling and walking network provides direct links from the Ahuriri and Napier CBDs to the Port. While buses do not currently run along Breakwater Road they can carry two bicycles free of charge; bus route 15 also passes through the Shakespeare Road/Battery Road intersection near to the eastern gate.

# 4 Road Safety

## 4.1 Crash History

NZTA's Crash Analysis System (CAS) was used to evaluate the trends in Police reported crashes for the past six calendar years, noting some non-injury crashes for the last 3-4 months of 2016 might not have been recorded at time of accessing CAS (late April 2017).

The crashes on the 3.66 km route comprising SH50 east of SH2 are provided in the table below. The coded crash list is provided in Appendix C along with some other crash tables.

The serious crash involved a motorcyclist losing control; four minor injury and three non-injury crashes were also lost control crashes. Two minor-injury and five non-injury crashes involved crossing or turning at an intersection (particular the Lever Street crossroads). One minor-injury and five non-injury crashes involved a rear end crash or hitting a parked vehicle at or within 30 metres of an intersection. One non-injury crash involved changing lanes.

**Table 4-1: SH50 crashes east of Pandora Road (RS 0)**

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2011 | | | 3 | 3 | 6 |
| 2012 | | | 1 | 1 | 2 |
| 2013 | | | 0 | 1 | 1 |
| 2014 | | | 0 | 3 | 3 |
| 2015 | | | 2 | 3 | 5 |
| 2016 | | 1 | 1 | 3 | 5 |

There have been no vehicle crashes reported in the six calendar years 2011 to 2016 along Breakwater Road south (local road portion) between Coote Road and the eastern Port entrance (start of SH50). There was however one non-injury crash on 4 July 2014 that occurred at the eastern Port entrance involving a car colliding misjudging/not noticing the intentions of a truck swinging wide to turn left into the Port[2].

None of the crashes occurred at the Port western access indicating that there are no safety concerns at the intersection per se. There have been no injury crashes associated with trucks along Breakwater Road and SH 50 east of SH 2 Pandora Road so generally there are no safety concerns with trucks along the SH 50 and Breakwater Road route.

The crash history reveals that there have been no injury crashes associated with trucks along Breakwater Road and SH 50 east of SH 2 Pandora Road.

With respect to non-Police reported crashes recorded in CAS in the same period, none occurred along the same route (start RS 0 of SH50).

Accordingly based on the crash history there is no reason that any additional light or heavy traffic to the Port (or rail associated movements) will adversely impact on road safety.

## 4.2 Western access safety

While the intersection with SH50 has been performing satisfactorily, there are nevertheless safety concerns in the current arrangement. These relate particularly to the shared pathway and the short stacking length between the rail track and the intersection. Following site visits in February and March 2017, concerns were listed in April 2017 in a memo report to Napier Port by MWH, now part of Stantec NZ (refer to Appendix D).

A number of mitigation measures were suggested in relation to the pedestrian/cyclist facility which are being addressed. One issue related also to 4-5 parking spaces within the Port being available to the public with motorists sometimes being confused as to how then to exit the Port. The recommendation was to consider restricting the public from using these spaces given the nearby ample parking adjacent to the State Highway.

However the issue of short stacking, which is a matter principally affecting the NZTA and KiwiRail, requires discussion between the parties. One mitigation option could be to signalise the intersection while incorporating the train movements in the traffic signal controller settings, which is done at a number of signalised intersections including Elizabeth Street by the Waikanae train station. This should better suit the shared pathway arrangement as well, noting that trucks exiting the Port might not only encroach over the rail track while waiting to exit but also block the route used by pedestrians and cyclists who might instead be tempted to walk/cycle along the road.

[2] This crash (ID 201440103) should have been recorded as being at SH 50 RP 0/0 and not solely as Breakwater Road (local road).

# 5 Traffic Surveys

Video data collection comprising turning movements by vehicle class including cyclists and pedestrians using MioVision video detection and processing was undertaken for Wednesday 10 August 2016 (from midnight to midnight) at both the western and eastern gates.

The peak hour flows for the AM and PM peak periods plus the midday peak period are given in Appendix B. These reveal that the peak hour during the day was the 2:45-3:45 pm period.

The highest number of cyclists in any 15 minute period was 2, while the highest number of pedestrians in any 15 minute period was 9 (12:15-12:30 pm).

The NZTA published AADT for the dual loop station 05000001 at RP 0/1.42 between Battery Road and western Gate 1 for 2015 is approximately 5285 vehicles per day with 14 percent heavy vehicles (HV). By comparison the 2015 AADTs along SH 2 were 8140 (4% HV) at the Westshore Bridge (Pandora Road north of West Quay), and 14,805 (7% HV) just south of the Pandora Road / SH 50 Hyderabad Road roundabout (RS 649). These values (given to nearest 5 vpd) were based on 29-32 days valid observed data, presumed to be four 7-8 day surveys during the year. The 2016 values were unavailable at time of writing (mid-late April 2017).

The surveyed motor vehicle flows closely match those recorded at the NZTA station during late May 2016, which as shown in the figure below has typical flows representing most months of the year aside from the peak February/March period.

The figures below shows the pattern of traffic along SH 50 Breakwater Road just west of Gate 3 for the past four years, using the NZTA TMS report procedure Draw Flow Graph.

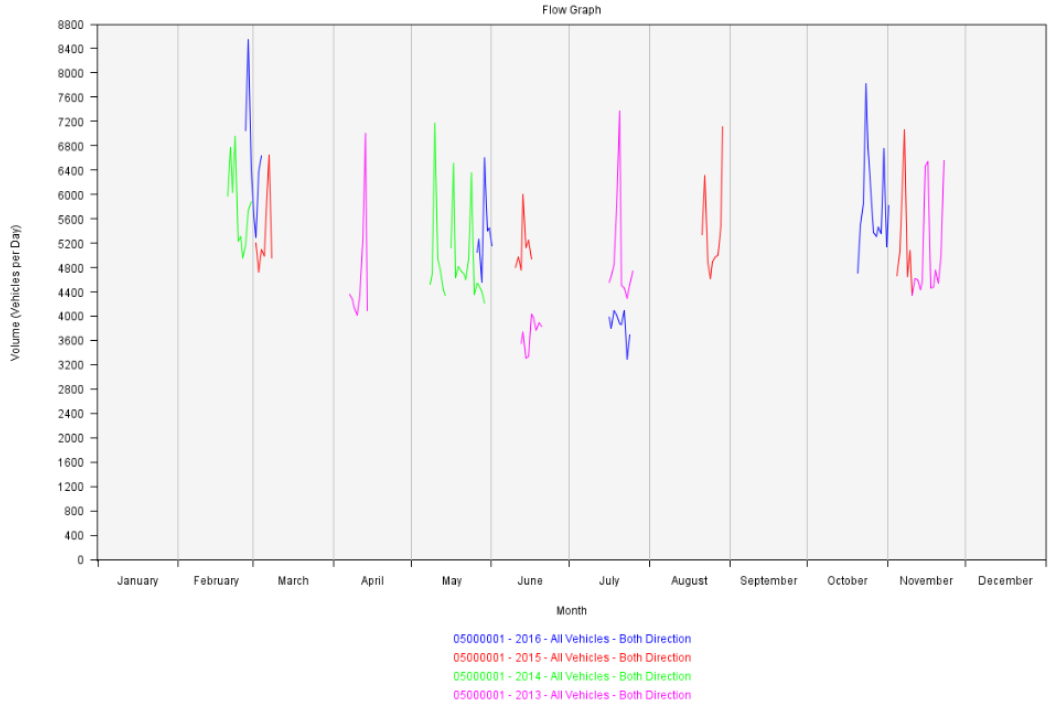


**Figure 5-1: SH50 Breakwater Road west daily two-way flows, 2013-2016**

TMS was also used to derive the quarter / hourly flow profile for the May 2016 week, the graphs of which are included in Appendix E.

They reveal that Friday afternoon flows were slightly higher (higher westbound through flows) than for the average Monday to Thursday, while the (light) vehicle movements along Breakwater Road were highest on Sunday when Port traffic is low (only a few trucks per hour recorded all day). The average weekday peak number of trucks per hour during the daytime was approximately 120 per hour or approximately one truck in each direction per minute.

The appended graphs support selection of the Wednesday mid-afternoon peak period as the analysis basis for coincidence of peak Port traffic with passing through traffic along SH50 Breakwater Road.

# 6 Current Traffic Generation

The current traffic turning flows observed during the weekday peak hour entering and exiting the Port are given pictorially in Figure 6-1 and tabulated in Table 6-1 and Table 6-2.

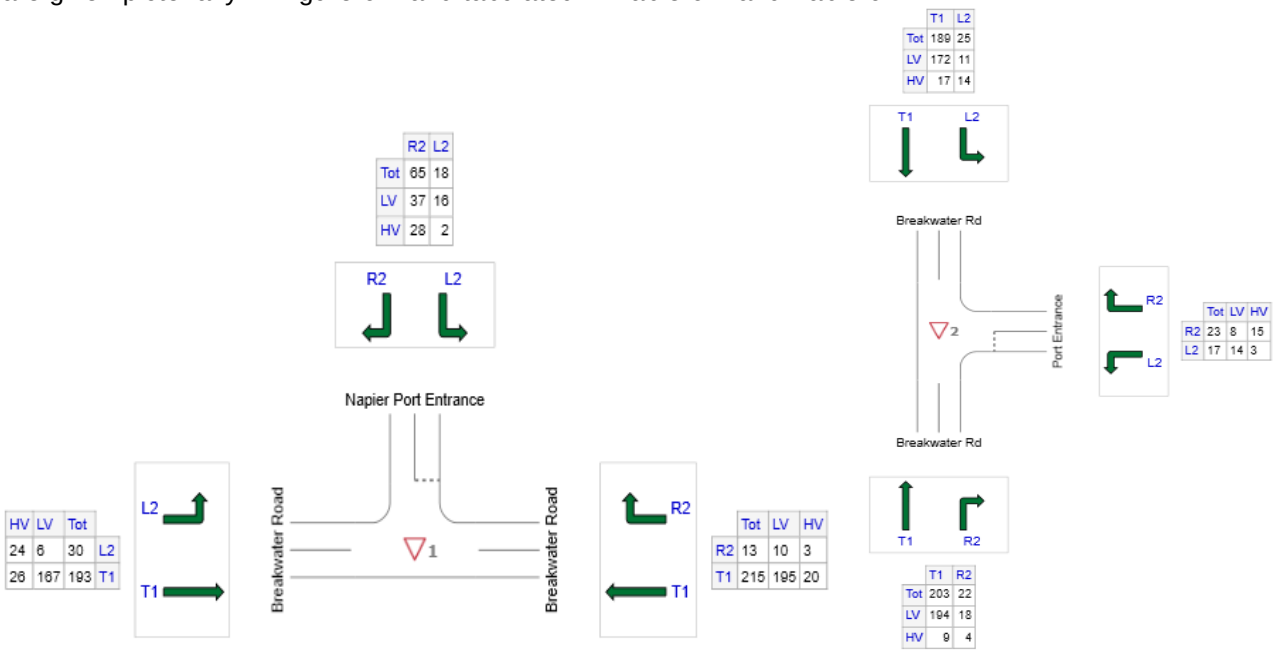


**Figure 6-1: Surveyed peak hour turning movement flows**

**Table 6-1: Surveyed peak hour flows: Western Access**

| | Breakwater Rd (W) | | | | Napier Port | | | | Breakwater Rd (E) | | | | West Entrance entering intersection | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | East Bound | | | | South Bound | | | | West Bound | | | | | |
| Time (PM) | L (all) | L (HV) | T (all) | T (HV) | R (all) | R (HV) | L (all) | L (HV) | R (all) | R (HV) | T (all) | T (HV) | Total (all) | Total (HV) |
| 2.45 - 3.00 | 7 | 6 | 49 | 3 | 17 | 13 | 1 | 0 | 5 | 1 | 56 | 9 | 135 | 32 |
| 3.00 - 3.15 | 10 | 7 | 38 | 8 | 14 | 8 | 1 | 0 | 1 | 0 | 55 | 6 | 119 | 29 |
| 3.15 - 3.30 | 10 | 8 | 53 | 7 | 17 | 2 | 7 | 0 | 4 | 0 | 50 | 2 | 141 | 19 |
| 3.30 - 3.45 | 3 | 3 | 53 | 8 | 17 | 5 | 9 | 2 | 3 | 2 | 54 | 3 | 139 | 23 |
| **Total** | **30** | **24** | **193** | **26** | **65** | **28** | **18** | **2** | **13** | **3** | **215** | **20** | **534** | **103** |

**Table 6-2: Surveyed peak hour flows: Eastern Access**

| | Breakwater Rd (N) | | | | Napier Port | | | | Breakwater Rd (S) | | | | East Entrance entering intersection | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | South Bound | | | | West Bound | | | | North Bound | | | | | |
| Time (PM) | T (all) | T (HV) | L (all) | L (HV) | L (all) | L (HV) | R (all) | R (HV) | T (all) | T (HV) | R (all) | R (HV) | Total (all) | Total (HV) |
| 2.45 - 3.00 | 48 | 2 | 6 | 2 | 7 | 1 | 9 | 5 | 54 | 5 | 3 | 1 | 127 | 16 |
| 3.00 - 3.15 | 36 | 6 | 5 | 3 | 2 | 0 | 5 | 4 | 45 | 1 | 5 | 1 | 98 | 15 |
| 3.15 - 3.30 | 45 | 3 | 7 | 3 | 6 | 1 | 3 | 3 | 53 | 0 | 5 | 1 | 119 | 11 |
| 3.30 - 3.45 | 60 | 6 | 7 | 6 | 2 | 1 | 6 | 3 | 51 | 3 | 9 | 1 | 135 | 20 |
| **Total** | **189** | **17** | **25** | **14** | **17** | **3** | **23** | **15** | **203** | **9** | **22** | **4** | **479** | **62** |

These show that the through (T) traffic past both entrances in each direction is fairly constant being generally in the range 190 to 200 vehicles per hour (vph) with a slightly higher 215 vph westbound flow past the western Port access. The number of vehicles entering the entrances is approximately 45 vph (43 to 47) with 40 vph exiting the Eastern gate and 83 vph exiting the Western Gate, giving an overall total of 213 vph entering/exiting the two entrances. Assuming no movements occur between the gates, the majority of Port traffic is to/from the “west” (143 vph) rather than to/from Marine Parade (70 vph).

# 7 Current Intersection Performance

The traffic count data from the video survey's recorded peak hour (14:45 to 15:45) has been analysed using a SIDRA (version 7.0.7) traffic model, applying the standard default values in the first instance. The outputs are given in Appendix F.

From the Port's records, there is a peak operating turnover and associated vehicle movements during March and April each year at the Port. To assess this peak time of the year the video counts for all vehicle classes for each turn, including through movements on Breakwater Road, were increased by 15% reflecting the observed seasonal flow patterns along SH50. The movement summary results are provided in the tables below.

**Table 7-1: Current peak flows intersection performance: Western Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 260 | 9.3 | 0.142 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 16 | 23.1 | 0.017 | 3.7 | LOS A | 0.1 | 0.5 | 0.39 | 0.45 | 29.6 |
| Approach | | 276 | 10.1 | 0.142 | 0.2 | NA | 0.1 | 0.5 | 0.02 | 0.03 | 48.8 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 22 | 11.1 | 0.022 | 3.1 | LOS A | 0.1 | 0.6 | 0.33 | 0.41 | 40.9 |
| 9 | R2 | 79 | 43.1 | 0.220 | 11.0 | LOS B | 0.9 | 8.2 | 0.66 | 0.78 | 35.4 |
| Approach | | 100 | 36.1 | 0.220 | 9.3 | LOS A | 0.9 | 8.2 | 0.59 | 0.70 | 36.5 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 36 | 80.0 | 0.031 | 5.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 41.3 |
| 11 | T1 | 234 | 13.5 | 0.130 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 270 | 22.4 | 0.130 | 0.7 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 49.1 |
| All Vehicles | | 646 | 19.3 | 0.220 | 1.8 | NA | 0.9 | 8.2 | 0.10 | 0.15 | 47.3 |

**Table 7-2: Current peak flows intersection performance: Eastern Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Breakwater Rd | | | | | | | | | | | |
| 2 | T1 | 259 | 4.4 | 0.137 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 3 | R2 | 28 | 18.2 | 0.029 | 6.2 | LOS A | 0.1 | 0.9 | 0.39 | 0.57 | 35.8 |
| Approach | | 288 | 5.8 | 0.137 | 0.6 | NA | 0.1 | 0.9 | 0.04 | 0.06 | 48.1 |
| East: Port Entrance | | | | | | | | | | | |
| 4 | L2 | 22 | 17.6 | 0.023 | 3.2 | LOS A | 0.1 | 0.6 | 0.34 | 0.41 | 35.7 |
| 6 | R2 | 29 | 65.2 | 0.098 | 12.4 | LOS B | 0.4 | 3.8 | 0.66 | 0.78 | 32.4 |
| Approach | | 51 | 45.0 | 0.098 | 8.5 | LOS A | 0.4 | 3.8 | 0.52 | 0.62 | 33.7 |
| North: Breakwater Rd | | | | | | | | | | | |
| 7 | L2 | 32 | 56.0 | 0.024 | 5.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 45.8 |
| 8 | T1 | 242 | 9.0 | 0.131 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 273 | 14.5 | 0.131 | 0.6 | NA | 0.0 | 0.0 | 0.00 | 0.06 | 49.5 |
| All Vehicles | | 612 | 12.9 | 0.137 | 1.3 | NA | 0.4 | 3.8 | 0.06 | 0.11 | 47.0 |

The results indicate that the current peak hour level of service at the peak time of the year for each movement is LOS A or B, that is the control (queuing plus geometric) delay averages less than 15 seconds per vehicle. The "maximum" expected queues are only one vehicle.

# 8 Conclusion

It is concluded that the existing Port access SH50 intersections are operating safely and with a higher level of performance that, as shown in the next Parts of this traffic assessment, should allow for their continued satisfactory use in the expanded development of the Port.

# Part 2 – WHARF CONSTRUCTION

# 1 Introduction

The Wharf Construction Methodology report by Beca provides one possible methodology and sequence adopted by the selected Contractor. Wharf construction is likely to take approximately 18 to 24 months in total.

> *A construction area will be established for the contractor adjacent to the wharf site. This will be fenced off to separate construction activities from port operations, possibly with a line of empty containers. Access to the site will be through the western gate and a defined route from the gate to the site will be established.*
>
> *There will be a large number of truck deliveries to site during the construction. The most concentrated number of deliveries will be during major [wharf] deck pours, when 5 to 8 concrete trucks will arrive every hour over a period of 4 to 6 hours. This will be additive to the number of trucks carrying containers that enter the port daily.*
>
> *It is anticipated that some materials, most significantly the pipe for the piles, will be delivered by ship directly to the port. This may also apply to some other materials such as rebar.*

The above is mainly associated with the construction of the concrete deck for the expanded wharf. At less concentrated times there will be dump trucks operating; the report states

> *The armour rock will be delivered to the backhoe in dump trucks. The source of the armour rock is not known, and it may be delivered to the port either by road or by barge.*

The report also states

> *The number of truck movements required for the revetment work will add further truck movements accessing the Port. Adopting an 18 month construction period and allowing for 25.3 blocks being trucked to site per day equates to 11,826 block units to be delivered to site, 6 days per week for 78 weeks. This equates to approximately 486 construction days. The number of truck movements is estimated to be 5 trucks per day, equating to 10 truck movements, conservatively carrying 5 blocks per day (that is 1-2 truck movements per hour). The timing of the delivery of the units is likely to coincide with the wharf deck construction sequence (including the timing of the piles being driven into the seabed).*

**Figure 1-1: Transporter carrying 6 block units**

Some other trucks might be expected from time to time, for example delivering welding equipment. There will likely be the occasional transporter to the site, for example transporting a loader or digger.

Once the wharf structure is complete, the pavement area along the south edge of the wharf will be re-graded to 'tie-in' and match the elevation of the wharf deck, involving standard asphalting machinery.

Staff engaged to work on the wharf development project will mainly arrive in light vehicles as at present.

Potentially the Contractors might provide vans or minibuses to and from designated parking areas away from the Port. Start and ends of construction shifts are not expected to coincide with the existing peak Port traffic time during mid-afternoon. For example workers supporting the construction of the concrete deck when concrete trucks are arriving will continue to work well after the last concrete trucks have left.

As at present not all workers will take private vehicles to work on site and many of those that do may car pool during their engagement period.

Some workers could be expected to take advantage of the shared pedestrian/cyclist pathway that follows the Port railway line providing convenient access to the Port on a flat route from central Napier and the Marine Parade foreshore.

# 2 Expected Traffic Generation

This section of the report will look specifically at the additional traffic generated by the construction work.

Below are the vehicle types, movements and maximum numbers included into the Construction Phase peak hour (14.45 to 15.45) model for the Port's western access. All traffic movements related to the construction of the new wharf will enter and exit the Port via the Western Gate.

| | |
|---|---|
| Right Turn into the Port | 5 Cars, 5 Light Vans and 8 Concrete Trucks |
| Left Turn into the Port | 5 Cars, 5 Light Vans and 8 Concrete Trucks |
| Right Turn from the Port | 5 Cars, 5 Light Vans and 8 Concrete Trucks |
| Left Turn from the Port | 5 Cars, 5 Light Vans and 8 Concrete Trucks |

The approach and departure directions for the Concrete Trucks are only assumed at the moment as the Contractors are yet to be confirmed. Because of this uncertainty, the modelled figures have allowed for 8 Concrete Trucks inbound and outbound for both directions on Breakwater Road. In addition, a number of associated light vehicle movements have also been included. These additional traffic movements are above the 8 concrete truck movements per hour in total that has been estimated in the construction methodology to provide additional confidence in the intersection's ability to manage the extra traffic.

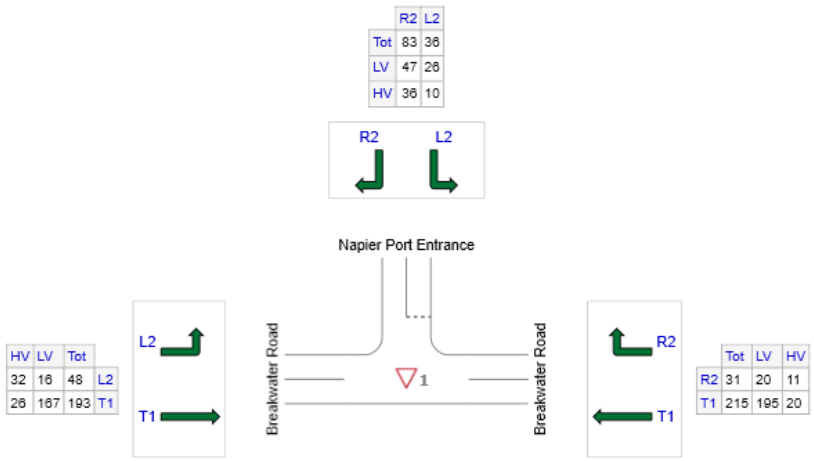


**Figure 2-1: Modelled construction turning movement flows: Western Access**

# 3 Traffic Impact on Port western access

The performance of the intersection based on the surveyed flows with the additional construction traffic added is given in Appendix E.

To reflect however that construction may occur during a busier time of the year, all of the above flows, conservatively including the user input 72 vph construction traffic, were factored by 10 per cent (and also 50% for a design life assessment), for which the performance of the intersection is given below.

**Table 3-1: Design Life assessment with construction plus additional 10% flows: Western Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 249 | 9.3 | 0.135 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 36 | 35.5 | 0.042 | 6.7 | LOS A | 0.2 | 1.5 | 0.42 | 0.60 | 40.6 |
| Approach | | 285 | 12.6 | 0.135 | 0.9 | NA | 0.2 | 1.5 | 0.05 | 0.08 | 49.1 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 42 | 27.8 | 0.046 | 3.3 | LOS A | 0.2 | 1.4 | 0.34 | 0.43 | 40.6 |
| 9 | R2 | 96 | 43.4 | 0.275 | 12.1 | LOS B | 1.2 | 11.1 | 0.68 | 0.84 | 34.8 |
| Approach | | 138 | 38.7 | 0.275 | 9.5 | LOS A | 1.2 | 11.1 | 0.58 | 0.72 | 36.4 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 56 | 66.7 | 0.044 | 5.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 41.8 |
| 11 | T1 | 223 | 13.5 | 0.125 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 279 | 24.1 | 0.125 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 48.7 |
| All Vehicles | | 702 | 22.3 | 0.275 | 2.6 | NA | 1.2 | 11.1 | 0.14 | 0.21 | 46.7 |

**Table 3-2: Design Life assessment with construction plus additional 50% flows: Western Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 334 | 9.3 | 0.182 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 48 | 35.5 | 0.066 | 7.7 | LOS A | 0.3 | 2.3 | 0.49 | 0.67 | 39.9 |
| Approach | | 382 | 12.6 | 0.182 | 1.0 | NA | 0.3 | 2.3 | 0.06 | 0.08 | 49.0 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 56 | 27.8 | 0.069 | 3.9 | LOS A | 0.2 | 2.1 | 0.41 | 0.49 | 40.2 |
| 9 | R2 | 129 | 43.4 | 0.546 | 25.0 | LOS C | 2.7 | 26.2 | 0.86 | 1.17 | 29.0 |
| Approach | | 185 | 38.7 | 0.546 | 18.6 | LOS C | 2.7 | 26.2 | 0.72 | 0.97 | 31.6 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 75 | 66.7 | 0.059 | 5.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 41.8 |
| 11 | T1 | 300 | 13.5 | 0.167 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 375 | 24.1 | 0.167 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 48.7 |
| All Vehicles | | 942 | 22.3 | 0.546 | 4.5 | NA | 2.7 | 26.2 | 0.17 | 0.27 | 45.5 |

The assessment of the western access intersection performance reveals that its performance with the additional construction traffic is still level of service B at worse. Even applying a high 50% to the input flows, with peak flow factor changed to 96.5% to reflect minor peak spreading, the worst level of service is C for the right turn out of the Port.

Accordingly it is assessed that the intersection can adequately cope with additional construction activity traffic associated with the proposed wharf.

# 4 Wider Traffic Impact

The proposed development generally only directly affects the western access, with heavy construction traffic limited to use of the western access. Even if some traffic (for example worker shuttle van) were to use the Port eastern access it can easily satisfactorily accommodate additional traffic in a likewise manner for the western access.

In terms of the wider highway network, the effect of construction traffic on the state highway network (SH50 and SH2 in particular) will be expected to be managed in the usual manner via a temporary traffic management plan(s) prepared nearer to the time of construction activity.

However, the NZTA is currently upgrading critical intersections, a Government initiative announced in late July 2016 partly in anticipation of the Port's development proposal; refer to Part 3.

# 5 Temporary Traffic Management

Within the wharf there will likely be put in place temporary traffic management (TTM) during the construction period and especially during key periods such as the concrete deck construction. When engaging the Contractor, the Port will no doubt include conditions to ensure the safe operation of the Contractors staff and equipment over and above OSH requirements.

No external TTM measures are expected to be needed aside from standard procedures applying to over-dimensioned vehicles such as a large digger being transported or a crane.

It can be expected that there would be some coordination by the Port of concrete truck activity with rail movements to/from the Port but occasional rail movements are unlikely to affect construction traffic to any great extent.

As noted above, as standard practice a temporary traffic management plan(s) will be developed nearer to the time of construction activity, which also includes managing construction traffic on the local highway network to/from the Port.

# 6 Conclusion and Recommendation

It is concluded that the existing western Port Gate 1 intersection should be able to operate satisfactorily with additional construction traffic.

As is standard practice it is recommended that the Port of Napier requires that the Contractor prepare and submit a construction traffic management plan for both external and internal operations, identifying also interaction with Port rail and other activities.

# Part 3 – POST CONSTRUCTION

# 1 Introduction

This section of the report will look at the ongoing operations, once the wharf is constructed and the associated traffic generation.

It should be noted that the effect of the recent constraints placed on CentrePort, for a period believed to be up to two years, which have resulted in a significant increase in Napier Port road and rail traffic (equivalent to a few years anticipated growth) are assumed to be of short-term effect only but nevertheless can be considered to demonstrate the need for the Port's proposed new wharf.

# 2 Past and Projected Port Traffic

Past growth from 2006 to 2015 and previous projected growth from 2016 to 2025 are given in the figure overleaf for total tonnage and twenty-foot equivalent containers (TEU) handled at the Port.
For the 2009 to 2015 calendar years the peak month and annual TEU are tabulated below[3].

**Table 2-1: Annual and peak month TEU**

| Year | Total TEU | Peak TEU | Peak month | Peak % total TEU |
|---|---|---|---|---|
| 2009 | 166,934 | 23,415 | April | 14.0 |
| 2010 | 180,871 | 24,583 | April | 13.6 |
| 2011 | 188,081 | 24,634 | March | 13.1 |
| 2012 | 204,065 | 26,793 | March | 13.1 |
| 2013 | 206,272 | 25,470 | March | 12.4 |
| 2014 | 220,048 | 31,922 | March | 14.5 |
| 2015 | 256,438 | 27,557 | April | 10.7 |
| 2016 | 257,380 | | | |

The busiest months for the container terminal serviced by Gate 3 are February/March to May inclusive, with at least one month reaching or exceeding 60% utilisation.

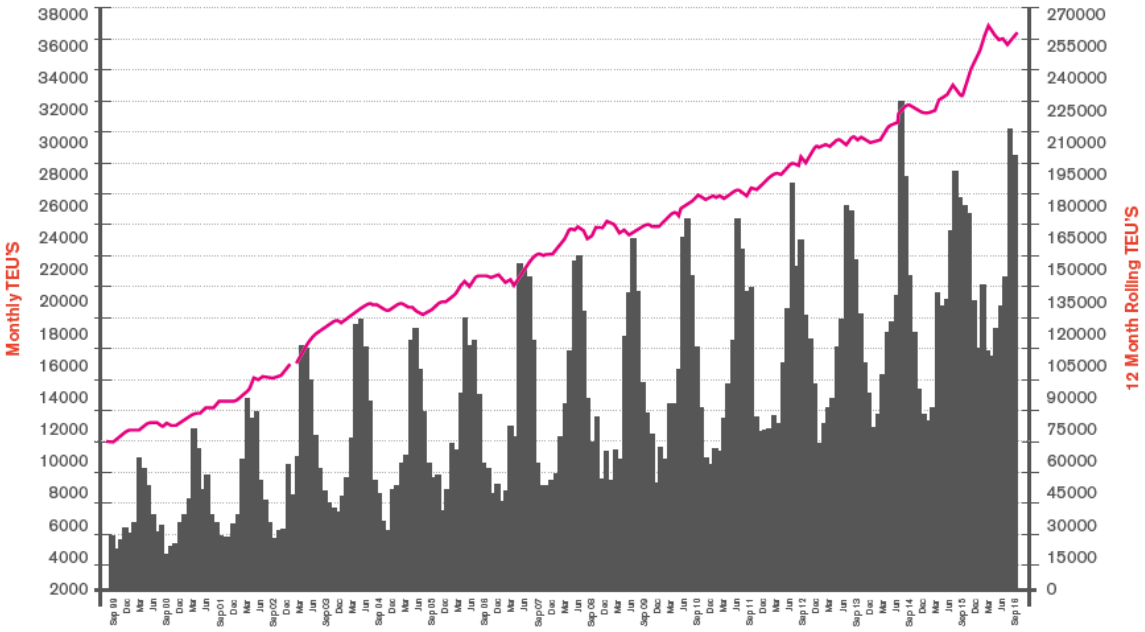


**Figure 2-1: Historical monthly and rolling 12 month TEU**

[3] These values were provided by the Port of Napier and differ slightly from the MoT Freight Information Gathering System (FIGS) data available on http://www.transport.govt.nz/sea/figs/ such as Port TEU and Land TEU.

In May 2016 it was reported that April 2016 was the busiest April ever (28,513 TEU), off the back of a busy March where monthly volumes were the second highest on record. Furthermore it was reported that log volumes were forecast to increase from 1.1 million tonnes to around 2.4 million tonnes by 2025.

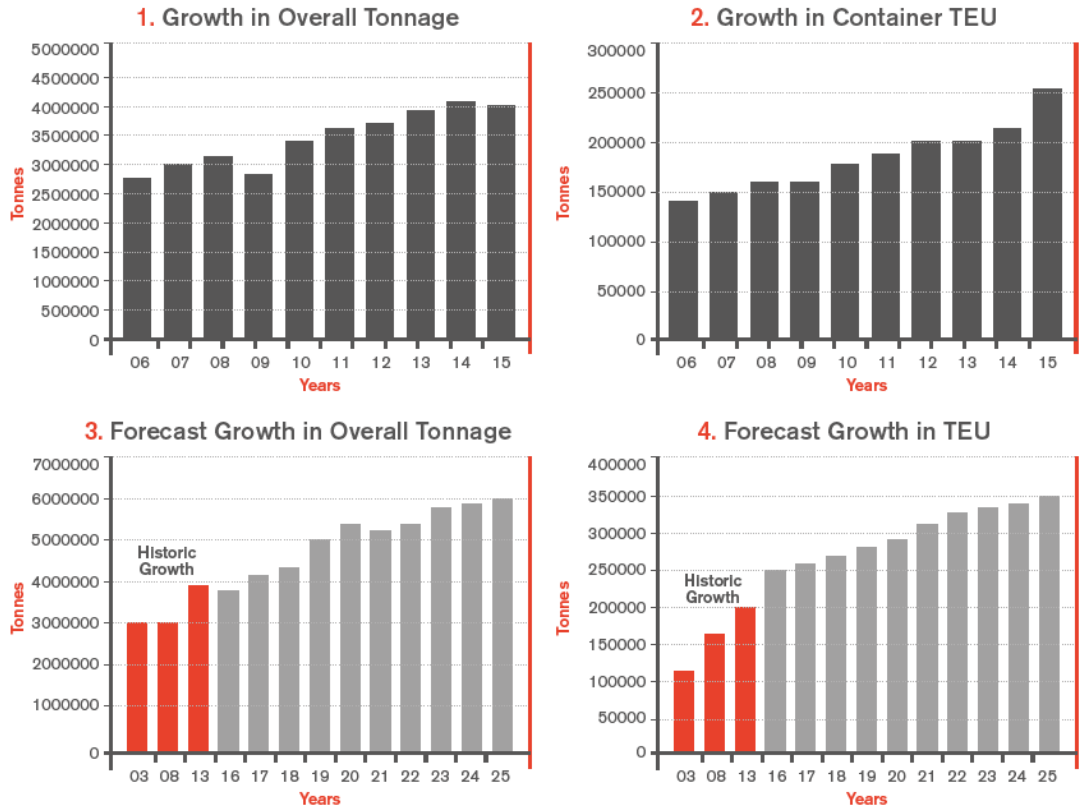


**Figure 2-2: Historical and Forecast annual overall tonnage and container TEU**

In addition within 5-10 years it is expected that Oasis class cruise ships will be operating within Australasia, which will in practice be able to berth at Napier once the new longer wharf is developed. Presently Napier is the gateway for up to 140,000 cruise vessel visitors per annum, with the number of cruise vessels increasing since 2007/08 to 2011/12 but constrained more recently by existing operations. The proposed development could attract another 4-5 vessels and upwards of 15,000–20,000 visitors per year.

The current operational limit for container wharf 5 is estimated as 300,000 TEU per annum which equates to a monthly limit of 42,000 when applying a peak month factor of 14%. This limit is projected to be reached by 2021 on a business-as-usual basis. Based on the forecast increase of 100,000 TEU from 2016 to 2025, the projected TEU for 2027 is approximately 372,000 TEU[4]. This is equivalent to a 48.9 % increase over the 2016 base value or a linear growth rate of approximately 4.4 % with respect to 2016.

The projected growth rate in log traffic is higher at approximately 13%, noting however that larger loads might be permissible for carrying by logging trucks and potentially a greater proportion could be transported by rail. Logging trucks typically enter and exit the Port via Gate 1.

# 3 Traffic Impact on Port Western access

To assess the effect of future port traffic it has been assumed that the same proportionate rate will apply as was presently observed for the 2:45-3:45 pm peak hour. Initially the 2016 through traffic flows past western Gate 3 were factored by 20% to reflect the busier autumn period and to allow for a small amount of background traffic growth, while the flows into and out of the Port were factored by 60%.

[4] The 2016 Annual Report forecast for 2026 lists 360,000 containers TEU along with 3.7, 2.8, and 0.5 million tonnes bulk cargo, log volume, and wood pulp respectively, plus 60 cruise ship calls.

These represent the projected flows for 2027 (taken as 10 years growth) with the proposed new wharf, for which the delay for the traffic turning out of the Port was assessed as less than 14 seconds (LOS B), with similar performance to that of the construction traffic.

**Table 3-1: Projected 2027 design flows intersection performance: Western Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 272 | 9.3 | 0.148 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 22 | 23.1 | 0.025 | 3.9 | LOS A | 0.1 | 0.8 | 0.41 | 0.47 | 29.5 |
| Approach | | 293 | 10.3 | 0.148 | 0.3 | NA | 0.1 | 0.8 | 0.03 | 0.04 | 48.4 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 30 | 11.1 | 0.031 | 3.2 | LOS A | 0.1 | 0.8 | 0.34 | 0.42 | 40.9 |
| 9 | R2 | 109 | 43.1 | 0.329 | 13.7 | LOS B | 1.5 | 14.0 | 0.72 | 0.91 | 34.0 |
| Approach | | 140 | 36.1 | 0.329 | 11.4 | LOS B | 1.5 | 14.0 | 0.63 | 0.80 | 35.3 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 51 | 80.0 | 0.043 | 5.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 41.3 |
| 11 | T1 | 244 | 13.5 | 0.136 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 294 | 24.9 | 0.136 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 48.8 |
| All Vehicles | | 728 | 21.2 | 0.329 | 2.7 | NA | 1.5 | 14.0 | 0.13 | 0.20 | 46.3 |

**Table 3-2: Design Life assessment: Western Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 323 | 9.3 | 0.176 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 32 | 23.1 | 0.039 | 4.5 | LOS A | 0.1 | 1.2 | 0.47 | 0.53 | 29.3 |
| Approach | | 354 | 10.5 | 0.176 | 0.4 | NA | 0.1 | 1.2 | 0.04 | 0.05 | 48.1 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 44 | 11.1 | 0.048 | 3.5 | LOS A | 0.2 | 1.3 | 0.38 | 0.46 | 40.8 |
| 9 | R2 | 158 | 43.1 | 0.611 | 25.0 | LOS C | 3.4 | 33.0 | 0.86 | 1.26 | 29.0 |
| Approach | | 202 | 36.1 | 0.611 | 20.3 | LOS C | 3.4 | 33.0 | 0.76 | 1.09 | 30.9 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 73 | 80.0 | 0.062 | 5.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 41.3 |
| 11 | T1 | 290 | 13.5 | 0.162 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 363 | 26.9 | 0.162 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 48.6 |
| All Vehicles | | 919 | 22.6 | 0.611 | 5.1 | NA | 3.4 | 33.0 | 0.18 | 0.30 | 44.5 |

A design life assessment was undertaken in a similar manner to that reported above for the construction traffic. The results given above equate to an equivalent of 30 years growth. Once again the right turn out of the Port continued to operate with LOS C; its maximum queue has increased from 1½ vehicles to around 3½ vehicles and which can still be satisfactorily accommodated by the existing layout.

These indicate that the existing intersection can operate satisfactorily for the long term from a capacity perspective, following construction of the expanded wharf and expected growth in Port traffic.

However as noted earlier, should safety concerns remain at the Western access in relation to heavy vehicles, rail and pedestrians/cyclists then signalisation may need to be considered. Preliminary investigation of a signalisation option (refer Appendix F) reveals indicatively that it could satisfactorily operate for the long term with a short cycle time and worse movement LOS C, with single through lanes and a protected right turn into the Port[5].

# 4 Traffic Impact on Port Eastern access

For comparison purposes a design life assessment was made for the eastern access in the same manner as for the western access, as shown in Table 4-1 below.

The results as compared to the surveyed 2:45-3:45 pm peak, relate to 45% additional through traffic and 135% additional traffic in/out of the Port. This shows that all movements continue to operate satisfactorily and slightly better than for the western access.

[5] Right turn arrows provided so the right turn in can be controlled when a train is operating.

**Table 4-1: Design Life assessment: Eastern Access**

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Breakwater Rd | | | | | | | | | | | |
| 2 | T1 | 310 | 4.4 | 0.163 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 3 | R2 | 54 | 18.2 | 0.063 | 6.8 | LOS A | 0.2 | 2.0 | 0.45 | 0.63 | 35.6 |
| Approach | | 364 | 6.5 | 0.163 | 1.0 | NA | 0.2 | 2.0 | 0.07 | 0.09 | 47.1 |
| East: Port Entrance | | | | | | | | | | | |
| 4 | L2 | 42 | 17.6 | 0.048 | 3.5 | LOS A | 0.2 | 1.3 | 0.38 | 0.46 | 35.7 |
| 6 | R2 | 57 | 65.2 | 0.260 | 19.8 | LOS C | 1.0 | 10.8 | 0.79 | 0.92 | 30.4 |
| Approach | | 99 | 45.0 | 0.260 | 12.9 | LOS B | 1.0 | 10.8 | 0.61 | 0.72 | 32.4 |
| North: Breakwater Rd | | | | | | | | | | | |
| 7 | L2 | 62 | 56.0 | 0.047 | 5.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 45.8 |
| 8 | T1 | 288 | 9.0 | 0.157 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 350 | 17.3 | 0.157 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 49.2 |
| All Vehicles | | 814 | 15.8 | 0.260 | 2.4 | NA | 1.0 | 10.8 | 0.10 | 0.17 | 45.4 |

# 5 Wider Traffic Impact

In terms of the wider highway network, the effect of increased Port traffic on the state highway network (SH50 and SH2 in particular) has not been assessed at this stage. The NZTA is charged by Government to support its Government Policy Statement on Land Transport (GPS) and the key GPS strategic priority is economic growth and productivity which is directly relevant to the proposed Port development.

In late July 2016 the Government announced a $25 million package of three road access improvements to Napier port as one of the first actions of Matariki - the Hawke's Bay Economic Development Strategy. The road improvement package includes improvements to intersections at Watchman Road (work has already commenced) and Hyderabad Road/Prebensen Drive as well as the SH50/SH2 Expressway. Accordingly it is expected that the Transport Agency will continue to maintain and oversee the local state highway network in the medium to long term such that it operates satisfactorily with the demands placed by current and future road users. The same likewise applies to Napier City Council responsible for the local road network.

Similarly it is expected that any increase in rail transport to/from the Port arising from the proposed development can be satisfactorily managed by the rail operator with oversight by the rail owner. Note that as reported in the MoT FIGS, the TEU by road and rail in or out of the Port gates showed a decline for rail for the 2015 calendar year both in total TEU and as a percentage of the road TEU.

**Table 5-1: Port road and rail TEU** (source: MoT FIGS)

| Year | Total Road TEU | Total Rail TEU | Rail as % Road TEU |
|---|---|---|---|
| 2012 | 139,980 | 26,840 | 19.2 |
| 2013 | 166,321 | 31,439 | 18.9 |
| 2014 | 227,066 | 47,622 | 21.0 |
| 2015 | 281,880 | 33,044 | 11.7 |
| 2016 | n/a | n/a | n/a |

# 6 Conclusion and Recommendations

It is concluded that the existing Port access intersections should continue to operate satisfactorily from a capacity perspective with the development of the Port. In terms of safety, minor improvements have been recommended at the Western access as part of a recent safety review, however should this problem remain then a longer term solution may need to be investigated, such as signalisation.

It is expected that the impact on the wider network of the Port operations, vital to the regional economy, will continue to be monitored and if need be addressed by road improvements, such as the three state highway projects announced by the Government in mid 2016 which have already been commenced by the Transport Agency. It is recommended to continue to review such needs in light of changing circumstances, such as the Kaikoura earthquake impact on competing CentrePort and changes to the Wairoa to Gisborne rail corridor for example, as well as the continual change in the maritime sector.

# Appendix A Napier network

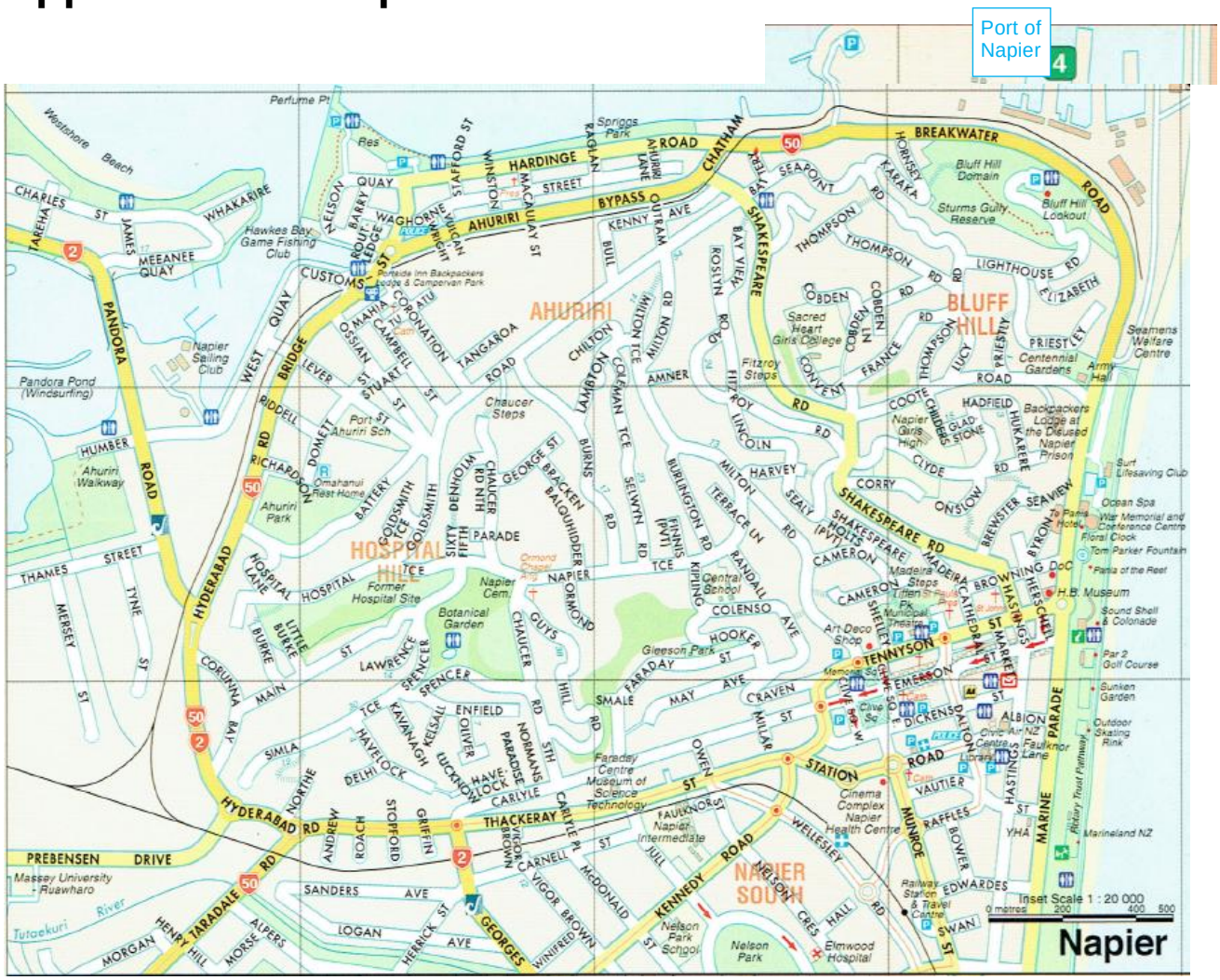


**Figure A-1: Road network** (Source: KiwiMaps North Island Provincial City & Towns 6th edition)

Western Access Gate 3 Eastern Access Gate 1

**Figure A-2: Western and Eastern Accesses** (Source: Google Aerial)

# Appendix B AM & PM and midday peak hour flows

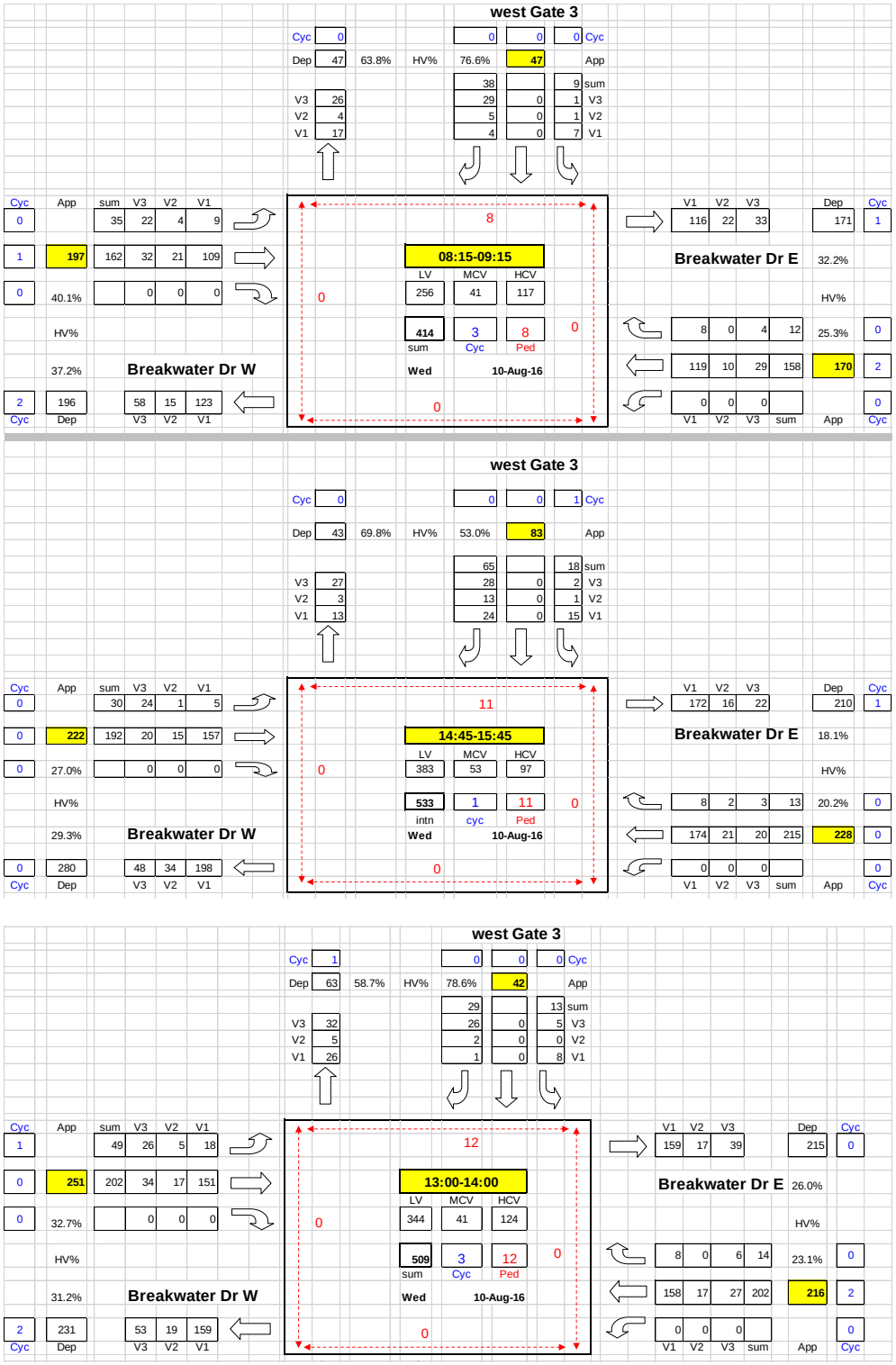


**Figure D-1: Western Access surveyed peak hourly flows**

LV comprises cars and m/c; MCV comprises LGV and Buses; HCV comprises trucks with/out trailers

Pedestrian flows were presumably only surveyed where they crossed the Port entrance; cyclists were surveyed on road but not along the shared pathway crossing the Port entrance.

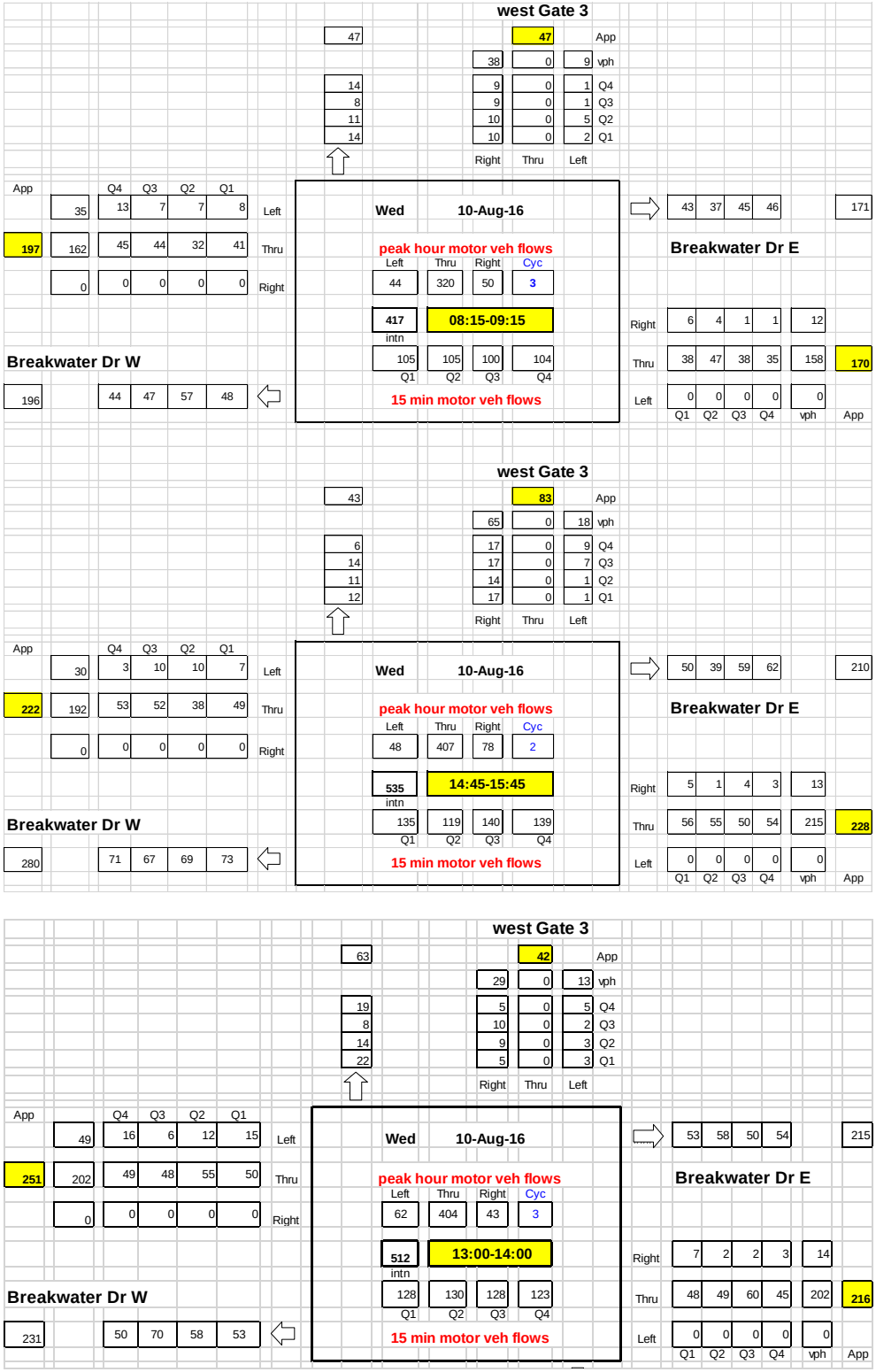


**Figure D-2: Western Access surveyed quarter hour flows**

These comprise the four quarter hour vehicle flows during the hour.

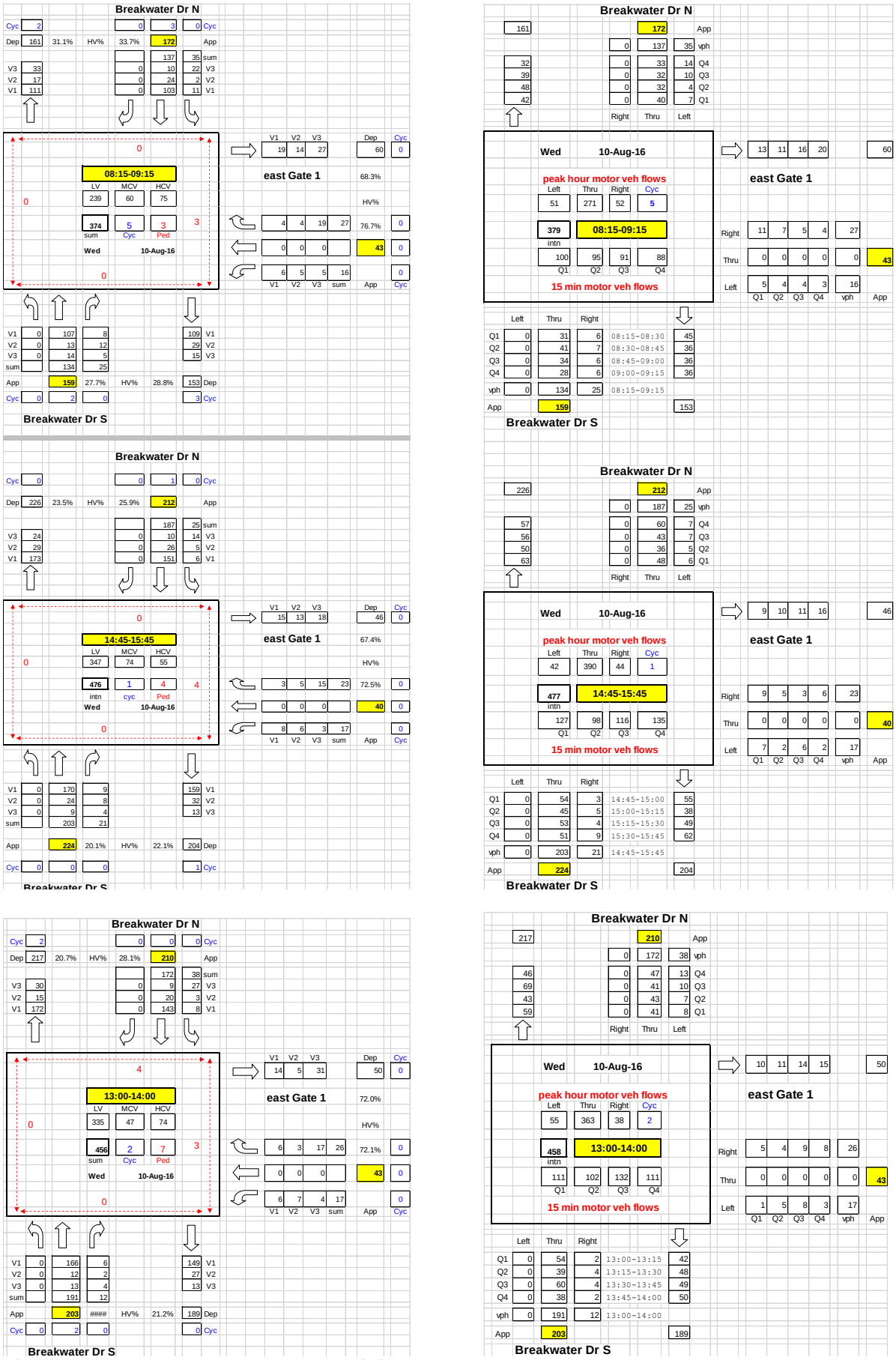


**Figure D-3: Eastern Access surveyed flows**

# Appendix C Crash statistics

The main focus is safety pertaining to the additional truck traffic associated with the Port. The following tables give the truck crashes for all of Napier City and for the main access routes nearest the Port.

**Table C-1: SH50 Hyderabad Rd / Bridge St / Ahuriri Bypass / Chatham St crashes involving trucks**

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2011 | | | | | 0 |
| 2012 | | | | 2 | 2 |
| 2013 | | | | | 0 |
| 2014 | | | | | 0 |
| 2015 | | | | 1 | 1 |
| 2016 | | | | | 0 |

**Table C-2: SH50 Breakwater Road crashes involving trucks**

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2011 | | | | | 0 |
| 2012 | | | | | 0 |
| 2013 | | | | | 0 |
| 2014 | | | | 1 | 1 |
| 2015 | | | | | 0 |
| 2016 | | | | | 0 |

**Table C-3: Marine Parade (Coote Road – SH2 Ellison Street) crashes involving trucks**

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2011 | | | | | 0 |
| 2012 | | | | 2 | 2 |
| 2013 | | | | | 0 |
| 2014 | | | | | 0 |
| 2015 | | | | 1 | 1 |
| 2016 | | | | 1 | 1 |

Note that Marine Parade is between Coote Road in the north and SH2 Ellison Street in the south. There have been no vehicle crashes reported in the six calendar years 2011 to 2016 along Breakwater Road between Coote Road and the eastern Port entrance (start of SH50). There was however one non-injury crash on 4 July 2014 that occurred at the eastern Port entrance involving a car colliding misjudging/not noticing the intentions of a truck swinging wide to turn left into the Port[6].

The crash history reveals that there have been no injury crashes associated with trucks along Breakwater Road and SH 50 east of SH 2 Pandora Road. The table below gives all crashes for the same 3.66 km route.

[6] This crash (ID 201440103) should have been recorded as being at SH 50 RP 0/0 and not solely as Breakwater Road (local road).

### Table C-4: SH50 RS 0 crashes east of Pandora Road

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2011 | | | 3 | 3 | 6 |
| 2012 | | | 1 | 1 | 2 |
| 2013 | | | 0 | 1 | 1 |
| 2014 | | | 0 | 3 | 3 |
| 2015 | | | 2 | 3 | 5 |
| 2016 | | 1 | 1 | 3 | 5 |

### Table C-5: SH50 RS 0 coded crashes east of Pandora Road plus Breakwater Road south

| CRASH ROAD | CRASH DIST | CRASH DIRN | INTSN | SIDE ROAD | CRASH ID | CRASH DATE | CRASH DOW | CRASH TIME | MVMT | VEHICLES | CAUSES (FACTORS) | OBJECTS STRUCK | ROAD CURVE | ROAD WET | LIGHT | WTHR a | JUNC TYPE | TRAF CTRL | ROAD MARK | SPD LIM | CRASH FATAL | CRASH SEV | CRASH MIN | PERS AGE1 | PERS AGE2 | EASTING | NORTHING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BREAKWATER ROAD | | | A | PORT ENTRANCE | 201440103 | 4/07/2014 | Fri | 1050 | GF | TS1C | 179A 387B | | E | D | B | F | T | G | C | 50 | 0 | 0 | 0 | | | 1937206 | 5622290 |
| 50/0/1.071 | | | I | HORNSEY ROAD | 201111160 | 8/02/2011 | Tue | 804 | GD | CE1C | 331A 363A 902 | | R | D | B | F | T | G | L | 50 | 0 | 0 | 1 | | | 1936649 | 5622910 |
| 50/0/1.086 | 15 | W | | HORNSEY ROAD | 201514678 | 23/06/2015 | Tue | 650 | CC | CE1 | 129A 410A | I | R | D | B | F | | N | R | 50 | 0 | 0 | 1 | | | 1936634 | 5622909 |
| 50/0/1.357 | 100 | E | | BATTERY ROAD | 201211649 | 5/04/2012 | Thu | 655 | CB | CW1CC | 103A 112A | FMM | R | W | DO | L | | N | L | 50 | 0 | 0 | 1 | | | 1936364 | 5622884 |
| 50/0/1.371 | 300 | W | | HORNSEY ROAD | 201511484 | 1/03/2015 | Sun | 108 | BF | CW1C | 103A 111A 131A 402A | | E | D | DO | F | | | C | 50 | 0 | 0 | 2 | | | 1936351 | 5622883 |
| 50/0/1.487 | 30 | W | | BATTERY ROAD | 201639061 | 14/05/2016 | Sat | 548 | EC | CW1 | 326A 502A | S | R | D | DO | F | | T | P | 50 | 0 | 0 | 0 | | | 1936235 | 5622870 |
| 50/0/1.556 | 280 | W | | PORT GATE | 201111078 | 13/01/2011 | Thu | 28 | DA | 40 | 103A 111A 632A | T | E | D | DO | F | | N | C | 50 | 0 | 0 | 1 | | | 1936167 | 5622870 |
| 50/0/1.654 | | | I | WAGHORNE ST | 201150753 | 18/02/2011 | Fri | 152 | DA | CE1 | 103A 131A | IS | R | D | DO | L | T | S | R | 50 | 0 | 0 | 0 | | | 1936120 | 5622784 |
| 50/0/1.714 | 60 | S | | WAGHORNE ST | 201611397 | 25/02/2016 | Thu | 1435 | DA | MS1 | 131A 352A | | M | D | B | F | | | P | 50 | 0 | 1 | 0 | | | 1936083 | 5622736 |
| 50/0/1.854 | 200 | S | | WAGHORNE ST | 201541147 | 16/03/2015 | Mon | 1420 | DA | CS1 | 111A 131A 632A 901 | F | M | W | OF | H | | | C | 50 | 0 | 0 | 0 | | | 1935946 | 5622714 |
| BRIDGE ST | | | I | AHURIRI BYPASS | 201254830 | 31/12/2012 | Mon | 2258 | KA | CS1X | 301A 830A | | E | D | DO | F | M | G | C | 50 | 0 | 0 | 0 | | | 1935255 | 5622506 |
| 50/0/2.588 | | | I | BRIDGE ST | 201154768 | 5/11/2011 | Sat | 115 | DB | CS2 | 111A 131A 632A | H | M | D | DO | F | R | G | C | 50 | 0 | 0 | 0 | | | 1935252 | 5622508 |
| 50/0/3.091 | | | I | RIDDELL ST | 201610593 | 28/01/2016 | Thu | 1101 | FA | CN1V | 366A | | R | W | B | H | T | N | C | 50 | 0 | 0 | 2 | | | 1934945 | 5622149 |
| 50/0/2.929 | | | I | LEVER ST | 201435816 | 7/04/2014 | Mon | 1930 | FB | VW2C | 181A | | R | | F | | X | G | C | 100 | 0 | 0 | 0 | | | 1935011 | 5622296 |
| 50/0/2.924 | | | I | LEVER ST | 201353729 | 21/09/2013 | Sat | 615 | HA | MS1C | 301B 375B | | R | D | O | F | X | G | C | 50 | 0 | 0 | 0 | | | 1935011 | 5622296 |
| 50/0/2.771 | | | I | OSSIAN ST | 201641864 | 24/06/2016 | Fri | 1252 | FD | CE1C | 331A | | R | D | B | F | T | G | C | 50 | 0 | 0 | 0 | | | 1935120 | 5622403 |
| 50/0/2.929 | | | I | LEVER ST | 201537685 | 15/06/2015 | Mon | 1416 | KB | CN1C | 301B 375B | | R | D | B | F | X | G | C | 50 | 0 | 0 | 0 | | | 1935011 | 5622296 |
| 50/0/2.929 | | | I | LEVER ST | 201648163 | 15/09/2016 | Thu | 1615 | HA | CE2C | 301A 112B | | R | D | B | F | X | G | C | 50 | 0 | 0 | 0 | | | 1935011 | 5622296 |
| 50/0/2.939 | 10 | S | | LEVER ST | 201433436 | 21/03/2014 | Fri | 821 | FD | CN1CC | 331A 358A | | R | D | OF | F | X | G | C | 50 | 0 | 0 | 0 | | | 1935006 | 5622287 |
| 50/0/2.751 | 15 | N | | OSSIAN ST | 201150647 | 23/02/2011 | Wed | 1730 | MO | VS1C | 371A | M | R | D | B | F | | N | C | 50 | 0 | 0 | 0 | | | 1935131 | 5622413 |
| 50/0/3.195 | | | I | RICHARDSON PLACE | 201112291 | 17/06/2011 | Fri | 750 | LB | CS14 | 303B 375B | | R | D | B | F | T | G | C | 50 | 0 | 0 | 1 | | | 1934915 | 5622043 |
| 50/0/3.391 | 30 | N | | BATTERY ROAD | 201548719 | 15/10/2015 | Thu | 1100 | AA | 4S1CCV | 181B 331B 361B | M | R | D | B | F | | N | C | 50 | 0 | 0 | 0 | | | 1934858 | 5621856 |

# Appendix D Photos of recent safety concerns

Photo 1: Pedestrian Maze in Shared Path

Photo 2: High Non-Standard Advisory Sign

Photo 3: Non-Standard Guide Lines and faded

Photo 4: Incorrect Shared Path signage Give Way markings

Photo 5: Public parking on Port land

**Figure D-1: Western Access pedestrian/cyclist facility photos** (source: Rob Partridge, Stantec NZ)

# Appendix E SH50 Traffic flow patterns

**Figure E-1: Local variation throughout the year in daily two-way flows**

The four surveys during 2016 are compared with the nearest continuous sites comprising the WiM site on SH2 at Eskdale and the telemetry sites on SH50 at Taradale and on SH2 at Tangoio.

In addition the continuous site 00200651 on SH2 Hyderabad Road: Taradale Road to Georges Drive is provided (TMS has a limit of graphing up to four sites).

These reveal that the July 2016 and June 2013 surveyed daily flows are unusually (dubiously) low, while the Feb/Mar 2016 surveyed daily flows are unusually high.

The vehicle length data for the four years were exported from TMS for which strangely only the (typical) end-May 2016 survey appeared, the results of which are shown below.

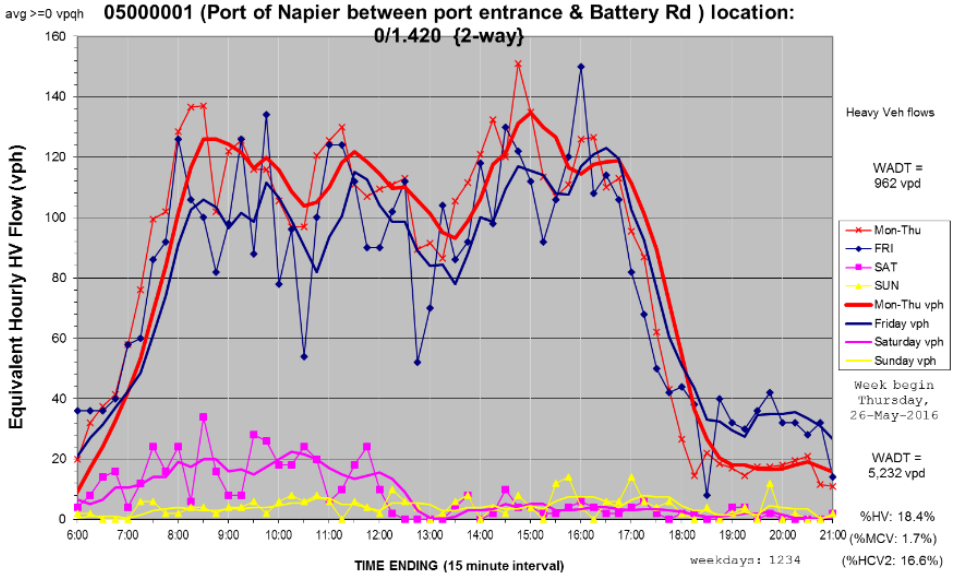


**Figure E-2: Breakwater Road west heavy vehicle typical hourly two-way flow profile**

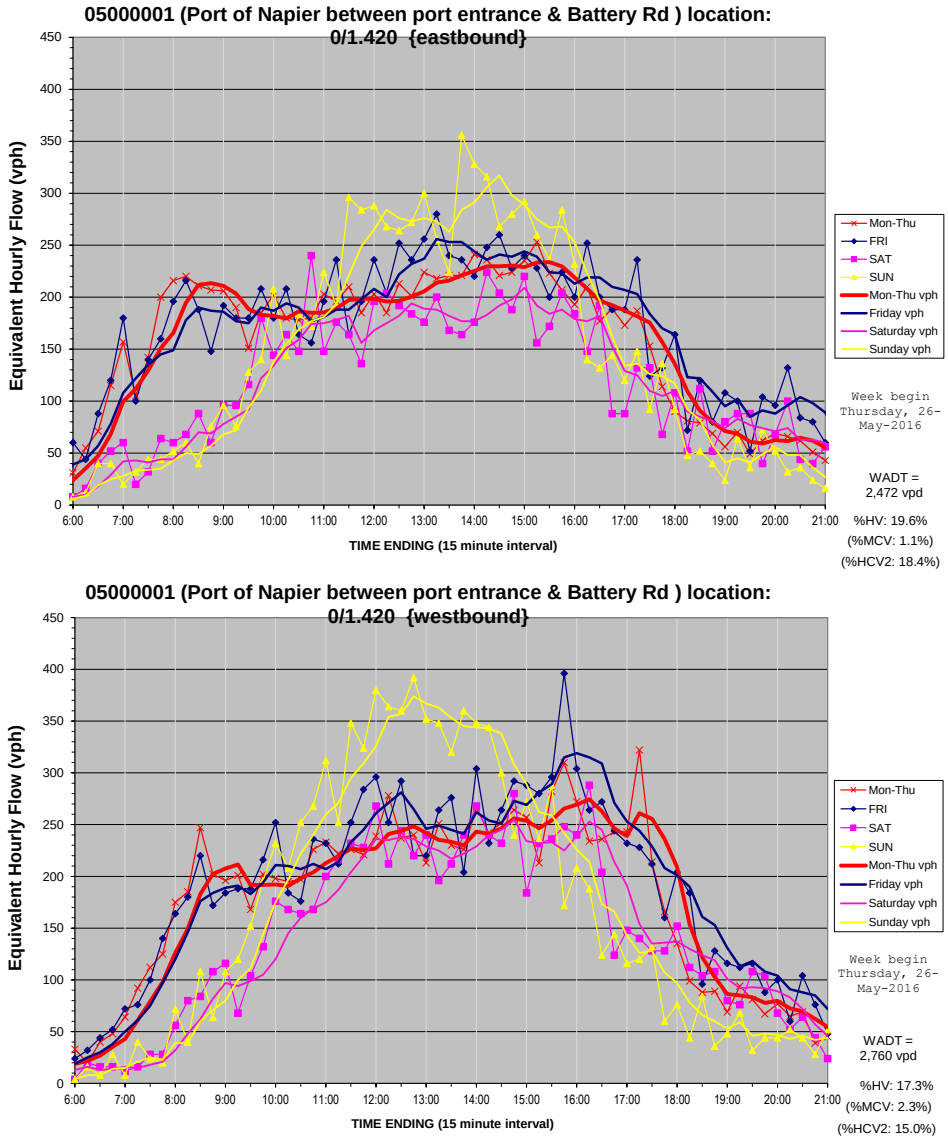


**Figure E-3: Breakwater Road west vehicle typical hourly flow profile by direction**

# Appendix F Intersection performance outputs

### Table F-1: Surveyed flows intersection performance: Western Access

**LANE SUMMARY**

**Site: 1 [Napier Port - West Entrance - Copy]**

Napier Port - West Entrance
Giveway / Yield (Two-Way)

**Lane Use and Performance**

| | Demand Flows Total veh/h | HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Breakwater Road | | | | | | | | | | | | | |
| Lane 1 | 226 | 9.3 | 1839 | 0.123 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 14 | 23.1 | 969 | 0.014 | 100 | 3.4 | LOS A | 0.1 | 0.5 | Short | 80 | 0.0 | NA |
| Approach | 240 | 10.1 | | 0.123 | | 0.2 | NA | 0.1 | 0.5 | | | | |
| North: Napier Port Entrance | | | | | | | | | | | | | |
| Lane 1 | 19 | 11.1 | 1014 | 0.019 | 100 | 2.9 | LOS A | 0.1 | 0.5 | Short | 10 | 0.0 | NA |
| Lane 2 | 68 | 43.1 | 410 | 0.167 | 100 | 8.9 | LOS A | 0.6 | 6.1 | Full | 100 | 0.0 | 0.0 |
| Approach | 87 | 36.1 | | 0.167 | | 7.6 | LOS A | 0.6 | 6.1 | | | | |
| West: Breakwater Road | | | | | | | | | | | | | |
| Lane 1 | 32 | 80.0 | 1183 | 0.027 | 100 | 5.3 | LOS A | 0.0 | 0.0 | Short | 80 | 0.0 | NA |
| Lane 2 | 203 | 13.5 | 1793 | 0.113 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 235 | 22.4 | | 0.113 | | 0.7 | NA | 0.0 | 0.0 | | | | |
| Intersection | 562 | 19.3 | | 0.167 | | 1.6 | NA | 0.6 | 6.1 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 7.0 | Copyright © 2000-2017 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: WANTY TRANSPORTATION CONSULTANCY LTD | Processed: Friday, 21 April 2017 12:52:44 PM
Project: C:\Users\David\Documents\Work2016\TI\Amwh_NapierPort\SIDRA\NapierPort_DKW2.sip7

### Table F-2: Surveyed flows intersection performance: Eastern Access

**LANE SUMMARY**

**Site: 2 [Napier Port - East Entrance]**

Napier Port - East Entrance
Giveway / Yield (Two-Way)

**Lane Use and Performance**

| | Demand Flows Total veh/h | HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Breakwater Rd | | | | | | | | | | | | | |
| Lane 1 | 214 | 4.4 | 1895 | 0.113 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 23 | 18.2 | 1019 | 0.023 | 100 | 5.9 | LOS A | 0.1 | 0.7 | Short | 40 | 0.0 | NA |
| Approach | 237 | 5.8 | | 0.113 | | 0.6 | NA | 0.1 | 0.7 | | | | |
| East: Port Entrance | | | | | | | | | | | | | |
| Lane 1 | 18 | 17.6 | 987 | 0.018 | 100 | 5.7 | LOS A | 0.1 | 0.5 | Short | 10 | 0.0 | NA |
| Lane 2 | 24 | 65.2 | 365 | 0.066 | 100 | 12.4 | LOS B | 0.2 | 2.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 42 | 45.0 | | 0.066 | | 9.6 | LOS A | 0.2 | 2.6 | | | | |
| North: Breakwater Rd | | | | | | | | | | | | | |
| Lane 1 | 26 | 56.0 | 1327 | 0.020 | 100 | 5.1 | LOS A | 0.0 | 0.0 | Short | 80 | 0.0 | NA |
| Lane 2 | 199 | 9.0 | 1842 | 0.108 | 100 | 0.0 | LOS A | 0.0 | 0.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 225 | 14.5 | | 0.108 | | 0.6 | NA | 0.0 | 0.0 | | | | |
| Intersection | 504 | 12.9 | | 0.113 | | 1.3 | NA | 0.2 | 2.6 | | | | |

It should be noted that the flows above are approximately 5¼ % larger by default than the user input flows to take into account some variance in the quarter hour flows within the peak hour.

For the succeeding analysis scenario the default speed for the Port leg traffic was changed from 50 to 30 km/h and the default peak period for the Eastern Gate was changed from 30 to 15 minutes and peak flow factor from 95 to 90 per cent.

For the longer term design life analysis scenario the peak flow factor was changed to 96.5/96.6 %.

**Table F-3: Peak construction flows intersection performance: Western Access**

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Breakwater Road | | | | | | | | | | | |
| 5 | T1 | 226 | 9.3 | 0.123 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| 6 | R2 | 33 | 35.5 | 0.037 | 6.5 | LOS A | 0.1 | 1.3 | 0.39 | 0.58 | 40.8 |
| Approach | | 259 | 12.6 | 0.123 | 0.8 | NA | 0.1 | 1.3 | 0.05 | 0.07 | 49.1 |
| North: Napier Port Entrance | | | | | | | | | | | |
| 7 | L2 | 38 | 27.8 | 0.041 | 3.2 | LOS A | 0.1 | 1.3 | 0.32 | 0.41 | 40.6 |
| 9 | R2 | 87 | 43.4 | 0.227 | 10.1 | LOS B | 0.9 | 8.6 | 0.63 | 0.76 | 35.9 |
| Approach | | 125 | 38.7 | 0.227 | 8.0 | LOS A | 0.9 | 8.6 | 0.54 | 0.66 | 37.2 |
| West: Breakwater Road | | | | | | | | | | | |
| 10 | L2 | 51 | 66.7 | 0.040 | 5.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 41.8 |
| 11 | T1 | 203 | 13.5 | 0.113 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 50.0 |
| Approach | | 254 | 24.1 | 0.113 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 48.7 |
| All Vehicles | | 638 | 22.3 | 0.227 | 2.3 | NA | 0.9 | 8.6 | 0.13 | 0.20 | 46.9 |

With respect to the SIDRA modelled critical gap of the long term design life, examination of the detailed output revealed that for the right turn out, right turn in, and left turn out, the effective critical gaps applied were approximately 7.0, 5.0 and 4.75 seconds respectively. These values are considered reasonably conservative, with the SIDRA defaults meaning that the traffic turning right out did so in one movement, giving way to both directions of through traffic and the traffic turning right into the Port. The SIDRA default also assumed that traffic turning out of the Port give way to half the traffic turning left into the Port although with the wide and long left turn lane it is expected few vehicles turning out of the Port would give way to traffic turning left into the Port so there is added conservatism in the analysis of operational performance.

**Table F-4: Long term design life flows intersection performance: Western Access signalised**

**LANE SUMMARY**

**Site: 1v [Napier Port - West Entrance - Future - Signals]**

Napier Port - West Entrance
Signals - Fixed Time Isolated Cycle Time = 45 seconds (Practical Cycle Time)
Design Life Analysis (Practical Capacity): Results for 45 years

**Lane Use and Performance**

| | Demand Flows Total veh/h | HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Breakwater Road | | | | | | | | | | | | | |
| Lane 1 | 323 | 9.3 | 858 | 0.376 | 100 | 8.6 | LOS A | 4.7 | 35.5 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 32 | 23.1 | 213 | 0.149 | 100 | 22.3 | LOS C | 0.7 | 5.6 | Short | 80 | 0.0 | NA |
| Approach | 354 | 10.5 | | 0.376 | | 9.8 | LOS A | 4.7 | 35.5 | | | | |
| North: Napier Port Entrance | | | | | | | | | | | | | |
| Lane 1 | 44 | 11.1 | 918 | 0.048 | 100 | 6.9 | LOS A | 0.5 | 3.5 | Short | 10 | 0.0 | NA |
| Lane 2 | 158 | 43.1 | 199[1] | 0.793 | 100 | 27.2 | LOS C | 4.0 | 38.6 | Full | 100 | 0.0 | 0.0 |
| Approach | 202 | 36.1 | | 0.793 | | 22.8 | LOS C | 4.0 | 38.6 | | | | |
| West: Breakwater Road | | | | | | | | | | | | | |
| Lane 1 | 73 | 80.0 | 788 | 0.093 | 100 | 7.3 | LOS A | 0.5 | 5.3 | Short | 80 | 0.0 | NA |
| Lane 2 | 290 | 13.5 | 359 | 0.808 | 100 | 23.6 | LOS C | 7.3 | 56.9 | Full | 500 | 0.0 | 0.0 |
| Approach | 363 | 26.9 | | 0.808 | | 20.3 | LOS C | 7.3 | 56.9 | | | | |
| Intersection | 919 | 22.6 | | 0.808 | | 16.8 | LOS B | 7.3 | 56.9 | | | | |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the full-length lanes. Some upstream delays at entry to short lanes are not included.

Note that the above is a preliminary indicative only assessment.