TPC TRAFFIC PLANNING CONSULTANTS LTD

Ref: 211017
29 March, 2023

Gull NZ Ltd
c/- Hayson Knell Ltd
P.O. Box 14085
TAURANGA 3143

Attention: Simon Childs

Dear Simon

PROPOSED GULL SERVICE STATION 1 DP 341981, MOLESWORTH DRIVE, MANGAWHAI
RESOURCE CONSENT APPLICATION NUMBER: RM 220251
ADDITIONAL TRAFFIC INFORMATION

As requested, we have considered the request for additional information received from Kaipara District Council (KDC) and the Northern Transport Alliance (NTA) in relation to the proposed Gull Service Station at Lot 1 DP 341981 Molesworth Drive in Mangawhai. For ease of reference in our response we have numbered and repeated the respective query (in *italics*).

1. *The average weekday traffic count data (6,150 vpd).*
- The ADT utilised appears to be lower than RAMM and Mobile roads, this might be due to COVID restrictions. Request the applicant to undertake the modelling again with the latest data.

   The traffic count information referred to in Section 2.1.1 of our Traffic Impact Assessment dated September 2022 (TIA) was supplied by the Northern Transport Alliance. This was used as background information in our TIA to describe the existing transport environment and we indicated in the TIA that the traffic counts carried out by NTA in October 2021 would have been influenced by the COVID-19 lockdowns that affected Auckland for the latter part of 2021.

   The traffic counts used for traffic modelling purposes were carried out in May 2022 and hence were clear of any effects related to the Auckland COVID-19 lockdowns. These traffic counts were adjusted for seasonal factors as described in Section 5.1.1 of our TIA and also included additional traffic likely to be using Molesworth Drive in the future related to development at Mangawhai Central consistent with the provisions of Plan Change 78.

   As such, we consider the traffic data used in the analysis carried out is appropriate for assessment purposes.

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2. *The proposed 2-way vehicle crossing.*
– We do not approve the western VC over the segregation strip. Has the applicant considered alternative location for the VC? Applicant is to address the possibility of not having the 2-way VC as part of their modelling. In AEE it has been specified that the proposed western access will be utilized as an exit-only.

The applicant has not considered an alternative location for the proposed western vehicle crossing. The AEE relates to the Gull Service Station which would typically use the proposed western vehicle crossing for exit movements while it would be used for entry and exit movements to the adjacent development. While there may be the occasional entry to the Gull Service Station from this vehicle crossing, the number of vehicles would be expected to be very low.

The segregation strip on Molesworth Drive was established in 2005 as a way to safely manage vehicle access to Molesworth Drive when it had a posted speed limit of 100km/hr. The approved access is shown in Figure 1 and is essentially in the same location as the existing eastern vehicle crossing that will be used to access the proposed Gull Service Station and the adjacent development.

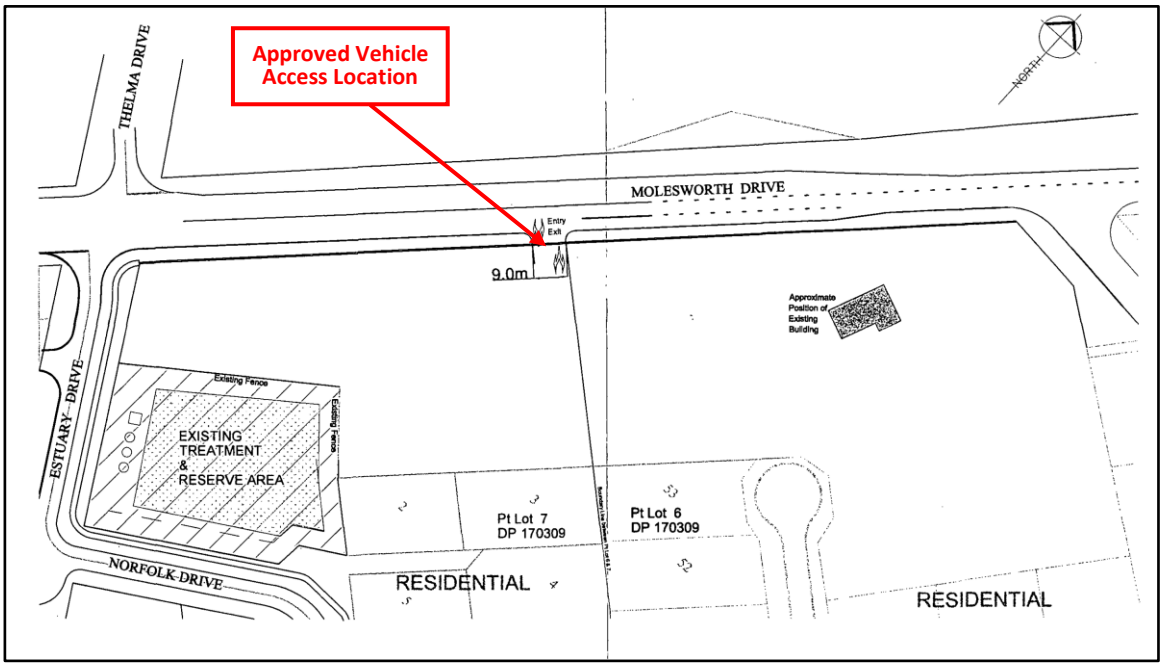


Figure 1 – Approved Molesworth Drive Vehicle Access

Given that the speed limit on Molesworth Drive has been reduced to 50km/hr compared to the 100km/hr speed limit that was in place when the segregation strip was installed, it is difficult to understand the continuing need for the segregation strip as the reasons for its implementation are no longer present.

We understand that there may be a reluctance to remove the segregation strip because of the recently installed shared pedestrian and cycle path in this location and the concerns expressed in the Road Safety Audit (RSA) prepared for the Council in relation

to the Stage 1 of the Mangawhai Shared Path cycle path provided in the vicinity of the Moir Street roundabout.

The concerns expressed in the RSA related to vehicle access are:

A. The width of vehicle access that pedestrians and cyclists need to cross that may also result in high entry speeds;

B. Delineation at the vehicle crossing points;

C. Width at the kerb of some of the vehicle crossings;

D. Implied vehicle priority of the vehicle access points.

Some of these aspects do appear in the proposed western vehicle crossing for the Gull Service Station, particularly related to vehicle crossing width to accommodate the swept path of fuel tankers exiting the site via a left turn. To address this matter particularly, a design has been developed that reduces the effective width of the vehicle crossing across the shared path from 24.5 metres at the kerbline, to 7 metres at the property boundary by relocating the shared path from the kerbline to the property boundary as shown in Figure 2 and the plans included in Attachment 1.

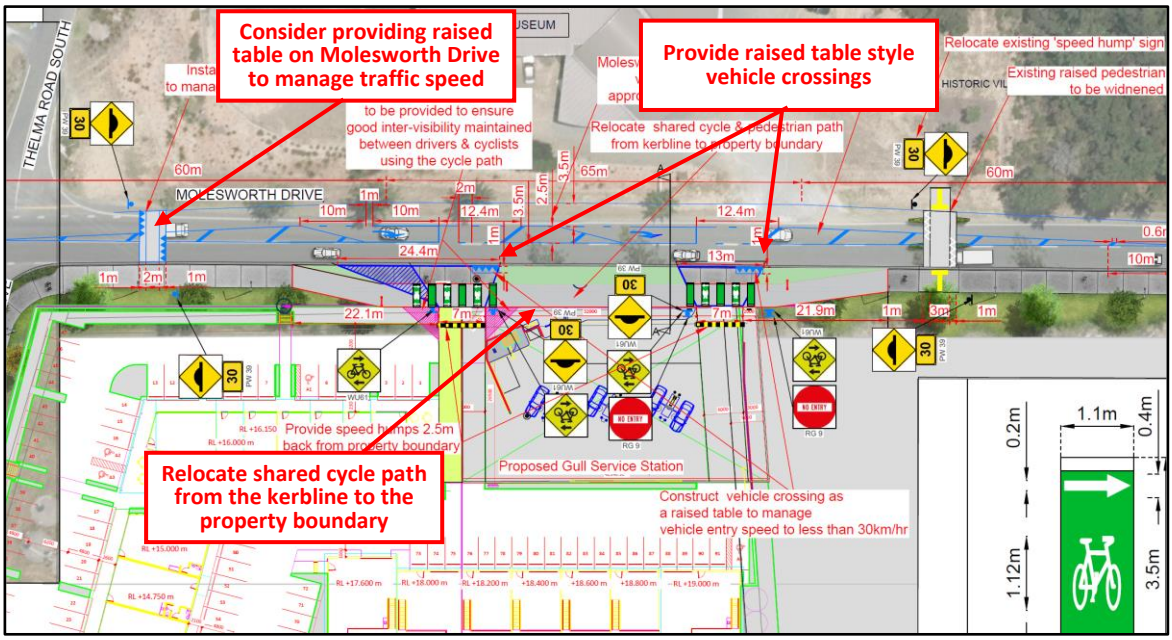


Figure 2 – Possible Relocated Shared Path Arrangement

Relocating the shared pedestrian and cycle path reduces crossing distances significantly compared to that required previously.

Additionally, the proposed vehicle crossings could have more of a raised table profile than a typical vehicle crossing profile. This is to manage the speed of vehicles turning

into the vehicle crossing so that it is consistent with the speed inter-action recommended for vulnerable road users under the safe system approach.

Furthermore, the existing raised table that was installed recently to the east of the site on Molesworth Drive could be duplicated on Molesworth Drive approximately 20 metres east of the Estuary Drive intersection. This would assist in reducing traffic speed on this part of Molesworth Drive as vehicles approach the intersection and also approach the proposed western vehicle crossing.

3. *The typical traffic generation for service station is 2.5% – 3% of passing traffic. – Request the applicant to provide further information on how 2.5%-3% traffic generation was determined, and adequate reasoning is to be provided. In research report 453 the trip generation rates (peak hour) for NZ 2010 has been specified as 20.4/bay and the trip generation utilised to carry out the modelling, appears to be low. Request the applicant to carry out the modelling again.*

The traffic generation rates indicated would imply a traffic generation of about 120 traffic movements per hour if applied to the proposed Gull Service Station.

In terms of traffic generating potential of a service station, the main determinant is the level of passing traffic on the frontage road while a lesser factor relates to the provision of a service station shop. The information quoted from Research Report 453 would have included service stations with a shop versus the proposal for Mangawhai which does not include such a facility, and this will have an influence on total traffic generated.

As part of a monitoring condition, we have recently carried out a series of traffic surveys at a recently opened Gull Service Station in Pokeno to coincide with the cheap fuel specials that Gull has from time to time. This facility has three pumps (six vehicle refuelling positions) and hence is the same configuration as that proposed for Mangawhai. The traffic monitoring indicated traffic generation of 80 to 100 traffic movements per hour or 13 to 16 traffic movements per hour per refuelling position. This traffic generation related to a "sale" special that occurs at irregular intervals and as such is not a normal traffic condition situation.

Nevertheless, for further assessment purposes we have adopted a traffic generation of 90 traffic movements per hour.

The resulting turning movements from this are shown in Figure 3 for the Weekday PM Peak Hour and in Figure 4 for the Saturday Midday Peak Hour.

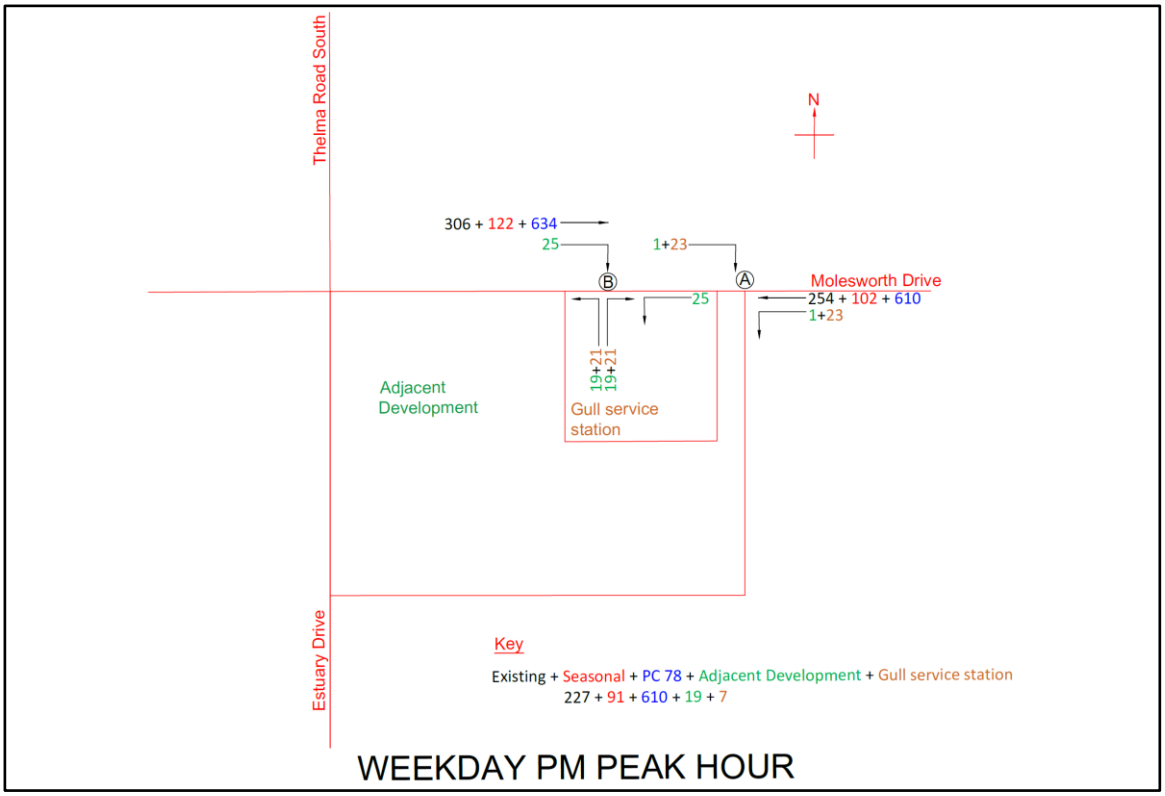


Figure 3 – Weekday PM Peak Hour Vehicle Crossing Turning Movements

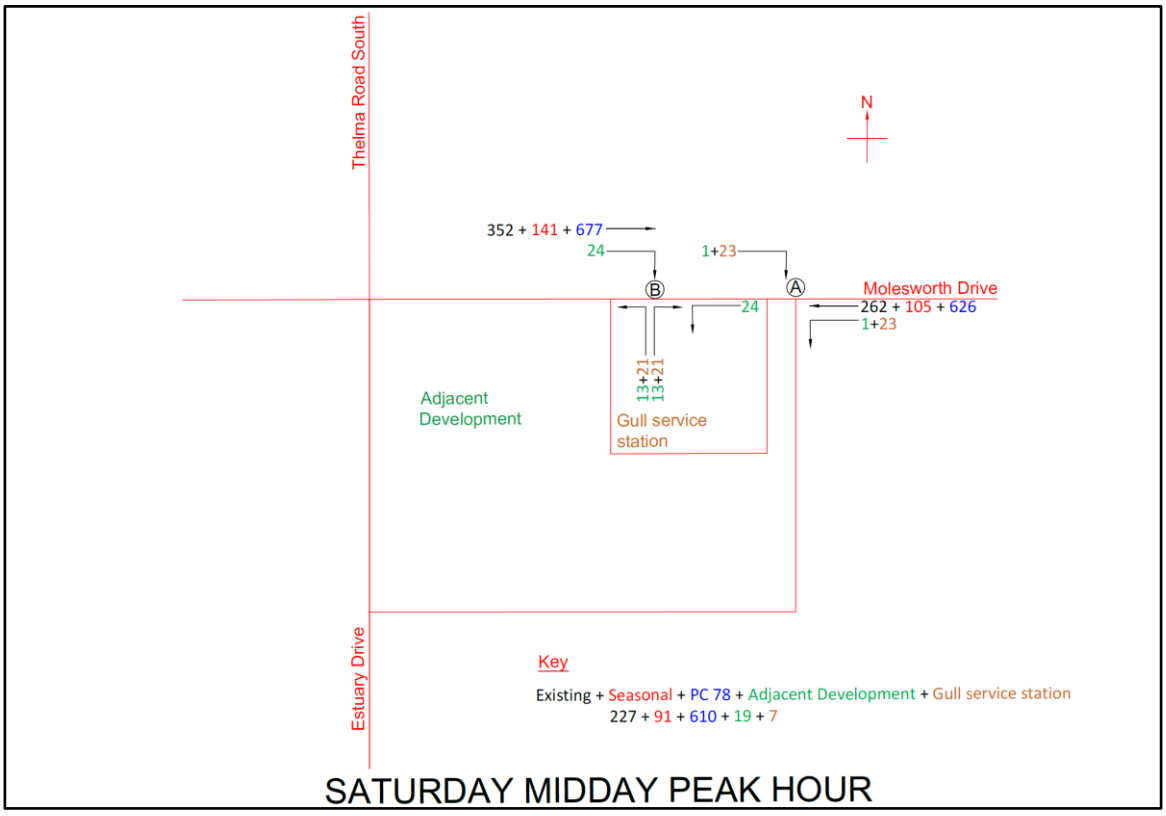


Figure 4 – Saturday Midday Peak Hour Vehicle Crossing Turning Movements

To confirm the operational capacity of the vehicle access point for these traffic flows, the operational characteristics of the proposed western vehicle crossing has been modelled using the SIDRA Intersection software package. The results of this analysis are shown in Table 1 for the Weekday PM Peak Hour and in Table 2 for the Saturday midday peak hour.

Table 1 – Molesworth Drive Entry /Exit Vehicle Crossing PM Peak Hour Results

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Site Entry Exit													
Lane 1	82	0.0	245	0.334	100	21.4	LOS C	1.1	7.8	Full	500	0.0	0.0
Approach	82	0.0		0.334		21.4	LOS C	1.1	7.8				
East: Molesworth - wbound													
Lane 1	971	5.8	1876	0.518	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	971	5.8		0.518		0.4	NA	0.0	0.0				
West: Molesworth - ebound													
Lane 1	1083	6.0	1866	0.580	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	25	0.0	476	0.053	100	11.5	LOS B	0.2	1.3	Short	25	0.0	NA
Approach	1108	5.9		0.580		0.6	NA	0.2	1.3				
Intersection	2161	5.6		0.580		1.3	NA	1.1	7.8				

Table 2 – Molesworth Drive Entry /Exit Vehicle Crossing Saturday Midday Results

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Site Entry Exit													
Lane 1	70	0.0	192	0.364	100	26.7	LOS D	1.2	8.2	Full	500	0.0	0.0
Approach	70	0.0		0.364		26.7	LOS D	1.2	8.2				
East: Molesworth - wbound													
Lane 1	997	5.9	1876	0.531	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	997	5.9		0.531		0.4	NA	0.0	0.0				
West: Molesworth - ebound													
Lane 1	1184	6.0	1867	0.634	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	24	0.0	449	0.053	100	12.0	LOS B	0.2	1.3	Short	25	0.0	NA
Approach	1208	5.9		0.634		0.7	NA	0.2	1.3				
Intersection	2275	5.7		0.634		1.3	NA	1.2	8.2				

The SIDRA modelling results confirms that the vehicle access will operate well within its capacity for the traffic generated by the Gull Service Station and the adjacent proposed development.

4. *Applicant is to carry out Safe system assessment for the vehicle crossings and the report is to identify if the proposed treatment is primary/ secondary/ non-safe system compliant. Primary treatment is to be proposed to mitigate the effects on shared path*

A Safe System Assessment of the vehicle access is included in Attachment 2.

The hierarchy of treatment is shown in Table 3 with the proposal having aspects of transformational and supporting treatments.

Table 3 – Western Vehicle Crossing Safe System Treatment Hierarchy

Hierarchy	**Treatment**	**Influence (E = exposure L = likelihood S = severity)**
Safe System options ("primary" or "transformational" treatments)	• Raised platform on Molesworth • Raised platform vehicle crossing	L, S L, S
Supporting treatments (compatible with future implementation of Safe System options)	• Reduced speed environment	L, S
Supporting treatments (does not affect future implantation of Safe System options)	• Turning lane • Advanced signage and warning	L L

5. *SIDRA Modelling.*
– Request applicant to include HCV% in their modelling. Request the applicant to carry out modelling on Molesworth Drive/Estuary Drive/Thelma Road intersection to determine the effects from the proposal (delays/queue due to the right turning movements). If the proposed western access is an exit only, the modelling is to reflect that. Have pedestrian delays been considered as part of the modelling? If yes, applicant to provide further details on it. Modelling has been carried out for Access B, has right turning movements for access A been considered? If yes, can you please provide the information for that entrance? Modelling for Weekend peak time must be carried out. The input for lane length has been provided as 500m – can you please outline the basis for this? Can you please let us know if the fuel tankers have been taken into consideration in the modelling?

In relation to the SIDRA modelling, the following is noted:

- A heavy commercial vehicle percentage of 6% has been added for traffic flows on Molesworth Drive.

- The lane length for the right turn lane has been reduced to 25 metres. The original at 500 metres was used to determine what lane length may have been required.

- There is approximately 1 fuel tanker delivery per week with this typically not occurring during the peak traffic periods. As such, it is not included in the SIDRA modelling for the peak periods analysed.

For Access A, this has been modelled for the traffic flows shown in Figure 3 for the Weekday PM Peak Hour and in Figure 4 for the Saturday Midday Peak Hour. As this vehicle crossing is proposed to be an entry only, it will cater for both left turn entry movements and right turn entry movements. The results of the SIDRA modelling for these traffic movements are shown in Table 4 for the Weekday PM Peak Hour and in Table 5 for the Saturday midday peak hour.

Table 4 – Molesworth Drive Entry Vehicle Crossing PM Peak Hour Results

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Molesworth - wbound													
Lane 1	969	5.9	1876	0.516	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	969	5.9		0.516		0.4	NA	0.0	0.0				
West: Molesworth - ebound													
Lane 1	1083	6.0	1867	0.580	100	0.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	23	0.0	478	0.048	100	11.7	LOS B	0.2	1.2	Short	25	0.0	NA
Approach	1106	5.9		0.580		0.6	NA	0.2	1.2				
Intersection	2075	5.9		0.580		0.5	NA	0.2	1.2				

Table 5 – Molesworth Drive Entry Vehicle Crossing Saturday Midday Results

Lane Use and Performance													
	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Molesworth - wbound													
Lane 1	996	5.9	1876	0.531	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	996	5.9		0.531		0.4	NA	0.0	0.0				
West: Molesworth - ebound													
Lane 1	1184	6.0	1867	0.634	100	0.4	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	23	0.0	450	0.051	100	12.2	LOS B	0.2	1.2	Short	25	0.0	NA
Approach	1207	5.9		0.634		0.7	NA	0.2	1.2				
Intersection	2203	5.9		0.634		0.5	NA	0.2	1.2				

The SIDRA modelling results confirms that the entry vehicle access from Molesworth Drive will operate well within its capacity for the traffic generated by the Gull Service Station and the adjacent proposed development.

In relation to the effect on the intersection of Molesworth Drive / Estuary Drive / Thelma Road, service stations tend to draw traffic from that passing on the frontage road rather than new trips. As such the proposal would not add traffic to Molesworth Drive and traffic would turn to and from the existing eastern and the proposed western vehicle crossing on Molesworth Drive. On this basis, the proposal would not add to existing turning movements at the intersection and as such would have no effect on the intersection.

In terms of the proposed western vehicle crossing being used for an exit crossing, the modelling that has been done and summarised in Table 1 and Table 2 is based on an entry / exit crossing. If this is an exit only crossing, the operational performance for exiting traffic will improve from that indicated in the tables because right turn exiting traffic would no longer need to give way to right turning entering traffic.

6. *Applicant is to carry out Safe system assessment on the intersection of Estuary Drive/Molesworth Drive/Thelma Road and the report is to identify if the proposed treatment is primary/ secondary/ non-safe system compliant. Primary treatment is to be proposed to mitigate the effects from this development.*

A safe system assessment of the intersection is included in Attachment 3 noting that the proposed Gull Service Station would not change turning movements at the intersection.

No changes are directly proposed for the intersection although a raised table on one of the Molesworth Drive approach, to manage traffic speed would fall within the "primary" treatment category with influences on both the likelihood and severity of crashes.

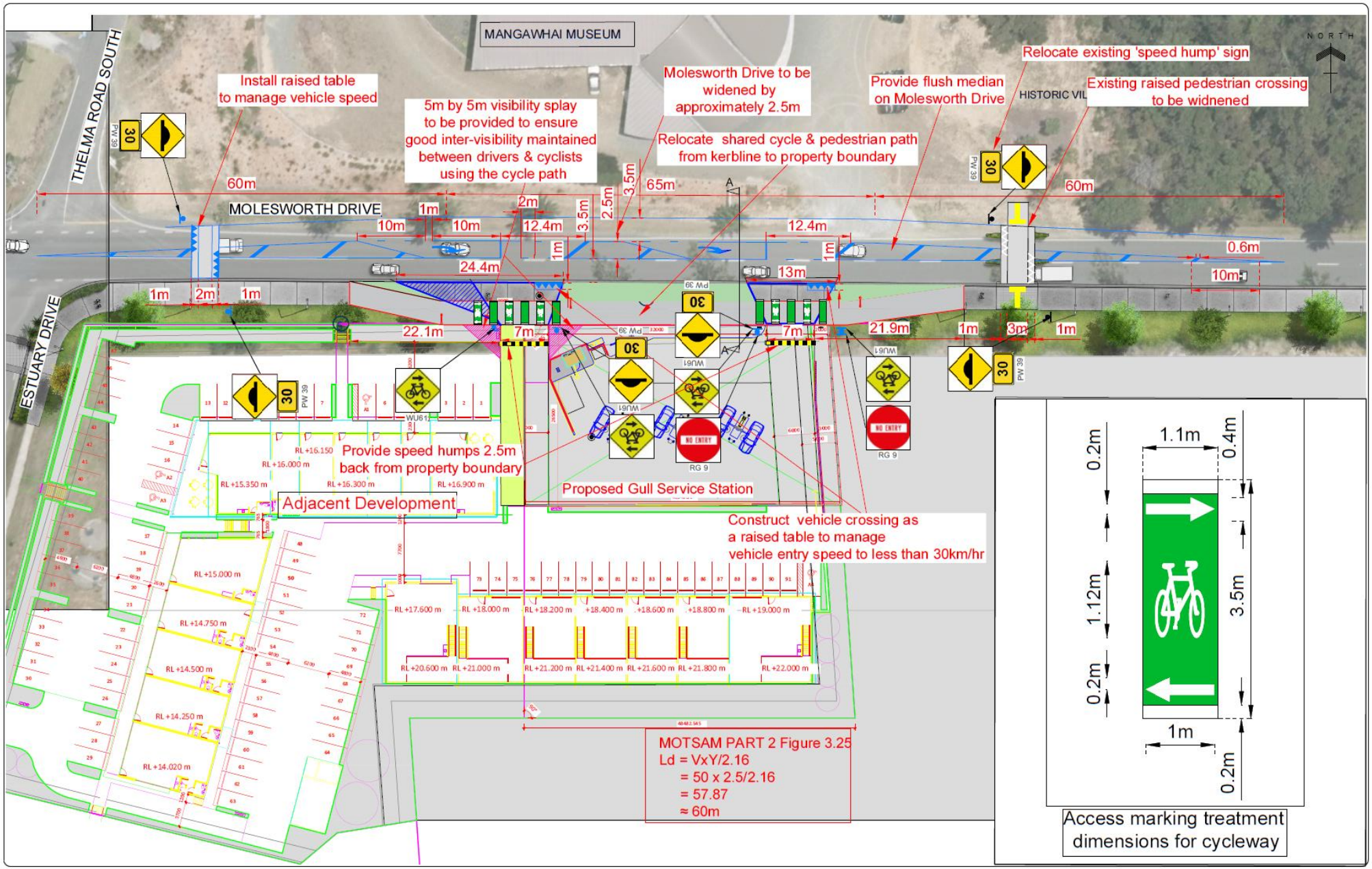
We trust that the above provides sufficient information to respond to the additional information request received from the Council. However, should there be further queries in relation to the above, we would be happy to discuss these with you.

Yours faithfully
TRAFFIC PLANNING CONSULTANTS LTD

Bryce Hall
Director
bryce@trafficplanning.co.nz

ATTACHMENT 1

Possible Vehicle Access Treatment



Rev	Revisions	By	Date

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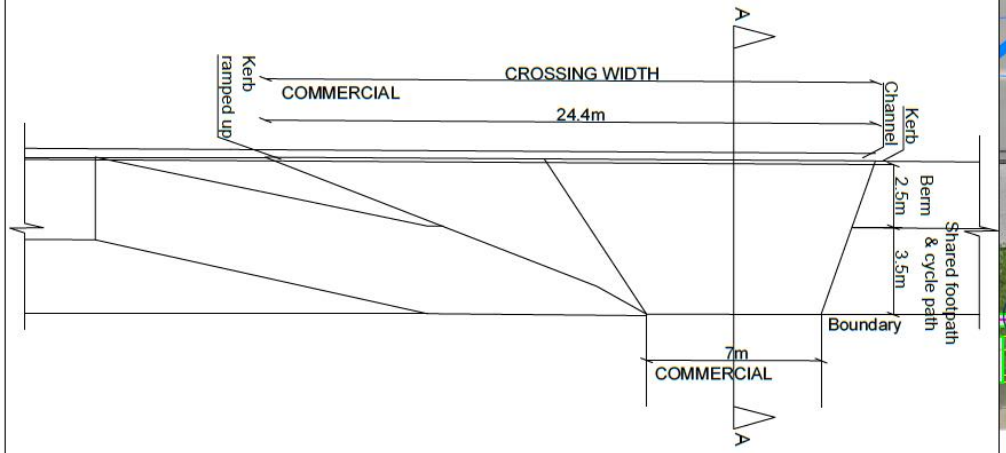
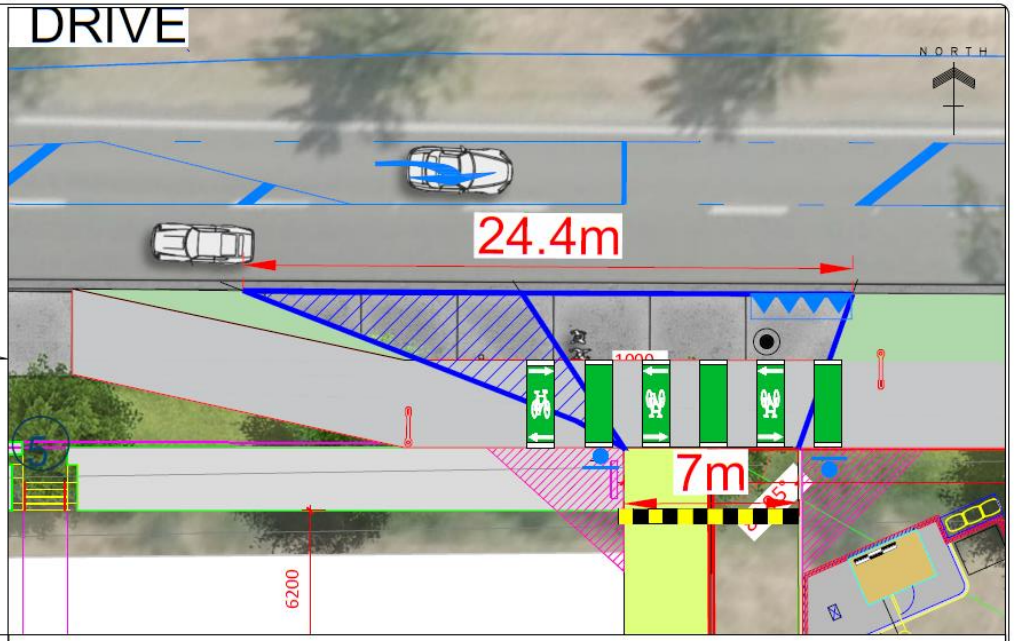
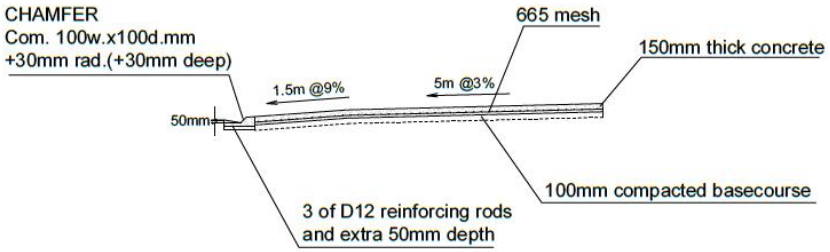
Project Title: Proposed Development Gull Molesworth Drive

Sheet Title: Proposed Vehicle Crossing Arrangements

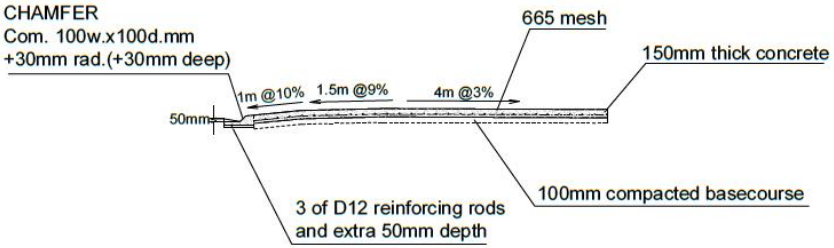
Designed	CE	Drawn	CE	Project No - (Sheet No)	Scales 1:500(A3)
Checked	BH	Approved	BH	211017 DDD - (1)	Date 22.03.23







KDC TYPICAL CROSS SECTION



PROPOSED CROSS SECTION

Rev	Revisions	By	Date

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Project Title: Proposed Development
Gull Molesworth Drive

Sheet Title: Proposed Vehicle Crossing

Designed	CE	Drawn	CE	Project No - (Sheet No)	Scales NTS(A3)
Checked	BH	Approved	BH	211017 DDD - (2)	Date 22.03.23

ATTACHMENT 2

Safe Systems Framework Assessment – Western Vehicle Crossing

TRAFFIC PLANNING CONSULTANTS LTD

Safe Systems Framework Analysis:
Proposed Molesworth Drive Western Vehicle Crossing

1.0 Background

The western vehicle crossing to the proposed Gull Service Station on Molesworth Drive was selected for framework analysis to reply to a request for additional information received from Kaipara District Council as part of a Resource Consent application for the Gull Service Station. The proposed western vehicle crossing is also proposed to serve an adjacent commercial development although this development also has vehicle access available to Estuary Drive.

The proposed vehicle access arrangement is shown in Figure 1.

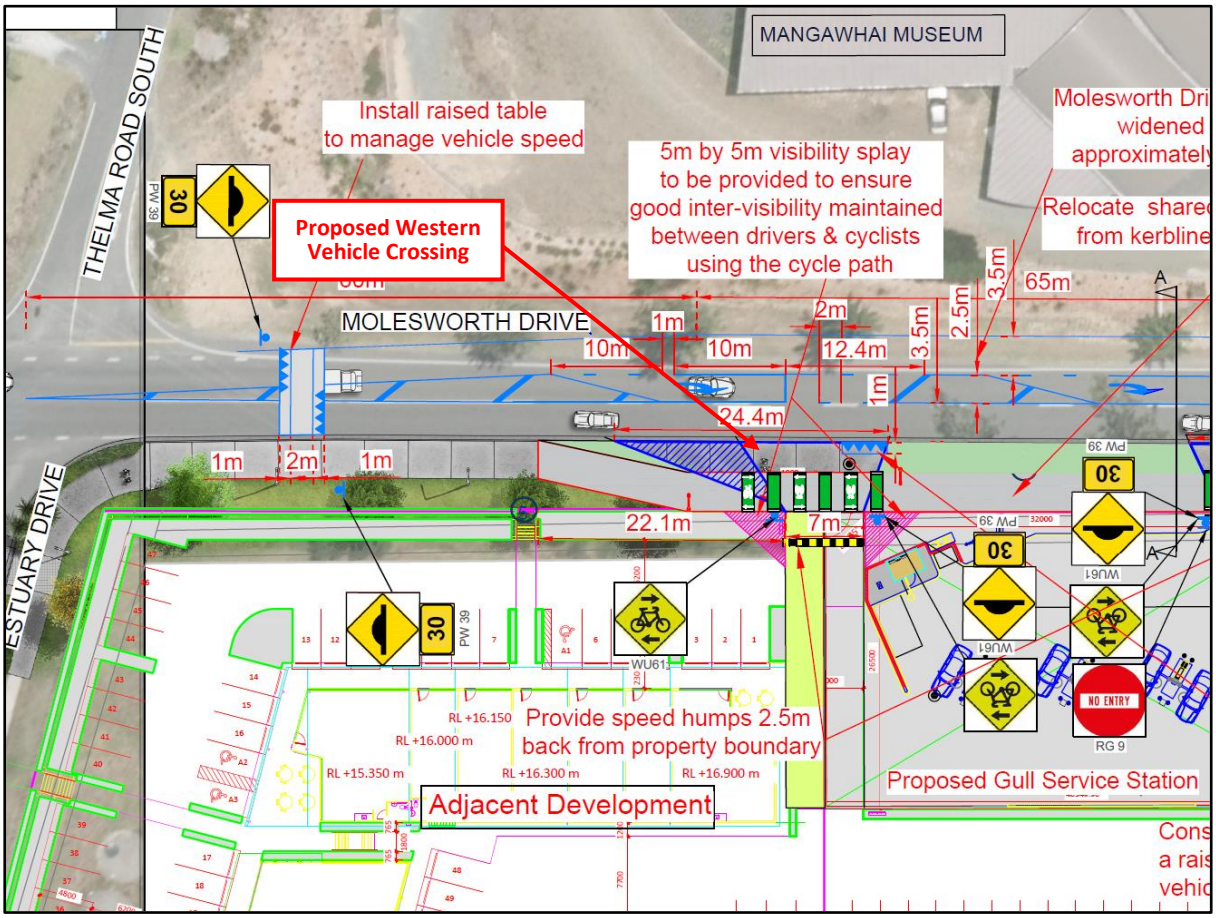

Figure 1 – Proposed Vehicle Crossing

The speed limit on Molesworth Drive is 50km/hr and it is classified as an arterial road.

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A 3.5 metre wide shared pedestrian / cycle path is provided on the southern side of Molesworth Drive and runs along the kerbline in this location. As part of the proposal the shared pedestrian / cycle path would be relocated against the property boundary to provide separation from the through traffic lane and to minimise the effective width of the vehicle crossing and potential conflict area.

The following presents a Safe System assessment of the following scenario:

- Proposed western vehicle crossing

2.0 Proposed Western Vehicle Crossing

Objective's identification

In the "baseline" case, traffic generation of the proposed development including the Gull Service Station is as shown in Table 6 below.

Table 6 – Traffic Generation Potential

Activity	Area	Daily Traffic	Weekday PM Peak Hour
Gull service station	6 pumps	900	90
Retail	472m^2 + 100m^2 outdoors[1]	680	95
Office	1,028m^2	150	20
Industrial	1,020m^2	120	15
Total		1,850	220

The objective of this assessment is to identify how well the proposed vehicle crossing aligns with Safe System objectives. This is the assessment of an individual location, looking at a specific road design and operational issues.

[1] For the purpose of this assessment the outdoor seating area has been included in the calculation of traffic generation potential.

Setting the context

Prompts	Comments
What is the function of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	• Molesworth Drive – Arterial road with a 50km/hr speed limit, primary access to Mangawhai, high flows (future flows of greater than 10,000 vpd) • Vehicle access to development including Gull Service Station – low speed environment (design speed of 20 km/h), future flows (anticipated to be less than 1,500 vpd) • Vehicle crossing, widened to accommodate a flare for a fuel tanker to exit from the service station • Raised speed table located approximately 70 metres to the east of the proposed vehicle crossing with an advisory "30km/hr" indicated • Shared path on the southern side of Molesworth Drive • No current public transport services in Mangawhai area, • No parking within traffic lanes • Straight road segments
What road users are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	• No school children present • Moderate to high future cyclists and pedestrians on Molesworth Drive
What is the vehicle composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	• Typical urban traffic composition. • Mostly light vehicles and a moderate proportion of heavy vehicles, • Low volumes of on-road cyclists and motorcyclists.
What is the reason for the project? Is there a specific crash type problem? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	• To assess the current level of road safety in Safe System, including baseline development and the subsequent road safety levels resulting from the proposed vehicle crossing. • No injury crashes reported in this location.

Safe System Matrix - Baseline

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume y	High volume y	High vol. Molesworth Drive y Vehicle crossing n	High volume y	Low pedestrian volumes Molesworth Drive n Vehicle crossing y	Low cyclist volumes Molesworth Drive n Vehicle crossing y	Low motorcyclist volumes y	
	3/4	3/4	3/4	3/4	4/4	4/4	2/4	
Likelihood	Steep grade n Deceleration lane n Presence of intersection y Road shoulders n Moderate clear zone – No barriers n Guidance and delineation y Flush medians y Curve road n Low speed environment y	Divided, wide/flush median y Intersection movements/conflict points minimal for HO crash n	% turning movements n No. of lanes and conflict points y High speed n Good sight distance y Protected turn lanes y Miss intersection n	High no. of lanes n Protected turn lanes n Extended decel. Lanes n Need to stop at sign n Buses stopping n	Separate facilities y Crossing facilities at intersection y Less lanes to cross y High speed n	Separate facilities y Crossing facilities at intersection y Road shoulders n High speed n	Delineation y Well surfaced y Straight road y	
	2/4	2/4	2/4	2/4	2/4	2/4	1/4	
Severity	High speed n No barriers n Steep grade n Drains n Kerbing y Poles and trees to hit y	High speed n	High speed n Reduced conflict angles n Good sight distance y	High speed n Visible intersection y Surfaced y	High speed n No crossing facilities n	High speed n	High speed n Some roadside hazards y	
	1/4	2/4	2/4	1/4	2/4	2/4	2/4	
Product	3*2*1=6/64	3*2*2=12/64	3*2*2=12/64	3*2*1=6/64	4*2*2=16/64	4*2*2=16/64	2*1*2=4/64	**56 /448**

Additional Safe System Components	Prompts	Comments
Road user	Are road users likely to be alert and compliant, or are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	• Local drivers and tourists – good reaction times, good level of control • Adequate sight distance • Moderate speed environment (50 km/hr for Molesworth Drive and 20 km/hr design speed for cul-de-sac)
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network?	• No vehicle enforcement • Moderate to high volume • Heavy vehicles – standard urban mix
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	• Emergency service vehicles can park in the adjacent development or on the central flush median • Diversion around a potential crash site is available– as such section of road can be isolated and traffic diverted • Closeness to emergency facilities (Whangarei Hospital - 60 km)

5.0 Conclusion

The Safe System Framework assessment has been carried out for the proposed western vehicle crossing.

ATTACHMENT 2

Safe Systems Framework Assessment - Intersection

TPC TRAFFIC PLANNING CONSULTANTS LTD

Safe Systems Framework Analysis: Molesworth Drive, Estuary Drive, and Thelma Road South

1.0 Background

The intersection of Molesworth Drive with Estuary Drive and Thelma Road South in Mangawhai was selected for framework analysis to reply to a request for additional information received from Kaipara District Council as part of a Resource Consent application for a proposed commercial development on the south-eastern corner of Molesworth Drive at its intersection with Estuary Drive. Molesworth Drive provides the main vehicle access to Mangawhai, with Estuary Drive and Thelma Road South providing a slightly staggered T-intersection with "Stop" controls on both Estuary Drive and Thelma Road South approaches as show in Figure 1.

Molesworth Drive

Estuary Drive through to Thelma Road South

Figure 1: Intersection Molesworth Drive with *Estuary Drive* and Thelma Road South

Molesworth Drive is provided with a kerb and channel on its southern side and a grass swale drain on the northern side. It has a carriageway width of some 7.3-metres and is identified as an Arterial Road in the Operative Kaipara District Plan (OKDP), with the primary function of moving traffic. A shared path (cycle and pedestrian) has recently been constructed along the southern side of Molesworth Drive, with the path anticipated to eventually carry some 850 cyclists per day[2] and perhaps two to three times that number of pedestrians. The posted speed limit previously changed from 80 km/hr (from 65 metres west of Estuary Drive) to 50km/hr eastward of the point. However, Kaipara District Council have recently reduced the speed limit along the length of Molesworth Drive to 50km/hr.

[2] Business Case for cycle path. Information supplied by Northern Transport Alliance April 2022.

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Estuary Drive extends southward from Molesworth Drive, primarily servicing residential activity and a camping ground and has a posted speed limit of 40 km/hr. In the vicinity of the intersection of Molesworth Drive, Estuary Drive has a kerb to kerb carriageway width of some 5.5 metres which provides for one lane of traffic in each direction and is identified as a Local Road with the primary function of providing access to adjacent properties. Grassed berms are provided on both sides of the road, with a footpath provided on the eastern side only.
Thelma Road South extends 600 metres northward from Molesworth Drive, primarily servicing some residential activity and a wastewater treatment plant. The first 50 metres of Thelma Road South has a posted speed limit of 50 km/hr before increasing to 80 km/hr albeit due to road width and alignment the actual speed of vehicles is lower than this. In the vicinity of the intersection Thelma Road South has a rural carriageway width of some 5.5 metres which provides for one of traffic in each direction and is identified as a Local Road. No separate pedestrian facilities have been provided.
The following presents a Safe System assessment of the following three scenarios:

- Existing intersection (baseline);
- Existing intersection with Plan Change 78, and
- Existing intersection with Plan Change 78, and the proposed development (including the Gull Service Station)

2.0 Baseline

Objective's identification

The objective of this assessment was to identify how well the current intersection aligns with Safe System objectives and to allow comparison with the proposal. This is the assessment of an individual location, looking at a specific road design and operational issues.

Setting the context

Prompts	Comments
What is the function of the road? Consider location, roadside land use, area type, speed limit, intersection type, presence of parking, public transport services and vehicle flows. What traffic features exist nearby (e.g. upstream and downstream)?	• Molesworth Drive - Arterial low-speed environment (50 km/h), primary access to Mangawhai township, high flows (weekday holiday peak 11,500 vpd & 6,150 weekday off peak) • Estuary Drive – Local Road, low speed environment (50 km/h), moderate flows (2,000 vpd) • Thelma Road – Local Road, low speed environment (50km/h + width + alignment), low flows (anticipated to be less than 500 vpd). • Semi-urban area • Staggered T-junction with Stop control on the Estuary Drive and Thelma Road South approaches • Shared path on southern side of Molesworth Drive and narrow footpath on east side of Estuary Drive • No public transport services • Grassed berms available for parking

Prompts	Comments
	• Straight road segments
What road users are present? Consider the presence of elderly, school children and cyclists. Also note what facilities are available to vulnerable road users (e.g. signalised crossings, bicycle lanes, school zone speed limits, etc.).	• No school children present • Cyclists and pedestrians (estimated to currently be in the order of 50 per day)
What is the vehicle composition? Consider the presence of heavy vehicles (and what type), motorcyclists and other vehicles using the roadway.	• Typical urban traffic composition. • Mostly light vehicles and a moderate proportion of heavy vehicles, • Low volumes of pedestrians, cyclists and motorcyclists.
What is the reason for the project? Is there a specific crash type problem? Is it addressing specific issues such as poor speed limit compliance, road access, congestion, future traffic growth, freight movement, amenity concerns from the community, etc.	• To assess the current level of road safety in Safe System, the proposed level once traffic flows from Plan Change 78 is developed, and the subsequent road safety levels resulting from the proposed business development. • One crash has occurred at the intersection from 2017 to 2021. Crash involved two vehicles turning right onto Molesworth Drive, one from each side road, hitting each other. The crash did not result in any injury.

Safe System matrix

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume y	High volume y	High vol. Molesworth Road y Estuary Drive n Thelma Rd Sth n	High volume y	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	4/4 summer peak	4/4 summer peak	4/4 summer peak	4/4 summer peak	3/4 summer	3/4 summer	3/4 summer	
	3/4 off peak	3/4 off peak	3/4 off peak	3/4 off peak	2/4 off peak	2/4 off peak	2/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation y Flush medians x Curve road x	Divided, wide/flush median n Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points y High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign y Buses stopping x	Separate facilities y Crossing facilities at intersection y Less lanes to cross y High speed x	Separate facilities y Crossing facilities at intersection y Road shoulders x High speed x	Delineation y Well surfaced y Straight road y	
	3/4	3/4	3/4	1/4	3/4	3/4	3/4	
Severity	High speed x No barriers x Steep grade x Drains x Poles and trees to hit y	High speed x	High speed x Reduced conflict angles x Good sight distance y	High speed x Visible intersection y Surfaced y	High speed x No crossing facilities x	High speed x	High speed x Some roadside hazards y	
	2/4	2/4	2/4	2/4	3/4	3/4	3/4	
Product	4*3*2=24/64 summer 3*3*2=18/64 off peak	4*3*2=24/64 SP 3*3*2=18/64 OP	4*3*2=24/64 SP 3*3*2=18/64 OP	4*1*2=8/64 SP 3*1*2=6/64 OP	3*3*3=27/64 SP 2*3*3=18/64 OP	3*3*3=27/64 SP 2*3*3=18/64 OP	3*3*3=27/64 SP 2*3*3=18/64 OP	**161 /448 SP**

Additional Safe System Components	Prompts	Comments
Road user	Are road users likely to be alert and compliant, or are there factors that might influence this? What are the expected compliance and enforcement levels (alcohol/drugs, speed, road rules, and driving hours) and what is the likelihood of driver fatigue? Are there special road uses (e.g. entertainment precincts, elderly, children, on-road activities), distraction by environmental factors (e.g. commerce, tourism), or risk-taking behaviours?	• Local drivers and tourists – good reaction times, good level of control • Adequate sight distance • Moderate speed environment (50 km/hr)
Vehicle	What level of alignment is there with the ideal of safer vehicles? Are there factors which might attract large numbers of unsafe vehicles? Is the percentage of heavy vehicles too high for the proposed/existing road design? Are there enforcement resources in the area to detect non-roadworthy, overloaded or unregistered vehicles and thus remove them from the network?	• No vehicle enforcement • Moderate to high volume • Heavy vehicles – 2% summer peak, 3.5% off peak.
Post-crash care	Are there issues that might influence safe and efficient post-crash care in the event of a severe injury? Do emergency and medical services operate as efficiently and rapidly as possible? Are other road users and emergency response teams protected during a crash event? Are drivers provided the correct information to address travelling speeds on the approach and adjacent to the incident? Is there provision for e-safety (i.e. safety systems based on modern information and communication technologies, C-ITS)?	• Road shoulders may be used for emergency stops • The roadside space and land beside the road can be used by emergency services • Closeness to emergency facilities (Whangarei Hospital - 60 km)

3.0 Plan Change 78

The estimated traffic generation of Project Plan Change 78 is likely to be in the order of 1,250 additional weekday PM traffic movements per hour to Molesworth Drive and 1,300 additional Saturday midday traffic movements per hour.

Safe System matrix

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume y	High volume y	High vol. Molesworth Road y Estuary Drive n Thelma Rd Sth n	High volume y	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	4/4 summer peak	4/4 summer peak	4/4 summer peak	4/4 summer peak	4/4 summer	4/4 summer	3/4 summer	
	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	3/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation y Flush medians x Curve road x	Divided, wide/flush median n Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points y High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign y Buses stopping x	Separate facilities y Crossing facilities at intersection y Less lanes to cross y High speed x	Separate facilities y Crossing facilities at intersection y Road shoulders x High speed x	Delineation y Well surfaced y Straight road y	
	3/4	3/4	3/4	1/4	3/4	3/4	3/4	
Severity	High speed x No barriers x Steep grade x Drains x Poles and trees to hit y	High speed x	High speed x Reduced conflict angles x Good sight distance y	High speed x Visible intersection y Surfaced y	High speed x No crossing facilities x	High speed x	High speed x Some roadside hazards y	
	2/4	2/4	2/4	2/4	3/4	3/4	3/4	
Product	4*3*2=24/64	4*3*2=24/64	4*3*2=24/64	4*1*2=8/64	4*3*3=36/64	4*3*3=36/64	3*3*3=27/64	**179 /448**

4.0 Development

The estimated traffic generation of the Business Development is likely to be in the range of 130 additional weekday PM traffic movements per hour and 107 additional Saturday midday traffic movements per hour.

Safe System matrix

	Run-off-Road	Head -On	Intersection	Other	Pedestrian	Cyclist	Motorcyclist	Total
Exposure	High volume y	High volume y	High vol. Molesworth Road y Estuary Drive n Thelma Rd Sth n	High volume y	Low pedestrian volumes y	Low cyclist volumes y	Low motorcyclist volumes y	
	4/4 summer peak	4/4 summer peak	4/4 summer peak	4/4 summer peak	4/4 summer	4/4 summer	3/4 summer	
	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	4/4 off peak	3/4 off peak	
Likelihood	Steep grade x Deceleration lane x Presence of intersection y Road shoulders one side Moderate clear zone – No barriers x Guidance and delineation y Flush medians x Curve road x	Divided, wide/flush median n Intersection movements/conflict points minimal for HO crash n	% turning movements x No. of lanes and conflict points y High speed x Good sight distance y Protected turn lanes n Miss intersection y	High no. of lanes x Protected turn lanes n Extended decel. Lanes x Need to stop at sign y Buses stopping x	Separate facilities y Crossing facilities at intersection y Less lanes to cross y High speed x	Separate facilities y Crossing facilities at intersection y Road shoulders x High speed x	Delineation y Well surfaced y Straight road y	
	3/4	3/4	3/4	1/4	3/4	3/4	3/4	
Severity	High speed x No barriers x Steep grade x Drains x Poles and trees to hit y	High speed x	High speed x Reduced conflict angles x Good sight distance y	High speed x Visible intersection y Surfaced y	High speed x No crossing facilities x	High speed x	High speed x Some roadside hazards y	
	2/4	2/4	2/4	2/4	3/4	3/4	3/4	
Product	4*3*2=24/64	4*3*2=24/64	4*3*2=24/64	4*1*2=8/64	4*3*3=36/64 SP 3*3*3=27/64 OP	4*3*3=36/64 SP 3*3*3=27/64 OP	3*3*3=27/64	**179 /448**

5.0 Conclusion

The baseline outcome of 169 and the Plan Change 78 / Plan Change 78 plus proposed development outcome of 179 shows that the development does not significantly affect the current level of road safety system. The greatest effect arises as a result of the traffic generating potential of Plan Change 78 and the additional traffic likely to use Molesworth Drive from this Plan Change.

The Safe System Framework assessment between the approved Plan Change 78 traffic conditions and the proposed commercial development result in the same calculated number indicating that the proposed development has no effect in respect of the assessment carried out.