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Ref: 221031
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By email

Attn: Mike Doesburg
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Dear Sir

Re: Brownlie Submission - Supplementary Commentary on Traffic Modelling Report

Further to our recent discussions and Integrated Transport Assessment (**ITA**) related to the Brownlie submission to The Far North District Council's District Plan, the required transport modelling has been completed by Flow Transportation Specialists Ltd (**Flow**).

This letter seeks to provide a concise summary and abridgement of the modelling report and provide a commentary on the results as we see them. Although essentially a stand-alone document, it should be read in conjunction with the modelling report and our ITA for completeness.

EXECUTIVE SUMMARY

Within the 10 year horizon, the modelling that has been undertaken shows that the proposed roundabout at SH10/Puketotara Road will operate well and that only a minor change in the form of a short right turn lane at the intersection of Waipapa Road/Waitotara Drive is need for it to also operate well in the peak periods.

The provision of the Fairway Drive access will also operate well, but it is considered that the queuing that is expected to occur in the PM peak period on Fairway Drive will be relatively short in extent and duration. It will also be internalised to a non-critical part of the roading network, and the queuing will contain traffic that has been found by the modelling to use the Plan Change area as a short cut - which can be reduced by the detailed design of the internal roading network.

In a broader context, the modelling shows that there are benefits to the wider transport network and improvements in the performance of the network compared to the Proposed District Plan – particularly in the one-way sections of Homestead Road and Fairway Drive as well as some parts of Kerikeri Road.

Flow's 20-year KFO scenario models showed that without the Kerikeri bypass there will potentially be congestion, with the results of this long range scenario premised on a considerable number of assumptions.

Flow did not model a 20-year PDP scenario, so there is no direct comparison between a KFO scenario and PDP scenario. However, given the modelling results of the KFO scenarios, we expect it is reasonable to assume that the PDP 20-year scenarios could also be the same or worse than the 20-year KFO scenarios. If infrastructure upgrades such as the Kerikeri bypass are necessary, we also expect that they will be required for other 20-year growth scenarios.

KFO's development will reduce trips around the network (i.e., between Waipapa and Kerikeri), partly as a result of internalisation of traffic to the development area. This emphasises the importance of providing a range of activities (e.g. employment and retail activities) alongside residential development to assist in minimising effects on the surrounding network by enhancing internalisation opportunities.

Therefore:

- Based on traffic modelling outcomes, there appear to be no transport-related constraints that would prevent development of KFO's land. Subject to planning input and the drafting of appropriate provisions, the modelling supports consideration of an upper development threshold aligned with the 10-year horizon tested – specifically, 1,600 dwellings and 50% development of other activities – with complete development enabled by the Kerikeri Bypass.
- Given that it may take longer than 10 years to reach the modelled level of development, we consider that it would therefore be more appropriate for any development ceiling to be linked to yield rather than timeframes. That is, any ceiling should refer to 1,600 dwellings and 50% other activities, rather than being tied to a specific number of years.

MODELLING DETAILS

By way of background, Flow developed a base model and forecast model of the Kerikeri and Waipapa area using the Aimsun micro-simulation modelling package. This model was then peer-reviewed (in accordance with an accepted NZ Guideline), and 'declared fit for purpose'.

The forecast model represents a 10-year forecast land use and traffic demand scenario based on the Council's Proposed District Plan (**PDP**) and a 'Do Minimum' road network. The forecast land use is based on Council's PDP. This is supported by Council's Section 32 reports with regard to the potential residential, commercial and industrial demand.

Kiwi Fresh Orange Company Limited's (**KFO**) submission on Hearing 15D seeks to rezone 197 ha of land between Kerikeri and Waipapa (**KFO Site**) to enable predominantly a combination of residential, and commercial land uses.[1]

To carry out this work it has been necessary for Flow to make a number of assumptions. One of these correctly assumes that development on the KFO Site replaces the forecast PDP growth, with the forecast demand remaining the same, but the location of the future development being altered.

The report presents the results of the modelling with two access scenarios. The first has the proposed three points of connection to the KFO Site. These are:

- SH10/Puketotara Road intersection.
- Waipapa Road/Waitotara Drive intersection.
- Fairway Drive connecting to the Fairway Drive/Homestead Road intersection.

An assessment has also been made of the modelled network without the Fairway Drive connection, but still retaining the:

- SH10/Puketotara Road intersection.
- Waipapa Road/Waitotara Drive intersection.

The assumed geometric characteristics at each intersection are as follows:

- SH10/Puketotara Road intersection: New roundabout as described in our ITA.
- Waipapa Road/Waitotara Drive intersection: Existing priority control, but with the provision of an additional right turn bay for traffic turning right from Waipapa Road into Waitotara Drive.
- Fairway Drive connecting to the Fairway Drive/Homestead Road intersection: The existing control at the southern end of Fairway Drive remains unchanged.

While the longer term total aspirational household yields under the Plan Change exceed those envisaged under the Proposed District Plan (**PDP**), the spatial configuration of the Plan Change and the modelling results show a greater internalisation of trips and a redistribution of demand that eases operational pressure on key parts of the existing road network.

These benefits are realised without taking into account any future uptake of, and the benefits arising from, active modes or public transport, or a potential long-term mode shift away from private vehicle use. Instead, the modelling relies on traffic generation patterns from recognised and accepted sources, with the residential generation patterns reflecting surveyed existing local behaviour.

[1] The Proposal seeks Mixed Use Zoning which provides for light industrial activities as a discretionary activity. A small amount of light industry has been included in the model to ensure that a reasonable range of activities potentially provided for is modelled.

Development in the PDP scenario is predicted within Kerikeri CBD (commercial/retail), Waipapa (industrial) and spread through the region for residential development (with large areas south of the Kerikeri CBD).

The KFO Site concentrates development of residential, commercial and retail in the area between Waipapa and the Kerikeri CBD and assumes a proportion of traffic is internalised[2] in this development area.[3]

Consequently, fewer trips are expected to occur on the surrounding road network (i.e. between Waipapa and Kerikeri), due to the change in the location of predicted growth in the next 10 years. External trips over longer distances expected from the PDP will also be replaced by shorter trips between the development area and Waipapa or Kerikeri or remaining internal to the KFO Site.

NETWORK WITH FAIRWAY DRIVE CONNECTION

The modelling outcomes for the KFO Site in the first decade, when compared to the PDP scenario, indicate the following significant decreases in the traffic volumes on the Kerikeri Road, Waipapa Road, SH10 and Heritage Bypass in both the morning and afternoon peak hours.

- Peak traffic flows on Kerikeri Road are predicted to reduce by approximately 10% in both directions when compared to the PDP scenario (both peak periods).
- Peak hour flows on Waipapa Road are predicted to decrease by some 5 to 10%, and
- Peak hour flows on Heritage Bypass are predicted to decrease by 12-14% in the PM peak and up to 20% in one direction in the AM peak.
- Similar changes are expected on SH10 (north of Kerikeri Road) with a reduction of approximately 15% in both peak periods.

With the 10 year scenario for the KFO Site, the SH10/Puketotara Road and Waipapa Road/Waitotara Drive intersections are predicted to operate with limited delays in the peak hours, and have a Level of Service (LOS) A or B.

Vehicle queues at the SH10 access (new roundabout) and Waipapa Road access points are also predicted to be relatively short – despite the geometric delay created by the introduction of the new roundabout on SH10 also being factored into the travel time and delay assessments.

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[2] Information provided by Economic advisers

[3] The Proposal seeks Mixed Use Zoning which provides for light industrial activities as a discretionary activity. A small amount of light industry has been included in the model to ensure that a reasonable range of activities potentially provided for is modelled.

At the intersection of Fairway Drive and Homestead Road some delays are expected to occur, with the overall operation of the Fairway Drive approach is predicted to have a Level of Service (**LOS**) D in the AM peak hour and a LOS F in the PM peak hour.

Further data from the operation of this approach to the intersection shows that the AM peak hour is predicted to operate adequately with some delay and relatively short queues.

In the PM peak queues of up to 200 to 250 metres on the Fairway Drive approach. This is a result of increased traffic volumes:

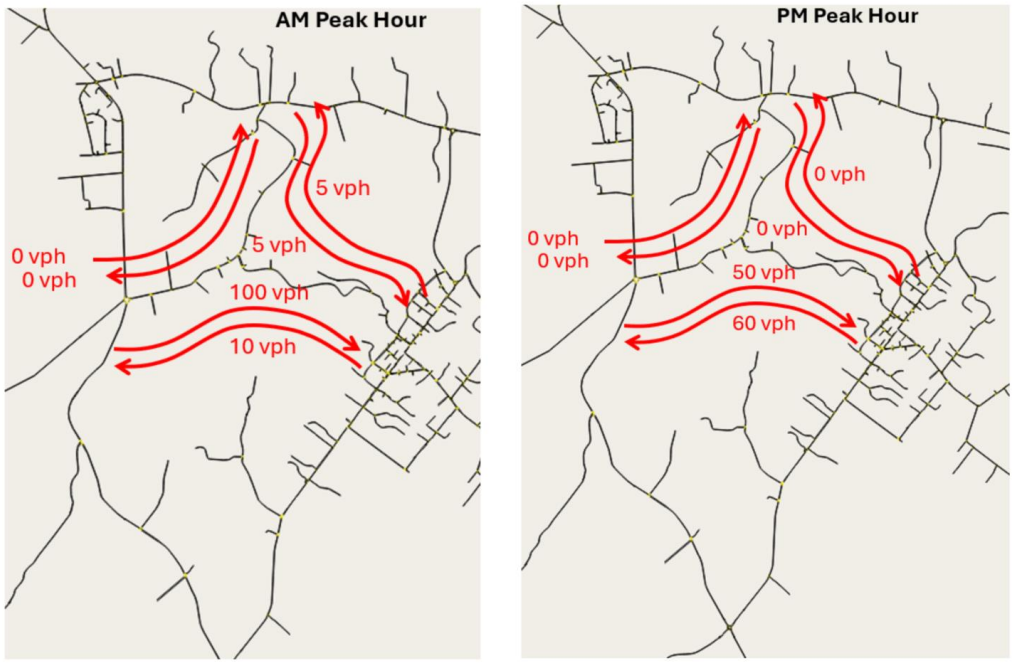
- Through the intersection that are travelling to and from the KFO Site, and
- The increased traffic flows through the Kerikeri CBD in the future.

Closer examination of this queuing data from the model shows it to be a short term event with the period of congestion being relatively short period and some 15 to 20 minutes long.

When considered in the context of the traffic flows, this congestion, which includes circa 100 vehicles per hour in the AM peak and 50 vehicles per hour in the PM peak using the KFO Site as a 'short cut' from SH10 to the Kerikeri commercial area via Fairway Drive, is not considered excessive, will be 'internalised', and has no material adverse impact on the operational performance of the surrounding road network.

The volume of short cut traffic anticipated by the model for the AM and PM peak period is provided in Flow's Figure 6 below.

Figure 6: Traffic volumes predicted to travel through the Plan Change area (10 year scenario) - vehicles per hour (vph)



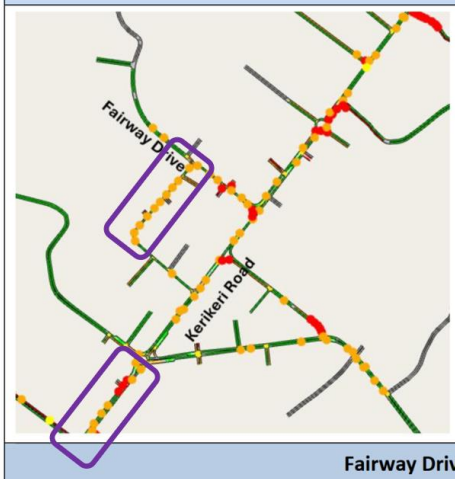
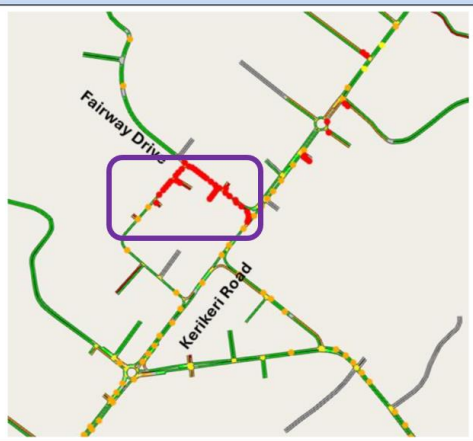
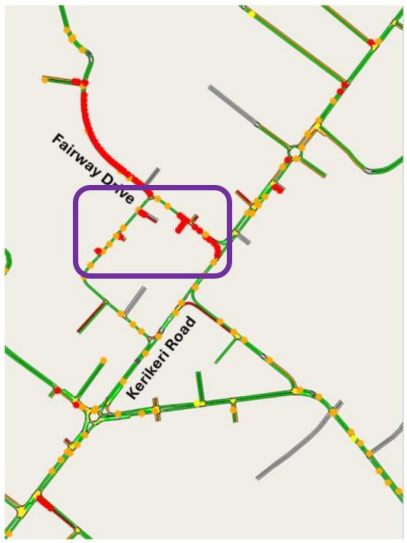
Through the provision of design elements to reduce the attractiveness of this route, the quantum of short-cut traffic could be easily reduced - with consequential benefits to the reduction in the queuing.

It is also noted and shown in the following screenshot of Flow's Table 6 that there are other material benefits to the local road network – particularly in the PM peak period when congestion on the one-way sections of Homestead Road and Fairway Drive, as well as some parts of Kerikeri Road, has decreased.

These areas are shown by the purple-coloured shapes, with the coloured dots representing individual vehicles, and the different colours showing the following:

- Vehicles represented by the green dots are travelling greater than 70% of the speed limit.
- Vehicles represented by the orange dots are travelling between 30% and 70% of the speed limit.
- Vehicles represented by the red dots are travelling less than 30% of the speed limit.

Table 6: Snapshot of vehicle queues at intersections - Plan Change development (10 year scenario)

Fairway Drive/Homestead Road PDP scenario	
AM peak hour	**PM peak hour**
	
Fairway Drive/Homestead Road With Plan Change development (10 year scenario)	
AM peak hour	**PM peak hour**
	

We have sought clarification from Flow about the details of the queue on Fairway Drive to better understand its characteristics. In summary, we have been advised that it can be considered a 95%ile queue that is in the order of 200 metres for a short time and briefly 250 metres long (being the definition of a 95%ile queue).

We also understand from Flow's examination of the model that the period of this congestion in the peak hour is relatively short and only some 15 to 20 minutes long.

In light of this, we consider that the short period and relatively short extent of the queuing is acceptable particularly when regard is had to the improved performance across the wider transport network and the following other important matters:

- The inclusion of 'short-cut' traffic in the queuing, and
- The confinement/internalisation of the queuing to a non-critical local area.

At the other access locations on the modelled network, the modelling shows that the operation of each intersection is acceptable for the KFO Site in the 10 year scenario during the morning and evening peak hours, with the:

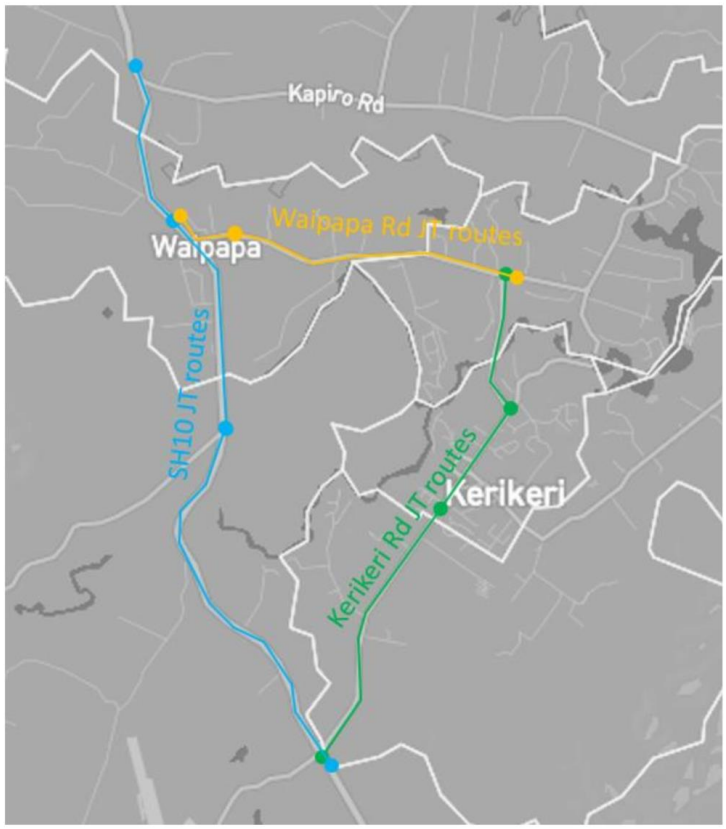
- New Puketotara Road/SH10 roundabout and the Waipapa Road/Waitotara Drive intersection both predicted to operate with limited delays in the peak hours and having a LOS of A or B.
- Vehicle queues at the SH10 access and Waipapa Road access points predicted to be relatively short.
- The right turn demand from Waipapa Road to Waitotara Drive being low (some 40 vph[4] and 75 vph in the AM and PM peak hours), and queues generally no more than 2 vehicles – which supports the provision of a new short right turn bay provided at the existing intersection.

Despite these network benefits, data has also been provided between selected reference points on SH10, Waipapa Road and Kerikeri Road to determine the differences in travel times.

These locations are shown in the following illustration from the Flow report.

[4] vehicles per hour

Figure 8: Journey time routes



A comparison of travel times for the 10 year development scenario shows the following differences (in seconds).

Table 8: Travel time comparison

Route	Direction	PDP		Plan Change '10 year' scenario		Difference (seconds)	
		AM	PM	AM	PM	AM	PM
SH10	Northbound	07:12	07:14	07:19	07:29	7	15
	Southbound	07:23	07:55	07:27	07:52	4	-3
Kerikeri Road	Northbound	08:35	08:45	08:30	08:20	-5	-25
	Southbound	07:49	07:49	07:45	08:00	-4	12
Waipapa Road	Eastbound	04:05	04:34	04:02	04:21	-3	-13
	Westbound	04:27	04:39	04:18	04:26	-9	-13

In summary, Flow has concluded that the travel times within the modelled area are unlikely to change significantly for this Plan Change scenario when compared to the Proposed District Plan scenario, with differences expected to increase or decrease by less than 30 seconds.

Of note is that the travel time assessment of the SH10 route includes the geometric delay introduced by the roundabout – a delay that does not feature in the PDP scenario.

NETWORK WITHOUT FAIRWAY DRIVE CONNECTION

The modelling has been repeated without the provision of a connection into the KFO Site from Fairway Drive but still retaining a connection to the golf course and adjacent existing properties.

Consequently, this scenario considers all of the traffic associated with the KFO Site having to move to and from the surrounding area via the SH10 roundabout and the connection to Waipapa Road.

Flow's concise summary of this scenario is as follows:

SH10/Kerikeri Road intersection

- *SH10/Kerikeri Road intersection is predicted to operate with a LOS C and LOS B in the AM and PM peak hours. This is slightly worse than the scenario with the Fairway Drive link, due to more drivers travelling via SH10 and Kerikeri Road. However, this is still considered an acceptable level of service*
- *The total traffic travelling through the SH10/Kerikeri Road roundabout is also still likely to be lower than the PDP scenario. This is due to the shift associated with the Plan Change, i.e. households would be closer to Waipapa and a large number of trips internalised to the Plan Change area development between households and retail/commercial/industrial development.*

SH10/Waipapa Road intersection

- *SH10/Waipapa Road intersection is predicted to operate with a LOS B and LOS D in the AM and PM peak hours without the Fairway Drive access point. This is still considered an acceptable level of delay*
- *However, without the Fairway Drive access, there is a predicted increase in traffic through the roundabout, predominantly on the SH10 south approach. This leads to a LOS F southbound on SH10 and longer queues in the PM peak hour*
- *Vehicle queues are predicted to be up to some 200 m long southbound on SH10. This is similar to the PDP scenario, albeit the SH10 southbound approach is predicted to operate with a LOS E. The overall LOS for the intersection is still the same, with a LOS D predicted.*

The majority of other intersections are predicted to operate with a LOS A or B without the Fairway Drive access point in place.

They have also provided a summary table of the travel times between the same routes, and this is provided below.

Table 10: Travel time comparison

Route	Direction	Proposed District Plan 10 year scenario		Brownlie development 10 year scenario without Fairway Dr link		Difference (seconds)	
		AM	PM	AM	PM	AM	PM
SH10	Northbound	07:12	07:14	07:22	07:28	10	14
	Southbound	07:23	07:55	07:56	08:43	33	47
Kerikeri Road	Northbound	08:35	08:45	08:28	08:25	-7	-20
	Southbound	07:49	07:49	07:57	07:51	8	2
Waipapa Road	Eastbound	04:05	04:34	04:03	04:34	-1	0
	Westbound	04:27	04:39	04:28	04:36	0	-3

Their concise summary of this states the following:

- *There is an increase in travel time southbound on SH10 of some 30 to 45 seconds (7 to 10%) in the peak hours when compared to the PDP scenario. This is due to the geometric delay of a new roundabout and also increased traffic volumes*
- *Travel times on Waipapa Road and Kerikeri Road are generally predicted to see relatively small changes in travel time.*

We note that the anticipated changes in the travel times are all less than 30 seconds, except at the SH10 roundabout where an increase in delays of up to 33 seconds in one direction in the AM peak and 47 seconds in the PM peak are expected to occur.

These changes include the additional geometric delays created by the introduction of the roundabout.

Overall, it is considered by Flow and ourselves that the network can operate without experiencing significant delays with:

- The analysed 50% of the full Plan Change development on the KFO Site,
- The two proposed access points, and
- The existing road network.

FULL BUILD-OUT OF PLAN CHANGE AREA

To obtain an indication of longer-term situation with the full build-out of the KFO Site, it has been assumed that this is level of development is achieved within a 20 year time frame.

The modelling of this 20 year horizon and assumed land use forecast by Flow, with all of the uncertainties that it contains for such a long period of time, has considered the following two scenarios:

- The inclusion of the proposed Kerikeri CBD bypass.
- The exclusion of the proposed Kerikeri CBD bypass.

In summary, Flow has reported the following:

> *The modelled scenario with full Plan Change development in place is predicted to lead to extensive delays (LOS F) and long queues on Fairway Drive (in excess of 500m). This may not eventuate, as the Kerikeri CBD bypass may be in place in the future.*
>
> *With the CBD bypass in place, there is a roundabout control at the intersection of Fairway Drive and Kerikeri Road. Our assessment indicates that this can accommodate the forecast Plan Change traffic from Fairway Drive.*
>
> *Further to this, this scenario is a 20 year land use forecast. Whilst we have accounted for development in the wider area, the nature and extent of this is somewhat uncertain given the 20 year timeframe.*
>
> *The assessment indicates that if a 20 year scenario with full development of the Plan Change area eventuates, then further changes to the network are required to accommodate the predicted traffic volumes.*

In light of this, we consider that it is apparent network improvements will be required beyond the 10-year horizon, particularly with respect to the Kerikeri CBD bypass and a roundabout at the intersection of Fairway Drive and Kerikeri Road. It is important to note that these interventions are not solely proposed as a response to the plan change development but rather, these reflect the long-term transport needs to support growth in the area.

It is important to note that the traffic modelling shows that the full development build out (20-year scenario) results in performance constraints across the network irrespective of where development occurs. Therefore, we also consider that these measures will be required for the network as a whole to provide for the growth in Kerikeri – wherever it may occur – as these locations are central to the operational effectiveness of the Kerikeri CBD, and not just for the KFO Site.

Given this situation and the uncertainties/limits associated with a model that is endeavouring to predict forward 20 years, it is considered prudent for traffic-related effects of development in the KFO Site beyond the 50% level modelled to be assessed further if planned upgrades (Kerikeri Bypass) to do not eventuate.

As the timeframe to reach the modelled level of development may extend beyond 10 years, it could be more appropriate for any development cap to be defined by the scale of development rather than a specific duration. In practical terms, this means referencing a cap of 1,600 dwellings and 50% development of other activities, rather than anchoring it to a fixed number of years.

CONCLUSION

The modelling that has been undertaken for the development on the KFO Site in the 10 year scenario has concluded that the effects on the road network can, overall, be considered similar (as a minimum), and in some respects better, when comparing the Proposed District Plan with the Proposed Plan Change.

The Proposed Plan Change for the KFO Site also allows the internalisation of the new trips within the KFO Site, rather than the use of the existing road network over a wider area by more vehicles.

Levels of congestion are expected to change due to the Proposed Plan Change, with predicted reductions in traffic volumes on Kerikeri Road, Waipapa Road and the Heritage Bypass in both commuter peak hours.

Specifically, the development on the KFO site effectively in-fills the area between Kerikeri and Waipapa and provides connectivity to Kerikeri, Waipapa Road and SH10.

Aside from the benefits arising from the network resilience when flooding can close SH10, the proposed roading network consolidates the new traffic movements into this well-connected area, with the benefits of a proportion of the trips being internalised and not extending beyond the area.

Consequently, the extent of trip-making on the wider roading network is reduced, which provides relief in the future to Kerikeri Road and Waipapa Road during the peak periods.

We do not consider that these benefits can be realised by the Proposed District Plan scenario, which is expected to have development in the Kerikeri CBD (commercial/retail), Waipapa (industrial) and residential development spread through the region (with large areas south of the Kerikeri CBD).

The modelling has shown that the geographical separation of these areas leads to trips occurring between these more distant locations.

In contrast the Proposed Plan Change for the KFO Site consolidates them and also internalises some resulting in transport efficiencies.

Furthermore, the Proposed District Plan results in a continued reliance on the existing Kerikeri Road and Waipapa Road corridors. This will only increase the operational pressure on these roads.

The modelling has shown that the proposed roundabout at SH10/Puketotara Road will operate well and that only a minor change in the form of a short right turn lane at the intersection of Waipapa Road/Waitotara Drive is need for it to also operate well in the peak periods.

The provision of the Fairway Drive access will also operate well, and it is considered that the queuing that is expected to occur in the PM peak period on Fairway Drive will be relatively short in extent and duration. It will also be internalised to a non-critical part of the roading network. Of note is that this queuing also contains traffic that has been found by the modelling to use the Plan Change area as a short cut - which can be reduced by the detailed design of the internal roading network.

We note that there are benefits to the wider transport network and improvement in the performance of the network compared to the Proposed District Plan – particularly in the one-way sections of Homestead Road and Fairway Drive as well as some parts of Kerikeri Road.

In effect, the Plan Change for the KFO Site could be considered to provide a better operational traffic environment as well as provide 'a degree of relief' to the existing road network.

In the event that the access to Fairway Drive is not available and the KFO Site relies solely on the connections to Waipapa Road and SH10, the modelling for the 10-year period indicates that both of the intersections will be able to operate in both peak hours with good levels of service.

Although models for a 20 year horizon are 'blunt instruments', the assessment of this longer term future period indicates that the full development of the KFO Site may require further changes to the network to accommodate the totality of the network's future traffic volumes. This is best assessed at a later date when there is greater certainty about the future traffic situation.

We trust this is sufficiently detailed for your immediate needs. As we stated above, although this has been prepared as a stand-alone document, it should be read in conjunction with the modelling report prepared by Flow and also our Integrated Transport Assessment.

Yours faithfully
TRAFFIC ENGINEERING & MANAGEMENT LTD

P.R. Brown
Managing Director