561 Horotiu Road

Proposed Commercial Development
Te Kowhai

OPERATIONAL NOISE
S92 QUERIES

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Prepared for: Quattro Property Holdings Ltd.
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Document Control

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Proposed Commercial Development

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Contact	Issue	Date	Rev
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S92 Queries

Thank you for the review and comments on the Acoustic Report - Revision 2 - dated August 2019, and the subsequent response letter dated 24th October 2019, for the proposed development at 561 Horotiu Road in Te Kowhai. The following responses pertain to the queries raised:

Query

Item 1: Undertake background sound level measurements at Position 3 in the evening and night-time periods.

Response

We note that due to the national emergency management alert level(s), it would be neither practical, nor representative (anytime in the near future) to undertake environmental monitoring pertaining to traffic movement.

Under these circumstances, we believe it is reasonable and practicable to rely on multiple other correlated measures to assess environmental noise pertaining to traffic for the subject rural environment; these being measurements at similar locations, and environment noise modelling for the subject area based on the traffic distribution collated with daytime measurement for verification.

We note that the modelling would have to correlate with measurements at both the subject location (using daytime measurements for verification purposes) and similar locations to be considered valid.

<u>Environmental Noise Modelling – Traffic</u>

Based on the following:

- Rural nature of the subject site,
- Horotiu Road is a Collector Road,
- AADT for Horotiu Rd is estimated at 4260 with 4% heavy vehicles

The following daily traffic distribution is representative of the road and the area in the vicinity of the subject site, and traffic on Horotiu Rd would be expected to follow the same distribution trend noted below.

Average Volume										
Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Weekday	Weekend	All Days
0000	9	8	2	7	10	21	27	7	24	12
0100	2	3	4	6	5	4	16	4	10	6
0200	6	3	4	5	5	7	6	5	7	5
0300	7	7	5	8	7	5	2	7	4	6
0400	20	17	17	14	18	13	9	17	11	15
0500	46	40	34	33	29	31	14	36	23	32
0600	107	100	95	115	117	37	22	107	30	85
0700	420	435	431	423	400	90	53	422	72	322
0800	447	459	446	432	425	180	106	442	143	356
0900	220	202	193	209	216	204	225	208	215	210
1000	181	167	202	191	197	279	304	188	292	217
1100	185	154	221	229	205	301	303	199	302	228
1200	231	214	226	228	211	316	288	222	302	245
1300	250	216	191	250	251	280	307	232	294	249
1400	254	221	260	259	271	295	311	253	303	267
1500	313	324	310	307	318	300	286	314	293	308
1600	322	382	398	390	434	263	284	385	274	353
1700	459	467	511	490	474	277	259	480	268	420
1800	228	271	301	317	309	194	164	285	179	255
1900	135	159	185	186	214	115	118	176	117	159
2000	93	121	119	102	116	80	115	110	98	107
2100	66	85	107	95	78	78	69	86	74	83
2200	37	39	49	48	79	62	32	50	47	49
2300	10	14	18	17	39	32	17	20	25	21
Total	4048	4108	4329	4361	4428	3464	3337	4255	3401	4011
								AWDT	AWET	ADT

Table 1 - Representative Hourly Traffic Distribution

Based on the above, the following hourly traffic volumes were used for modelling purposes. The speed limit on the road is 50kph, and note that daytime traffic modelling is used for verification against existing measurements:

- Daytime: 420 vph (4% trucks)
- Evening: 85 vph (2% trucks)
- Night-time: 6 vph (0% trucks)

To predict noise propagation at the subject site from the road, as pe the above traffic volumes (including for verification against measurements), an environmental model was constructed for the area using the CadnaA version 2019 computer modelling program. The following applies to the modelling software CadnaA:

- CadnaA is an internationally recognised software package designed for the prediction of noise propagation. CadnaA implements numerous national and international standards and guidelines, including the CoRTN standard of the United Kingdom Department of Transport and Welsh Office for the Calculation of Road Traffic Noise as required in NZS6806:2010.

- The modelling method for noise propagation over distance is based on the international standard ISO 9613: "Acoustics – Attenuation of sound during propagation outdoors" methodology.
- The model allows importing digital ground elevation contours and data to define the topography and data for each of the noise sources, and the locations, geometry and elevations of the noise receivers. The program then calculates the L_{eq} dBA noise levels as the metric for the noise levels for the purposes of this assessment.

Analsysis

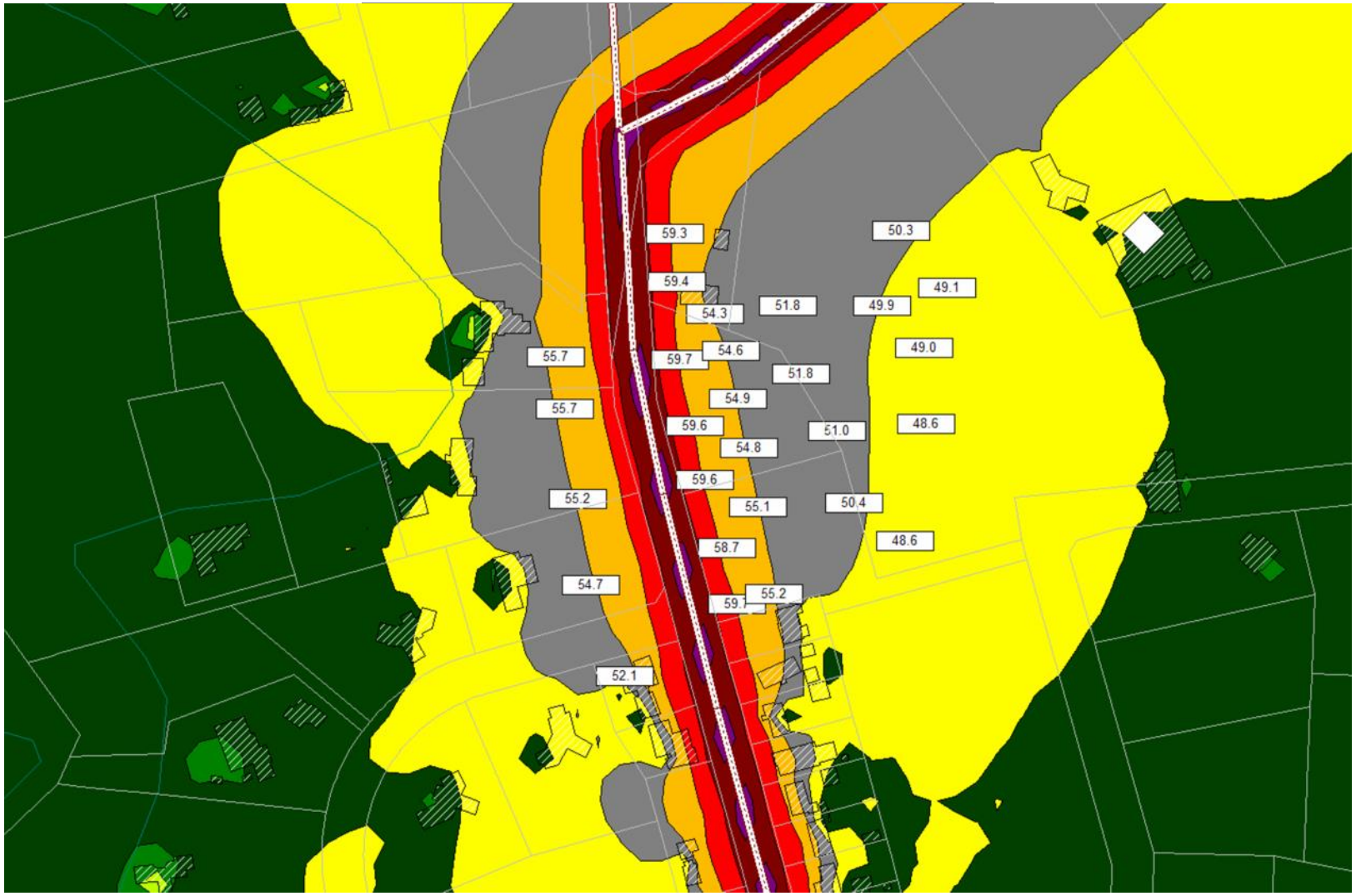
The graphs in the pages below show the noise contours asssociated with traffic only. We note the following conservative measures incorporated into the model:

- Other environmental noise would be expected to exist in the subject environment, but for the purposes of this assessment however, noise levels are assessed based on traffic only.
- Shielding effects from buildings and other structures are diregarded, and noise propagation is assumed open field.

As per the graphs below, we note the following:

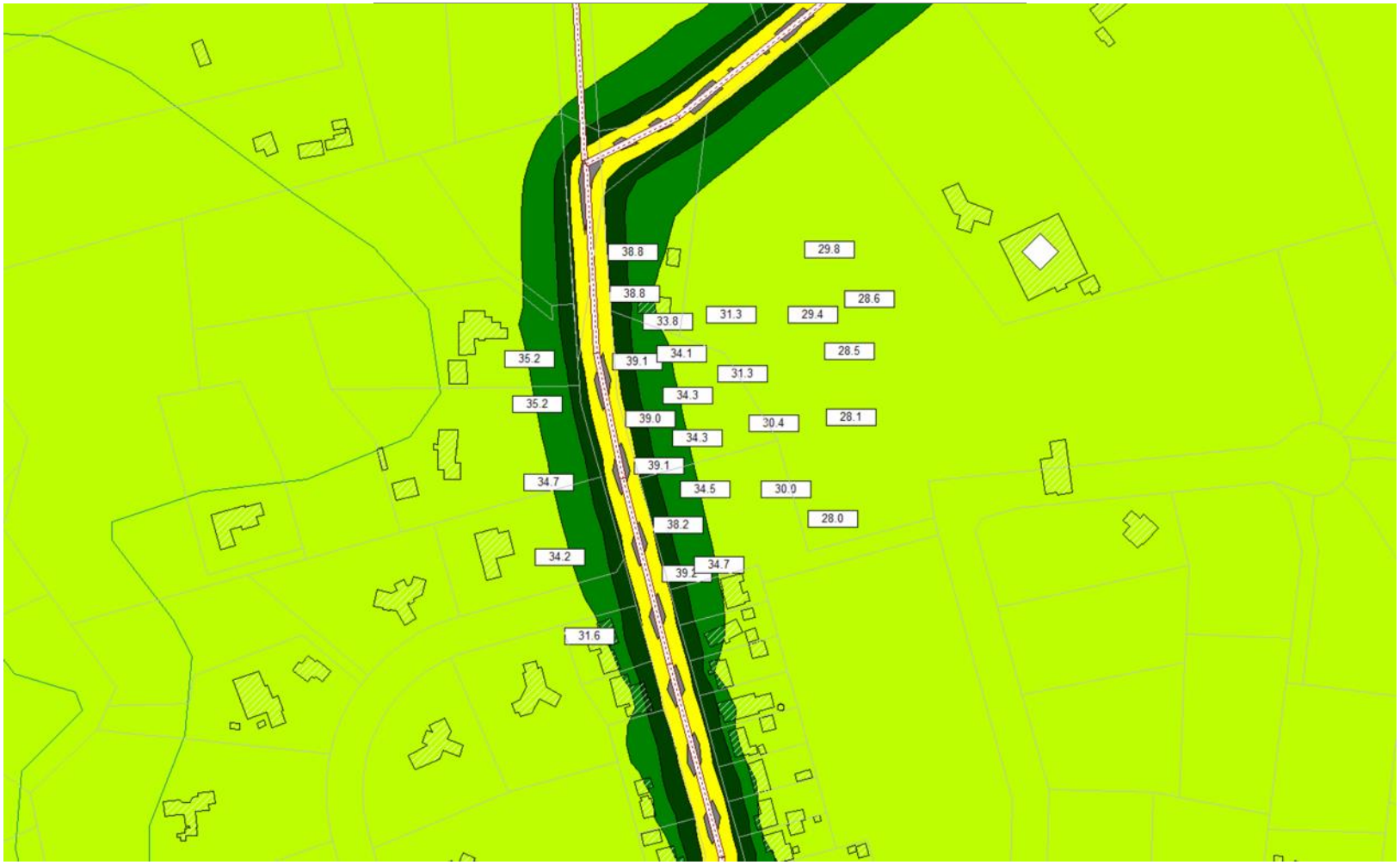
- Daytime noise levels from traffic:
    - Predicted to be LA_{eq} 59dB at the side of the road. This collates with the daytime measurement at Location 1 (also at the side of the road), where LA_{eq} was 60dB. Noise level.
    - Predicted to be LA_{eq} 52dB at 25-30m from the roadside, which also collates (albeit conservatively 1db lower) with the measure value at location 3 where LA_{eq} was 53dB
    - Based on the predictive model collating conservatively with the measured values, the model is within acceptable tolerances, and can be deemed valid for purposes of assessment of traffic noise based on vehicle numbers.
- Evening noise levels from traffic:
    - Predicted to be between LA_{eq} 51dB (≈ L_{10} 54dBA) at the roadside, down to LA_{eq} 43dB (≈ L_{10} 46dBA) at the eastern boundary of the subject site.
- Night-time noise levels from traffic:
    - Predicted to be between LA_{eq} 39dB (≈ L_{10} 42dBA) at the at the roadside, down to LA_{eq} 31dB (≈ L_{10} 34dBA) at the eastern boundary of the subject site.

Scenario	Receiver Height
Daytime – 420 vph	1.5m



Scenario	Receiver Height
Evening – 85 vph	1.5m

Scenario	Receiver Height
Night – 6 vph	1.5m



Query

Item 2: Provide commentary around predicted night-time noise levels at the boundary with 557 Horotiu Road and Lot 4000 DP 527122, compliance and level of effects.

Response

The following pertains to the noise sources, and propagation from the proposed building to each of the adjacent sites to the North and East:

557 Horotiu Rd

This receiver is the closest to the proposed facility, and is currently occupied by a residential building in proximity to the boundary. As such, this is considered the most sensitive receiver, and warrants particular consideration in terms of mitigation. Pertaining to noise sources, the following is an elevation view of the proposed building from the northern boundary:

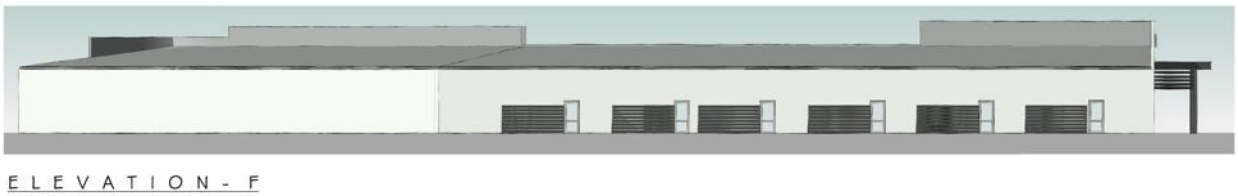


Figure 1 - Elevation view from Northern boundary with 572 Horotiu Road

We note that only the rightmost occupancy (takeaway) as depicted by the glazed door at the right, is expected to have any notable mechanical plant requiring penetrations through the façade (e.g. extraction fans). The other occupancies are all either retail or in the case of the superette at the leftmost occupancy would only have internal equipment, and furthermore has a solid façade facing the north and east with no glazing or penetrations.

It is key to consider that the operation of the takeaway does not extend into the night time hours, and as such any mechanical plant requiring external noise (e.g. extraction fans) would not operate during night hours.

Operations would only extend to the evening hours no later than 10pm. During these evening hours, we note that noise levels from traffic are predicted to be circa 46dBA at the boundary close to the neighbouring building. This is noted to be higher than the cumulative noise from the operations of the proposed facility during these hours.

Regarding night hours, which pertain mainly to internal equipment, it would be expected that the glazed door would be closed during night time for security purposes. It is also assumed that the takeaway would include fridges and freezers for preservation of perishable food items.

Based on noise generated by commonly used commercial chillers and freezers, and provided the door complies with the requirements of the acoustic report (i.e. STC 31) noise levels external to the building from the takeaway shop would subjectively be inaudible at the boundary during night time. In proximity to the glazed door of the proposed takeaway unit, noise levels would be less than 30dBA and absent tonality on account of attenuation through the façade and door glazing.

Lot 4000 DP 527122

This site is adjacent the subject site at its eastern boundary. Pertaining to noise sources, the following is an elevation view of the proposed building from the eastern boundary:

Figure 2 - Elevation view from Eastern boundary

We note that the leftmost solid façade is proposed to be a suprette. This façade is solid with no glazing or penetrations. The operation of the superette would be expected to include commercial chillers and freezers for the storage of perishables, and these would be expected to operate continuously.

Notwithstanding that, we note that even if the building envelope (and the subject façade) are timber framed with internal lining, the attenuation of the solid façade would render the noise from the internal equipment well below 30dBA externally with no tonality.

Pertaining to night time noise level, ambient noise levels at the boundary of this site are predicted to be just above 30dBA (from traffic only.) As such, noise levels from the operation of the facility during night time would be expected to be below the ambient noise levels, and well below the compliance levels required.

As previously provided, the following is a breakdown of the noise levels from individual noise sources during daytime operations, and as a cumulative measure, as follows:

Location	***Predicted noise level - Day (L_{A10} dB)***			
	Vehicles	*Plants*	*Takeaway*	*Cumulative*
557 Horotiu Rd	34	42	42	45
571 Horotiu Rd	55	34	30	55
Lot 4000 DP 527122	<25	40	24	40
560C Horotiu Rd	36	32	34	38
560A Horotiu Rd	41	34	40	44
564A Horotiu Rd	42	34	39	44
8 Westvale Lane	43	31	31	43

Table 2 - Daytime noise levels

These levels are for the daytime or peak hour for each source of noise. E.g. the plant noise is for all mechanical plant operating simultaneously.

For reference, we note the following night time noise levels predicted from the operation of the equipment required to run continuously.

Location	***Predicted noise level – Night (L_{A10} dB)***
557 Horotiu Rd	33
571 Horotiu Rd	30
Lot 4000 DP 527122	33
560C Horotiu Rd	<30
560A Horotiu Rd	<30
564A Horotiu Rd	<30
8 Westvale Lane	<30

Table 3 - Night time noise levels

Query

Item 3: Provide commentary on how the proposed development has adopted BPO into the design and operation of the activity.

Response

The proposed development incorporates the following design considerations and mitigation measures to provide the Best Practicable Options to minimise effects on the neighbouring properties:

- The design of the building incorporates an orientation where noise is facing away from the noise sensitive adjacent northern and eastern neighbours.
- Parking and traffic movements have been located on the south-western portion of the site, as far as practicably possible from neighbouring residential receivers.
- The façade facing the adjacent eastern neighbour is solid with no glazing or penetrations to attenuate any internal noise levels.
- Glazed doors on the façade facing the adjacent northern neighbour are required to be acoustically suitable with an STC rating of 31 to attenuate any equipment noise required to operate continuously.
- Occupied operation of the facility requiring external noise sources is limited to the daytime and evening periods, with no activities occurring after 10pm.
- The mechanical plant units for each tenancy shall be selected to be well within compliance with the District Plan noise limits at all times.
- Truck deliveries/pickups are restricted to daytime hours.
- Acoustic screening is proposed to reduce any potential noise from the takeaway facility.

We finally note for reference that the facility is complying with the noise limits at all times, and furthermore, noise levels emanating from the facility are predicted to be at or lower than noise from public traffic on the adjacent road.