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CCC Proposed Plan Change 14

Industrial-Residential interface – Review of potential noise issues

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1.0 BACKGROUND

As requested, we have undertaken a review of the Industrial-Residential interface in Christchurch. We understand that there has been a history of some conflict between noise generating and noise sensitive activities at this interface, and the Christchurch City Council (CCC) is interested in whether this should be reflected in Plan Change 14 *Housing and Business Choice* (PC14) in some way.

As requested, this preliminary report covers the following:

- A review of the current relevant Christchurch District Plan (CDP) noise limits, and how they compare to current best practice and guidance.
- A discussion of typical noise sources encountered in the Industrial zone based on a review literature and database material.
- A review of material provided by the CCC regarding specific historic complaints and conflict at the Industrial-Residential interface.
- A summary of our observations during a series of site visits to understand the types of activities at the existing Industrial-Residential interfaces and obtain indicative noise measurements.

In the context of the above, we have considered whether the current CDP noise limits are sufficient to address residential development adjoining industrial zones which would be enabled by PC 14, and we have provided preliminary recommendations.

Based on initial discussions with the CCC, we had identified the following potential concerns around PC14 and the Industrial-Residential interface from a noise point of view:

- PC14 enables more intensive development of residential sites, meaning more people may come to live within the vicinity of a Residential-Industrial interface.
- PC14 enables residential dwellings to be constricted up to 3 stories in height. This may mean that (i) the upper levels of new dwellings 'overlook' industrial activities to a greater extent, and do not benefit from the screening of typical boundary fences, or intervening buildings, and (ii) as NZS6802:2008 requires assessment of compliance at 1.2 – 1.5 metres above any floor level of interest, there may be compliance locations created which receive higher noise levels than in the current situation, and this may result in currently complying levels of noise from industrial activities exceeding the noise limits.

We have therefore also considered the significance of these issues further below.

2.0 CURRENT CHRISTCHURCH DISTRICT PLAN RULES

There are three main industrial zones within the Christchurch District Plan – 'Industrial General', 'Industrial Heavy' and 'Industrial Park'. The objective of each of these zones is described within the District Plan as follows:

- *Industrial General – Recognise and provide for industrial and other compatible activities that can operate in close proximity to more sensitive zones due to the nature and limited effects of activities including noise, odour, and traffic, providing a buffer between residential areas and the Industrial Heavy Zone*

- *Industrial Heavy – Recognise and provide for a full range of industrial and other compatible activities that generate potentially significant effects, including relatively high levels of noise, odour, heavy traffic movements, and the presence of significant amounts of hazardous substances, necessitating separation from more sensitive activities.*

- *Industrial Park – Recognise and provide for industrial activities in the high technology sector and other industries in a high amenity environment dominated by open space and landscaping, and that generate higher volumes of traffic than other industries while having negligible effects in terms of noise, odour or the use and storage of hazardous substances.*

This is reflected within spatial layout of the various zones evident in the District Plan maps, where it is the 'Industrial General' areas which typically directly adjoin residential areas. We note that while this approach does provide some physical distance between Industrial Heavy and Residential areas, it does not actually directly control the noise levels received in Residential areas (because the noise limits in the CDP apply at receiving sites – so a moderate noise activity in a nearby Industrial General zone and a high noise activity in a more distant Industrial General zone may result in the same noise level at a Residential receiver). This approach may have some indirect benefit however as, for example, it may generally ensure that the heavy vehicle traffic attracted by Industrial Heavy is unlikely to travel through Residential areas.

As explained above, the noise limits within the CDP are determined by the Zoning of the receiving site. The limits for noise received at the various 'Industrial' zoned sites are outlined in table 1.1 below (i.e. noise generated on one Industrial site, and received on another).

Table 1.1 – Current Christchurch District Plan noise limits for sound received at Industrial sites

Zone	Time (hrs)	Noise limits
Industrial General Except that noise levels shall not exceed 50 dB L_{Aeq}/75dB L_{AFmax} at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00	0700 – 2200	70 dB L_{Aeq}
	2200 – 0700	70 dB L_{Aeq}
Industrial Park Zones – (Awatea and Memorial Avenue) Except that noise levels shall not exceed 50 dB L_{Aeq}/75dB L_{AFmax} at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00	0700 – 2200	60 dB L_{Aeq}
	2200 – 0700	60 dB L_{Aeq}
Industrial Heavy Zone Except that noise levels shall not exceed 50 dB L_{Aeq}/75dB L_{AFmax} at any residential unit lawfully established prior to 6 March 2017 during the hours of 22:00 to 07:00	0700 – 2200	75 dB L_{Aeq}
	2200 – 0700	75 dB L_{Aeq}

Again, while these noise limits do not directly control noise received within Residential zones, they do have some indirect relevance – by placing an upper cap on generally how 'loud' Industrial activities can be in each type of Industrial zone. That in turn moderates to some extent the possibility of significant cumulative noise effects which could theoretically occur in situations where there are no noise limits between industrial sites, and so the only limit that applies is that when the sound is ultimately received at a residential receiver. In that situation it is more likely that numerous industrial activities could generate noise which, when assessed individually complied with the residential limit, but when assessed cumulatively, exceeded the limit. Where there are limits between industrial sites (even if they are relatively lenient), it is more likely that industrial sources which are far from the residential interface will be constrained by that limit, resulting in something lower than the residential limit at residential receivers. Overall, the CDP approach of nominating noise limits between Industrial sites is therefore a more conservative one than that taken in some other Districts.

Noise generated in any of the Industrial zones when received at a Residential zoned property are required to comply with the Residential noise limits. These are as follows:

0700 to 2200 hours	50 dB L_{Aeq}
2200 to 0700 hours	40 dB L_{Aeq} / 65 dB L_{AFmax}

The Christchurch District Plan requires compliance with these noise limits is measured and assessed in accordance with NZS6801:2001 *Acoustics – Measurement of environmental sound*, and NZS 6802:2008 *Acoustics – Environmental noise* – except that the provisions of NZS6802:2008 relating to Special Audible Characteristics do not apply.

2.1 Comparison with other guidance

A number of sources of guidance are available with regard to the setting of appropriate noise limits to protect residential amenity. The two sources referred to most commonly in New Zealand are discussed below.

2.1.1 NZS 6802:2008 Acoustics – Environmental Noise

NZS 6802:2008 *Acoustics – Environmental noise* provides a guideline daytime limit of 55 dB $L_{Aeq\ (15\ min)}$ and a night-time noise limit of 45 dB $L_{Aeq\ (15\ min)}$ for "*the reasonable protection of health and amenity associated with the use of land for residential purposes*". The Standard also recommends a night-time L_{AFmax} noise limit of 75 dB L_{AFmax} to prevent awakening events. The Standard explicitly states that an L_{AFmax} noise limit should be set where sleep protection is required, and should only be set for night time hours. The Standard states that "*the intention of L_{AFmax} noise limits is to provide protection against the effects of 'typical maxima' of the specific sound and not the 'absolute maxima'. A noise nuisance does not generally arise from a single isolated incident. A single isolated noise event which exceeds an applicable limit might not be representative of the sound under investigation and should not be used as the sole basis for compliance action."*

For heavy industrial zones NZS 6802:2008 offers a guideline intra-zonal limit of 75 dB $L_{Aeq\ (15\ min)}$ for compatible activities. However, if residential accommodation is permitted separate rules should apply to the residential accommodation to achieve adequate isolation of habitable rooms.

NZS 6802:2008 also requires the application of a penalty for noise containing 'Special Audible Characteristics' (SAC). In cases where SAC are confirmed to be present, the adjustment is +5 dB. The Standard provides guidelines in section 8.3 regarding 'daytime' and 'night-time' for use in situations where these are not specified. The timeframe recommended is 0700 to 2200 hours for daytime, and 2200 hours to 0700 hours for night-time on any day of the week.

The New Zealand National Planning Standards (2019) direct the use of NZS6802:2008 in District Plans in Section 15 *Noise and Vibration Metrics*.

The limits provided in the CDP for the protection of residential receivers from industrial noise are therefore almost entirely consistent with NZS6802:2008 which is current New Zealand best practice as per the New Zealand National Planning Standards. The two minor departures are:

- With regard to Special Audible Characteristics – where the CDP in effect does not require sound to be assessed for SAC, but instead sets the noise limits 5 dB lower than the guideline values outlined in NZS 6802:2008 – thereby essentially assuming all sound has SAC. While this eliminates disagreements where a subjective judgement would have otherwise been required as to the presence of SAC, it does mean there is no incentive in some situations for noise producers to eliminate SAC from their emissions, because the noise limit is the same in either situation. It may also increase the risk of cumulative night time noise levels exceeding the overall sleep disturbance threshold of 45 dB L_{Aeq}, as is discussed further below.

- On the other hand, the CDP sets a night time L_{AFmax} limit which is 10 dB more stringent than the NZS 6802:2008 recommendation – in theory providing a 'better than minimum' level of amenity protection with regard to sounds such as 'bangs, clangs and thumps' during the night time period.

2.1.2 World Health Organisation Guidelines for Community Noise

Guidelines for Community Noise (1999), a document produced by the World Health Organisation (WHO) based on extensive international research, recommends a guideline limit of 55 dB $L_{Aeq(16\ hours)}$ to ensure few people are seriously annoyed in residential situations during the daytime. A guideline limit of 50 dB $L_{Aeq(16\ hours)}$ is recommended to prevent moderate annoyance during the daytime. For the night-time, guideline limits of 45 dB $L_{Aeq(8\ hour)}$ and 60 dB L_{AFmax} are provided, to allow occupants to sleep even with windows open. For noise received in industrial areas, the WHO recommends a guideline limit of 70 $L_{Aeq(24\ hours)}$.

The limits provided in the CDP for the protection of residential receivers from industrial noise are therefore again very similar to the World Health Organisation *Guidelines for Community Noise.* There are some minor differences in assessment approach and the numerical values, but the overall outcome would be expected to be very similar for the majority of Industrial-Residential interfaces.

2.2 Discussion

The CDP approach for controlling industrial noise received in Residential Zones is consistent with the relevant guidance for the protection of residential areas from adverse noise effects. The Standards referred to in the CDP are current New Zealand best practice, and consistent with the National Planning Standards directions. With regard to the numerical limits themselves – for sound which contains SAC the limits are at the upper end of the range, but not inappropriate. The night time L_{AFmax} limit is relatively stringent.

Some aspects of the CDP approach which could potentially be viewed as 'shortcomings' include:

- The CDP approach doesn't directly address cumulative noise – that is, one dwelling receiving elevated noise from multiple industrial sources. The CDP limits apply to each discrete activity in the Industrial zone, received in the Residential zone – so theoretically many Industrial activities could produce noise at that level at one residential receiver, leading to some accumulation. However, that issue is not unique to the CDP as there is no practical way place a direct limit on the combined sound level of all industrial sources. Some partial solutions are to set limits for each discrete activity in the Industrial zone which are considerably lower than the desirable cumulative level or to set very restrictive limits at the boundaries of the Industrial sites. For sound with SAC, it could be argued that the CDP approach increases the risk of cumulative industrial noise exceeding the overall sleep disturbance threshold of 45 dB L_{Aeq} as in effect it permits each source to generate 45 dB L_{Aeq} (40 dB L_{Aeq} plus 5 dB penalty if assessed in full accordance with NZS6802:2008) which leaves no headroom for accumulation. However as discussed further below, our observation is that the physical arrangement of sources and receivers at the Industrial-Residential interface typically provides little realistic opportunity for accumulation.

- Short sounds during daytime (bangs, clangs and thumps) are not directly controlled, as there is no L_{AFmax} limit. However, that is consistent with the very directive instructions of NZS6802:2008.

- Intermittent sounds (for example, 1 or 2 very loud container drop noises, experienced once or twice per month) may be disturbing for residential neighbours, and experienced at over 65 dB L_{AFmax}. However, the clauses in NZS6802:2008 requiring a noise measurement for enforcement purposes (to be 'representative of the sound under investigation', and for 'typical' not 'absolute' maxima to be considered) mean that such sound is unlikely to be considered non-complying. Again however, that is consistent with the instructions of NZS6802:2008. The low night time L_{AFmax} limit in the CDP may ensure that some of these issues are controlled more than in some districts.

- Some sounds may be very subjectively intrusive or annoying due to their character (for example, 'metal on metal scraping' sounds, or reversing beepers) but will nevertheless comply with the noise limits. It could be argued that in effect, the 5 dB SAC penalty which is 'built in' to the CDP limits may not be sufficient for these sounds.

We have discussed these issues further below, however in general terms the National Planning Standards endorse the NZS6802:2008 approach which is embodied in the CDP rules, and for many of the issues identified above, we are not aware of any obviously superior, standardised approach. In our view, solutions should be developed via systematic and objective research and eventually integrated into the National Planning Standard directives – rather than developed ad hoc for individual District Plans.

3.0 TYPICAL INDUSTRIAL NOISE SOURCES

Table 3.1 below (reproduced from the Christchurch District Plan), records what activities are permitted in the General and Heavy Industrial zones in Christchurch.

Table 3.1 – Permitted activities in Industrial General and Industrial Heavy Zones

Activity	Industrial General Zone	Industrial Heavy Zone
Industrial activity	Y	Y
Heavy Industrial activity	N	Y
Warehousing and distribution activities	Y	Y
High technology industrial activity	Y	Y
Service industry	Y	Y
Trade and industry training activity	Y	Y
Ancillary retail activity	Y	Y
Retail activity on the Tannery site	Y	N
Food and beverage outlet	Y	Y
Trade supplier	Y	N
Yard-based supplier	Y	N
Service station	Y	Y
Second-hand goods outlets	Y	N
Ancillary office	Y	Y
Public transport facility	Y	Y
Emergency service facilities	Y	Y
Gymnasium	Y	Y
Preschool	Y	N
Parking lots / Parking building	Y	Y
Community corrections facility	Y	Y
Poultry hatchery	N	Y
Bulk fuel supply infrastructure	N	Y

These types of activities may involve the following noise sources:

- Handheld power tools such as grinders, rattle guns
- Forklifts or reach stackers moving products, containers, loading vehicles and other bulk good
- Heavy vehicle movements on and off site including idling, refrigeration units and air brakes
- Large machine both wheeled and tracked moving about on sites, and being loaded / unloaded from trucks
- Metal forming equipment, cutters, lathes, mills, drills, folders, presses and hammering – both indoors and out
- Mechanical plant including extract fans, air-compressors, outdoor chillers, refrigeration equipment
- Specialised large-scale outdoor equipment such as car crushers, foundry shaker tables

Examples of the typical noise levels produced by a selection of these typical sources, and the measures which may be required to ensure compliance with the CDP noise limits at residential receivers are provided in table 3.2.

Table 3.2 – Typical noise levels and mitigation which may be required for Industrial activities to comply with the CDP Residential noise limits

Activity	Sound Level	Typical mitigation - Daytime	Typical mitigation - Night-time
Metal forming equipment – for example handheld grinder, metal forming press	110 – 120 dB L_{wA}	Located indoors, or behind a barrier and set back in the order of 100 metres from any dwelling.	Located inside a fully enclosed space and set back in the order of 50 – 100 metres from any dwelling.
Large vehicles – Container handling equipment, large earthmoving machinery being loaded	100 – 110 dB L_{wA}	Set back in the order of 100 metres from any dwelling or 50 metres from a dwelling if orientated away from boundary or behind a barrier.	Located inside a fully enclosed space and in the order of 50 metres from any dwelling.
Medium scale equipment - Compressors, typical forklifts, loading drainlayers excavator onto a truck	95 – 100 dB L_{wA}	Enclosed or behind a barrier or set back in the order of 50 metres from any dwelling.	Located inside a fully enclosed space and at least 30 metres from a dwelling or set back in the order of 50 metres from any dwelling and behind a barrier.
Hand-held equipment, typical of 'service' businesses – for example small pneumatic ratchet	90 - 95 dB L_{wA}	Set back in the order of 40 metres from any dwelling or behind a barrier.	Set back in the order of 40 metres from any dwelling and behind a barrier.
Workshop – typical	85 dBA internal reverberant level	Set back in the order of 30 metres from any dwelling or orientated away from dwelling.	Closed doors at night and in the order of 30 metres from any dwelling.

As table 3.2 indicates, a range of higher noise activities can theoretically operate on Industrial sites which boarder the Residential zone in the daytime with minimal specialist mitigation – for example, a large forklift could operate outside a warehouse, which provides screening to dwellings behind. Metal forming equipment or a metal grinder could operate inside a suitably constructed building with the doors closed.

For activity occurring during the night-time additional attention to specialist mitigation and management is likely to be required, such as locating activities indoors or locating activities that are expected to produce higher levels further from the Residential zone boundary. Work in workshops during the night-time would also likely need to typically be undertaken with doors closed.

Overall, it is our expectation that the range of activities outlined in table 3.1 would be able to operate within various parts of the Industrial zone, and readily achieve compliance with the CDP noise limits. However, as table 3.2 demonstrates, not all activities will be suitable for sites which directly adjoin the Residential Zone boundary – and there is considerable potential for non-compliances to be generated if appropriate attention is not paid to mitigation and/or hours of operation.

4.0 SITE INVESTIGATION

Figure 4.1, as provided by CCC, shows existing Industrial-Residential zones in the CDP. As part of this review, we visited examples of the Industrial-Residential interface for every major instance throughout the city.

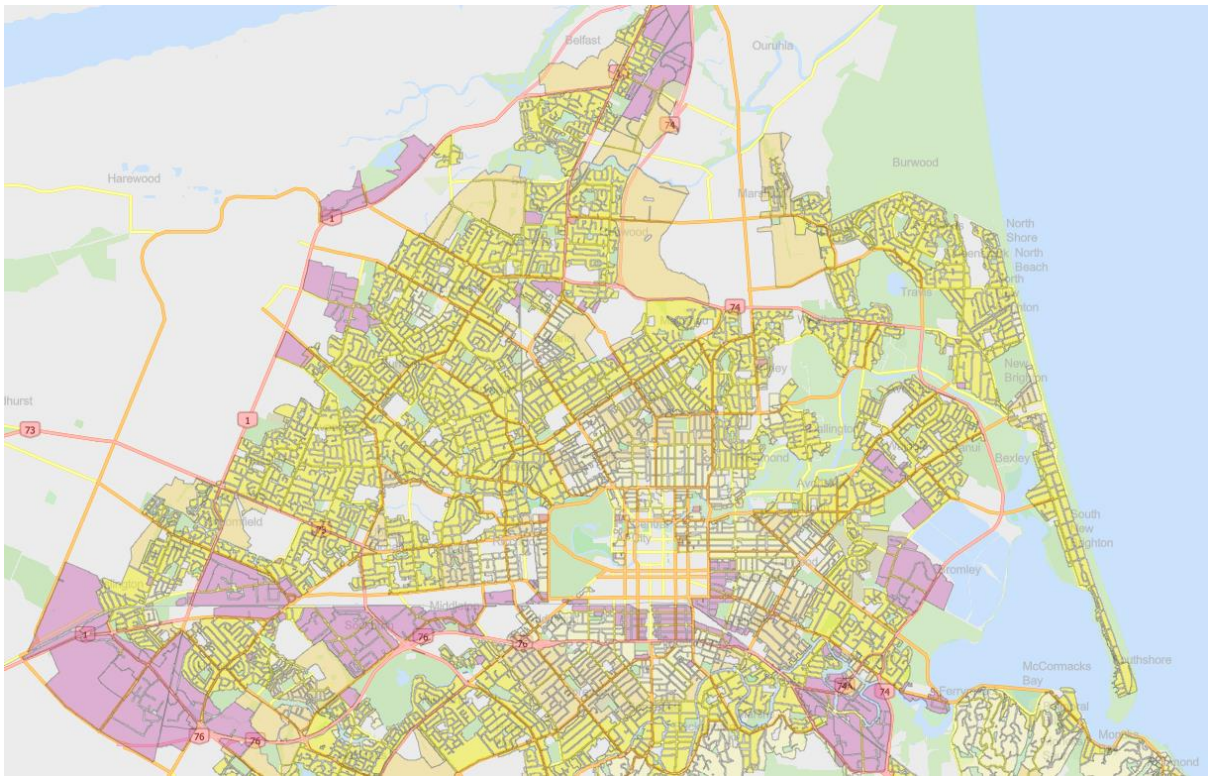

Figure 4.1 - Overview of current Industrial Zones (purple) and Residential Zones (yellow) interfaces across urban Christchurch

Areas visited by either Jeremy Trevathan or Clare Dykes of AES during the weeks of 28 November and 5 December 2022 included:

- Woolston
- Bromley
- Wainoni
- Phillipstown-Waltham
- Addington
- Hornby Central
- Hornby-Hei Hei
- Wigram-Halswell

- Burnside
- Papanui
- Belfast

The site visits were conducted at various times ranging from 5.00 am through to 5.00 pm. Meaningful noise measurements were generally not possible, due to interference from traffic noise on roads and the transient nature of many of the noise sources. As noted below, the exception was noise from mechanical plant, where various indicative measurements were undertaken. A summary of our findings is provided below.

4.1 Nature of industrial activity

The types of industrial sources observed were:

- Outdoor service areas – These included small areas where gas powered forklifts are used, larger areas such as container yards using reach stackers or telehandlers, or contractors' yards.
- Mechanical plant – This includes refrigeration units, large ventilation fans, etc.
- General 'industrial' activities – cutting, bangs and clangs, noise from specialised equipment (car crushing, big heavy equipment, excavator with claw etc.)
- Heavy vehicles

An overall observation was that along the many kilometres of Industrial-Residential interface throughout the city which featured the above noise sources, the layout of industrial sites was often close to ideal in terms of ensuring the industrial activities could comply with the CDP limits. It was not obvious whether this was due to the influence of current and historic planning rules (including the structure of the noise limits), or for practical reasons. A common arrangement was a large building over part of the site with its 'back' to the Residential zone boundary, and an 'active' outdoor area yard at the 'front' of the building, which shields that activity from the Residential zone boundary.

There were also many Industrial uses near the zone boundary which appeared to be relatively benign such as:

- A large building along the boundary line – such as show rooms or storage sheds with minimal activity
- Smaller scale business which only operate during the daytime period such as show rooms, automotive servicing, small distribution services.
- Car parks or service access points often ran along the Residential zone boundary, which are sporadically used and/or only used by light vehicles.
- Churches, a school, a funeral home, and a large fully-internal fitness facility

For these reasons, it seemed that residential sites 'sharing a common boundary' with an Industrial zone was not necessarily the highest risk arrangement.

Higher risks appeared to be involved with dwellings located across a road from an Industrial zone – as they were more likely to be exposed to the active / outdoor aspects of the Industrial activities and/or the heavy traffic which they attract, with no prospect of meaningful screening from interviewing structures. In some cases, if the road is wide and carries a high volume of traffic (for example, Shands or Maces Road) this arrangement did not appear to be particularly problematic. However, for narrow roads where the road was the primary access to Industrial sites, the road traffic at times is noticeably dominated by heavy vehicles

directly associated with the Industrial activity (for example, Branston Street). Large despatch yards are also located in relatively close proximity to dwellings.

4.2 Specific observations

Some observations are discussed below, with regard to the current successful function of the CDP noise rules discussed in the previous sections.

Mechanical plant

Noise from mechanical plant was a common feature, as this equipment was often elevated and oversized (for example, spray booth extracts or blast chillers).

However, mechanical plant is typically a very easily quantified source during the design stage of a project, which should be always able to be designed to comply with the CDP limits. We did not observe anything during our site visits which suggested a different approach was needed – despite numerous examples being observed where mechanical plant did not comply with the CDP limits (sometimes by more than 20 dBA). This always appeared to be due to absence of any effort to implement any of the various mitigation which is routinely implemented by good operators.

It is interesting to note that despite numerous on-going non-compliances, this type of mechanical plant noise does not feature highly in the complaints records discussed in the following section – suggesting neighbours are actually quite tolerant of that type of noise, even at levels above the CDP limits.

Heavy vehicles

Heavy vehicles were a commonly encountered noise source – including engine and brake noise. However as discussed above, due to the layout of many Industrial sites, this noise is often generated some distance from residential receivers, or in locations which are screened.

However, there were a moderate number of instances where Industrial site accessways run along the length of a Residential boundary. In addition, as above, on narrow low volume roads on- and off-site heavy vehicle noise can also be a distinct source at Residential receiver locations. Sporadic night time movements (e.g. rubbish collection) were observed in some locations – where the on-site element of the activity was unlikely to have complied with the CDP night time noise limit. The on-road aspect of this noise is not controlled by any CDP noise limit but was often very distinctive in the context of other ambient noise.

The CDP traffic noise sound insulation provisions, contained in section 6.1.7.2.1, have some relevance in this situation, as they require any new dwellings overlooking the road to be designed to provide an enhanced level of sound insulation. Only in some situations would with the approach during that process take into account the actual use of the road and then only in general terms (percentage heavy vehicles over an average 24 hour period).

Reversing Beepers

Reversing beepers associated with forklifts was a very commonly observed feature across many of the industrial areas. This noise would typically readily comply with the CDP noise limits, but was often very distinctive in the context of other ambient noise. Forklift noises also included engine whine, and clatter from pallets and the use of horns as a warning when moving around blind corners.

There are now practical alternatives to reversing beepers, the use of which often encouraged or mandated during Resource Consent processes irrespective of whether the noise levels comply with the District Plan provisions. This could be understood to be an acknowledgement that this noise source can still be problematic even when complying with a traditional noise limit / NZS6802:2008 assessment approach.

Bangs, Clangs and Thumps

Intermittent bangs, clangs and thuds were observed on many of the site visits. This noise was often emanating from Industrial activities set further back into the Industrial zones (i.e. not from sites directly adjacent to Residential) and so the exact source was often never visible – but generally appeared to be likely associated with heavy or bulky materials being moved around in outdoor areas on sites (for example, container loading and unloading and stacking). Many of the sites we observed also had large areas of 'passive storage' during our visit. Presumably activities in these areas also generate that type of noise from time to time as the items we observed currently in storage were moved into their current positions, and then removed. Contractors' yards which involve vehicles being loaded and departing in the morning, and returning in the evening were also observed to be passive during many of our visits, but presumably also generate similar intermittent noise from time to time.

This noise would only obviously create a CDP compliance issue if it occurred during the night when an L_{AFmax} limit applies, and was a regular feature of the industrial activity, such that the clauses in NZS6802:2008 about 'representativeness' and repeated infringements were satisfied. If occurring during the daytime, or so sporadically that it could be argued the sound was not generally 'representative' of the activity, this noise would typically comply with the District Plan noise limits, or at least fall into a grey area where enforcement action was unlikely to be taken. This noise could however still be intrusive, due to its impulsive character.

5.0 CCC 'EFFECTS OF INDUSTRIAL ACTIVITIES ON THE ADJOINING RESIDENTIAL ZONE' MEMO

The CCC have provided us with a memo entitled *Effects of industrial activities on the adjoining residential zone* (dated 10 December 2019) which contains a summary and discussion of 45 noise complaints which arose at the interface between Residential and Industrial zoned areas between 01/12/16 and 20/03/19. The majority of noise complaints are concentrated in three industrial areas: Belfast (14), Woolston (11) and Hornby South (8). A further 12 complaints were recorded in these interface regions, however they concerned dust, visual and odour complaints.

Table 5.1 below outlines a summary of noise complaints covered in CCC memo.

Table 5.1 – Summary of noise complaints information provided for 2016 to 2019

Location – assumed to be of noise source	Day/night	Noise source	Number of complaints	Activity at site	Noise level compliance with Christchurch District Plan noise limits
26 Belfast Rd, Belfast	Day	Metal cutting	10	Window joinery manufacturing	Not stated
20 Station Rd, Belfast	Day and night	Droning noise through night, trucks beeping at night, banging and clattering noise	4	Water bottling factory	Not stated
Curries Rd, Woolston	Night	Unloading containers, forklifts beeping (only quiet between 1am and 5am)	1	Unknown site (assumed food cold store by CCC)	Not stated
76 Garlands Rd, Woolston	Day	Metal crushing noise, clanging, scraping, machinery noise, forklift, constant high noise levels throughout day	10	Temporary recycling / car crushing	'Generally complied', but some 1 – 2 dBA exceedances
121 Branston St, Hornby South	Day and night	Truck noise all night, loud crashing and banging from moving containers, forklift noise	5	Container transport and storage	Complied
34 Branston St, Hornby South	Night	Trucks loading and unloading of containers	1	Packaging supplier	Not stated
80 Shands Rd, Hornby South	Night	Loading / unloading of containers prior to 7am	1	Warehousing / logistics	Complied
716 Halswell Jctn. Rd, Hornby South	Not stated	Excessive industrial noise	1	Welding	Not stated

Notes: (1) 12 out of 33 complaints listed above are related to the loading / unloading of containers at night and truck noise associated with it.

(2) 20 out of the 33 complaints came from the same two 'repeat offender' source sites.

A summary of each of the locations involved is provided below.

Belfast

10 of the noise complaints in Belfast were made with regard to the same location at 26 Belfast Road and related to the cutting of metal with an open workshop door. This site is located in an Industrial General zone, with the closest residential boundary less than 10 metres from the closest industrial building. It is not clear whether the District Plan noise limits were breached, however clearly the noise source was of great annoyance for nearby residents. Based on table 3.2 above, we expect that the CDP limits were being exceeded, and the complaints were justified.

The remaining noise complaints were directed at a water bottling plant located at 20 Station Road in Belfast in an Industrial Heavy zone. The complaints cited a number of noise sources, such as a loud droning noise at night, trucks beeping throughout night and general banging and clattering noise. We are aware from our involvement at the time that during this period Cloud Ocean Water were regularly producing noise which exceeded the District Plan limits. A Resource Consent was eventually granted for night time operations, which included a requirement for a noise barrier to be constructed between the factory and the closest dwellings to ensure compliance with the CDP noise limits.

Woolston

Car crushing activities were taking place at 76 Garland Road (Industrial General zoning) during the daytime, resulting in 11 noise complaints. Notable noise sources included metal crushing and clanging, machinery noises and a constant 'droning' noise as well as forklift activity noise throughout the day. This activity was temporary, however compliance officers concluded that the noise levels generally complied with noise limits, with occasional exceedances between 1 and 2 dBA. It is possible that L_{AFmax} levels were very high – however consistent with NZS6802:2008 and as outlined above, the District Plan has no daytime L_{AFmax} noise limit. The noise is likely to have contained SAC – but as above, the Christchurch District Plan sets the same limit for that noise, as for noise of a more benign character. Overall it appears that the activity was marginal in terms of compliance, and did feature some of the characteristics that as discussed above, the CDP (and NZS6802:2008) may not cope well with.

One noise complaint originated from the area of Curries Road in Woolston. The only Industrial-Residential interface on this road shows a setback of 25 metres between the closest residential lot and an Industrial General zoned site. The complaints noted noise from trucks unloading containers and forklift beeping throughout the night, however it is noted that there was a period of silence between 1 am and 5 am. The L_{AFmax} levels from this activity may well have exceeded the CDP 65 dB L_{AFmax} limit, and as above, forklift beepers are also one of the sources which the CDP (and NZS6802:2008) may not cope well with.

Hornby South

Noise complaints in Hornby South mostly related to the activity of trucks and container unloading with forklifts throughout the night. There was a particular attention to the noise 'carrying at night' – and it seems likely that there may have been the perception of louder noise due to the lack of background noise at these hours.

A site which received six complaints was at 121 Branston Street, which is located in an Industrial General Zone. 121 Branston Street directly adjoins neighboring residential lots. Another General Industrial zoned complaint site at 80 Shands Road also directly adjoins residential lots with a container unloading area less than 15 metres away from the closest residential lot. Compliance monitoring has been undertaken at both 121 Branston Street and 80 Shands Road multiple times, and concluded the activities undertaken complied with the noise limits. Despite compliance with noise limits, complaints were still lodged which suggests either a louder-than-usual activity occurred to prompt the complaints, or the character of the noise even at complying noise levels was disruptive. This situation highlights some of the challenges there can be in monitoring and enforcement, when the noise source is variable.

We have considered the above observations in compiling our discussion and recommendations in the following section.

6.0 DISCUSSION

In general terms, our review and analysis has indicated that:

A. The CDP noise limits which control the Industrial-Residential interface are in line with best practice (including the directives of the National Planning Standards) and put the onus on Industrial operators to comply with 'residential level' limits by the time their noise reaches residential areas. This in effect creates a 'buffer area' around the perimeter of, but within, each area of Industrial zoning. Within this buffer area, only low to moderate noise generating Industrial activities can locate and realistically expect to operate in compliance with the CDP, irrespective of the range of industrial activities permitted in the zone generally.

B. Many of the activities currently occurring in Industrial zones close to the Industrial-Residential interface are not high noise generating (potentially self-selected due to the close proximity of a boundary at which stringent noise limits apply), or have arranged their sites such that compliance with the CDP noise limits is readily achieved, and it is likely that residential neighbours in these areas rarely experience any noise adverse effects.

C. Some of the historic complaints involved situations where Industrial operators were not complying with the CDP noise limits. The fact that residential neighbours complained is not a failure of the noise limits in those situations. Furthermore, different noise limits or an intensified level of residential activity would presumably have resulted in the same outcome, as the noise is subjectively unacceptable to normal, average people.

Based on the above, in the majority of situations (i.e. locations along the majority of the Industrial-Residential interface), it would be difficult argue generally that the potential intensification of Residential activity as a result of Plan Change 14 would have any meaningful additional adverse effect.

<u>Situations where some change to the Plan may be appropriate</u>

At most, if a limitation on intensification was to be considered (for example, a buffer within the Residential zone where intensification could not occur, or enhanced sound insulation was required for new dwellings) it appears that this could potentially be justified in some specific locations / situations (which would need to be defined spatially, or in some other suitably precise way). The more complex issues or situations which may appear to potentially justify that sort of an approach are:

D. There is evidence of industrial activities not complying with the noise limits – both in the CCC memo, and observed directly during our site visits. Theoretically all of those situations should be resolved immediately via enforcement action, as they involve illegal noise emissions and expose residents to potentially harmful levels of noise. However, in reality that process takes time and may not ever happen, if no complaints trigger an investigation – and as they wait for the situation to be resolved, residents will be exposed to elevated levels of noise. In that context, having less people exposed to that temporary non-complying noise (either through limiting intensification or requiring sound insulation close to the Industrial-Residential interface) is theoretically a good thing. However, on the other hand, new regulations to that effect would do nothing to protect those living in existing dwellings, and may be seen to be enabling or accommodating unconsented noise emissions from industrial operators. In other words, should PC14 really be modified to cater for situations where Industrial operators do not comply with the CDP noise limits?

E. Even if individual Industrial activities operate in compliance with the CDP rules, theoretically a potential 'cumulative noise' issue could exist for some specific Residential receivers. For example, in theory there is the potential for a single residential dwelling to be exposed to night time noise levels of 40 dB L_{Aeq} from a number of different Industrial operators which combine to expose them to a level of noise exceeding the WHO / NZS6802:2008 sleep protection threshold of 45 dB L_{Aeq}. This is particularly the case if some or all of the sources contain SAC (which under a full NZS6802:2008 assessment would suggest they are in effect, the receiver is experiencing a level of

45 dB L_{Aeq} already). However, based on our site visits, a review of the layout of the Industrial-Residential interface and complaints information, there is no evidence that this is something which has been an issue in practice, and it is not obvious how more intensified residential use resulting from PC14 would change that. As discussed below, in any event a more logical step to alleviate this concern would be to correct the 'SAC exclusion' in the current CDP rules, ensuring the starting point for any accumulation was 40 dB L_{Aeq} from each operator (including a +5 dB SAC penalty if justified). Exploring that change is not within the scope of PC14.

F. People living across the road from Industrial zones may experience noise from on-road heavy vehicles directly associated with the Industrial zone, which is not controlled by the CDP noise limits. The relatively stringent night time 65 dB L_{AFmax} limit in the CDP does ensure that limited on-site heavy vehicle activity would be permissible, where the road is narrow and so the distance between the on-site location where the vehicle is operating and the Residential boundary is limited to the width of the road. There will however be some residual effect in some situations. As above, it may be possible to enhance the CDP road traffic noise rules in some way to improve this – however exploring that change is not within the scope of PC14. Alternatively, it could again be argued that having less people exposed to that uncontrolled on-road heavy vehicle noise (either through limiting intensification or requiring sound insulation for dwellings across the road from an Industrial zone) is theoretically a good thing. However, again, such new regulations would not protect those living in existing dwellings, and as above any such effect seemed to only potentially be evident on specific roads – as often underlying large traffic volumes concealed any noise associated with Industrial activities in the immediate vicinity. There was also no evidence in the CCC memo that this issue on its own was of concern to residents.

G. A final and more challenging issue is that while the CDP noise limits are largely consistent with NZS6802:2008 and best practice, they may permit some sounds at a level and character that may still be annoying to more than an outlying percentage of the population – for example 'metal on metal scraping' sounds, occasional 'bangs, clangs and thumps' or reversing beepers may fall into this category. However as above, we are not aware of any obviously superior, standardised approach. In our view, solutions should be developed via systematic and objective research and eventually integrated into the National Planning Standard directives – rather than developed ad hoc for individual District Plans.

More generally, to introduce via PC14 a requirement for sound insulation or a setback implies that current residential sites may be being exposed to something undesirable and/or could be seen by Industrial operators as a licence to have less regard to their noise emissions. A planning assessment may be appropriate to determine the best approach. Requiring Residential areas to react in some way to protect themselves from Industrial activities, signals an intention to deliberately move the 'buffer' (which is inevitably required between the inherently acoustically incompatible Industrial and Residential zones) from within the Industrial zone (as is currently the case, due to the way the noise limits work as described above), to within the Residential zone. Presumably that process would need to be informed by a higher-level review of what the priorities and demands actually are for various land use types in the city. A large strategic change would also need to consider what the outcomes would be for all the industrial operators which have already established in a manner which is respectful of the current noise limits, and the existing residential sites which are established on the understanding that they will be protected by the current noise limits.

Three storey houses

At the outset of this review, we were concerned that the upper levels of new three storey houses which would be enabled by PC14 might now overlook industrial areas, whereas before lower houses were screened. In that situation, in line with NZS6802:2008, the upper façade would now become a compliance assessment location. If noise levels exceeding the District Plan limits were received at that upper façade because it had more direct line of sight to Industrial activities, it is not clear how the situation would be resolved. That could be a justification for requiring new intensified residential dwellings to provide some level of sound insulation or be set back.

Our site visits indicated that the vast majority of current dwellings at the Industrial-Residential interface are currently single storey. Therefore, the nearby Industrial activities are already currently vulnerable to the same issue as described above, if these sites were redeveloped for 2 storey under the current rules. Whether the redevelopment was 2 or 3 stories, the same issue could potentially exist, as only single storey dwelling can be practically screened by boundary fencing (that is, both the 6+ metre high screen required to screen a two storey dwelling and the 9+ metre screen required to screen a three storey dwelling are impractical). Therefore, PC14 doesn't create an entirely new issue in that regard.

A real-world scenario which we observed during the site visits was a ground level industrial noise source such as a forklift which currently operates 25 metres from a residential dwelling, but is currently screened by a small intervening single-level industrial building (approximately 3 metres in height). Compliance with a 50 dB L_{Aeq} limit would just be achieved in that scenario. If the neighbouring dwelling was increased to two stories, noise levels of 55 to 60 dB L_{Aeq} may be experienced at the upper level facade. If the neighbouring dwelling was increased to three stories, noise levels of over 60 dB L_{Aeq} may be experienced at the upper level facade. To ensure continued compliance with a 50 dB L_{Aeq} limit in that scenario, a two-storey dwelling would need to be set back at least 70 metres from the forklift, and a three-storey dwelling would need to be set back at least 120 metres from the forklift.

The Plan could be amended to be clearer as to what approach should be taken in a situation where a new receiver results in an existing activities complying noise emissions now exceeding the noise limits – although we are aware that even the Case Law on that issue is not well resolved. Alternatively, a 'buffer' area where three storey dwellings could not be constructed would ensure this issue was very unlikely to arise.

7.0 RECOMMENDATIONS

Based on the above, it is our view the PC14 residential intensification will not create significant noise effects or noise reverse sensitivity issues at the Industrial-Residential interface, along the vast majority of the length of the interface. Where there are potential issues, wider changes to the Plan would be required (which are outside to the scope of PC14) to ensure an integrated approach, and/or the issues involve aspects of the management of industrial noise for which definitive research and guidance is not yet available (and so it is not realistic to expect the CCC to devise and implement a superior approach in the CDP).

Matters which could however potentially be addressed via changes to the Plan include:

- Reconsidering the approach to SAC.
- Clarifying whether noise limits apply at upper façade of multi-level dwellings constructed after an Industrial activity is established, or introducing a 'buffer' area where three storey dwellings could not be constructed overlooking existing Industrial sources.
- Considering whether the current Plan rules relating to traffic noise insulation could be modified to require additional insulation when dwellings are established across the road from Industrial activities which may generate night time heavy vehicle movements in close proximity to dwellings on otherwise low volume roads.
- Considering whether the Plan could be more directive in some way to better control activities which may involve noise sources that are not well controlled by the current limits (but for which the NZS6802:2008 / National Planning Standards currently do not provide a better approach) – for example, 'metal on metal' sounds, 'bangs, clangs and thumps' and reversing beepers.

The CCC could also consider whether enforcement could be made any more efficient and/or proactive. Identifying and correcting any non-compliance issues quickly ensures that people are not exposed to undesirably high levels of noise for extended periods.