

4 July 2022

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Dear Simon,

Review of medium density residential standards- noise effects at Industrial Zone interface

1.0 Introduction

Styles Group have been engaged by Rotorua Lakes District Council to review the proposed Medium Density Residential Standards (**MDRS**). The MDRS will introduce new development controls affecting the permitted density, height and location of residential development in Residential Zones.

The purpose of our review is to identify whether the additional development capacity enabled by the MDRS will give rise to noise-related effects at the interface of the Residential and Industrial Zones. Our review focusses on the Industrial- Residential interfaces in the three 'areas of interest' provided to us below.



Ngapuna



Fairy Springs



Ngongotoha

The three areas of interest are occupied by established residential and industrial activities. We understand that much of the development has not reached the intensification (in terms of height of building and minimum setbacks) that the ODP provides for. This advice assumes that:

- The existing residential activities have generally not been developed to the maximum permitted bulk and location controls authorised by the Operative District Plan (ODP) standards. We understand that most of the residential dwellings are single-storey and have not been developed to the maximum permitted height (two-

storey) enabled by the ODP. We refer to this as the physically existing environment.

- That the residential land could be developed to the maximum in terms of bulk and location permitted by the ODP, as of right. We refer to this as the legal existing environment. This forms the official 'starting point' for the evaluation of the change in effect that the MDRS could authorise.
- The activities in the Industrial Zone operate in accordance with the ODP maximum permitted noise levels for noise generated within an Industrial Zone and received in a Residential Zone.

We understand that the MDRS does not affect the existing zoning pattern or seek to rezone land at the industrial interface. This advice does not consider any potential noise constraint arising from a new zoning pattern near to the Industrial Zones.

This advice focusses on the net change to the noise environment arising from the MDRS. Table 1 below compares the Operative District Plan (**ODP**) standards to the MDRS.

Table 1 Comparison of ODP and MDRS standards

Standard	ODP Standard	MDRS
Dwellings per site	One per 350m ² or average of 450m ² (Residential 1)	Up to three dwellings
Building height	7.5m	11m plus roof
Yards	5m front, 2.5m for all others	1.5m front, 1m for all others.
<i>Interface noise standards (Industrial to Residential)</i>	Noise levels from an activity in an Industrial Zone shall not exceed the noise limits specified for the adjoining Residential Zone "when measured at any point within the receiving site": • 7am to 7pm: 50 dB L_{Aeq(15min)} • 7pm to 10pm any day except public holidays: 45 dB L_{Aeq(15min)} • Night time and public holidays: 40 dB L_{Aeq(15min)} and 70 dB L_{AFmax}	
<i>No change</i>		

2.0 The net change in noise environment from the MDRS

Table 1 identifies that the ODP interface noise rule requires industrial activities to meet the residential noise limits "at any point within the receiving site". This requirement will continue to control the noise generating potential of the industrial operators that are located on or near to the residential interface.

Industrial sites that are well separated from the residential interface (i.e. by distances greater than 150m) will typically be able to operate without significant constraint and meet the maximum permitted noise levels in the Industrial Zones (75 dB L_{Aeq(15min)} daytime and 70 dB L_{Aeq(15min)} nighttime at their industrial neighbours).

The potential changes arising from adopting the MDRS are:

1. The MDRS will authorise a greater density of residential development. Additional residential receivers may be established in Residential Zones via infill development or redevelopment of land. This could enable more residential activity at or near the interface with the Industrial Zones.
2. The MDRS will enable higher residential development. The MDRS will authorise an additional storey of vertical residential development (to a height of 11m). We understand that in simple terms, the changes in permitted height are to allow dwellings to go from two storey (ODP) to three storey (MDRS). This is likely to result in residential receivers 'over-looking' industrial activity to a greater degree than in the physical and legal existing environments.
3. Residential development may be established closer to site boundaries as a result of the reduced yard setbacks enabled under the MDRS. The changes in yard setbacks are a very minor feature of the potential changes from an acoustics perspective.

Overall, we consider the key noise effects on the Industrial Zone relate to the more intensive vertical residential development authorised by the MDRS. These effects and practical implications for the industrial operators are discussed below.

3.0 New noise non-compliance arising from the MDRS

The noise standards at the residential / industrial zone interface requires noise makers in the Industrial Zone to comply with the noise limits when measured and assessed at "*any point within the receiving site*".

In practical terms, and following the procedures set out in NZS 6802:2008 *Environmental Noise*, this results in noise compliance locations that are typically:

- a) 1.5m above the ground level and ground floor deck or floor height on the residential site; and
- b) 1.5m above the finished floor level of any dwelling. This includes multi-storey dwellings. This would lift the assessment position to typically 4m to 4.5m above the ground for a two-storey dwelling and approximately 7.5m above the ground for a three-storey dwelling.

Figures 1, 2 and 3 below represent the following three scenarios:

- 1) Scenario 1: the physically existing single-storey development that we understand is common in the areas of interest.
- 2) Scenario 2: legally existing two-storey development that has been constructed to the minimum rear or side-yard setback and the maximum height permitted by the ODP. We understand that this forms the current legal 'existing environment' in the residential zones.
- 3) Scenario 3: Three storey development that has been constructed to the minimum rear or side-yard setback and the maximum height permitted by the MDRS.

3.1 Scenario 1 → the physically existing environment- predominantly single-story dwellings

Figure 1 depicts the scenario that we understand is typical for the typical physically existing environment at the interface with the Residential and Industrial Zone. Figure 1 shows a single storey dwelling adjacent to an industrial activity at the zoning interface.

The presence of a single-storey dwelling requires the industrial activity to meet the residential zone noise limits when measured and assessed “*any point within the receiving site*”. The presence of a single storey dwelling requires noise levels to be measured and assessed 1.5m above the immediate ground level or finished floor level of the dwelling.

Figure 1 demonstrates that the presence of a 2m high acoustically effective fence provides effective screening from the industrial noise. The residential activity does not have line of sight to the industrial building or outdoor yard where noise sources would typically be operating.

In this case, the industrial activity is located at the immediate zoning interface and is required to conduct their operations to achieve compliance with the residential noise limits. This tension forms part of the existing environment and will typically require the noise maker to take care to schedule noisy activities (inside the building or in the yard) to the daytime period when higher noise limits apply.

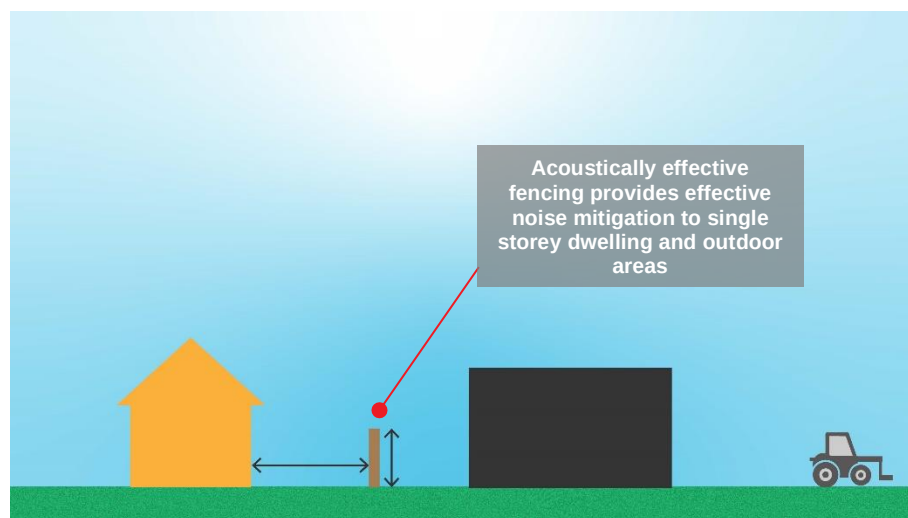


Figure 1 Single story residential development (physical existing environment)

3.2 Scenario 2 → the legal existing environment- two story dwellings

The legal existing environment in the ODP anticipates and provides for two-storey dwellings at the Industrial Zone interface.

Figure 2 depicts the existing legal environment under the ODP whereby a two-storey dwelling is adjacent to an industrial activity at the zoning interface.

The presence of a two-storey dwelling requires noise levels to be measured and assessed 1.5m above the immediate ground level, and at 1.5m above each floor level of interest (i.e. at heights of 1.5m and 4m - 4.5m above ground).

Figure 2 demonstrates that the presence of a 2m high acoustically effective fence provides effective screening at ground level, however no screening is provided to the second level. Many two-storey developments will partially or wholly overlook industrial yards and low industrial buildings.

In this scenario, the industrial noise maker is still subject to the same constraints as in Scenario 1 however additional steps will be required to operate in compliance with the residential noise limits when measured and assessed at the second floor of the dwelling. These potential constraints on the noise maker form part of the existing environment, and may require the activity to:

- Schedule noisy activities such as loading trucks, moving goods around with a forklift or more than a small number of truck movements to the daytime period, when higher noise limits apply
- Screen the upper floor from noisy vehicles/ machinery in the yard (i.e. inside or behind industrial buildings)
- Limit noisy activities to within the buildings on the site, ensuring that no openings (such as roller doors) face the residential interface.

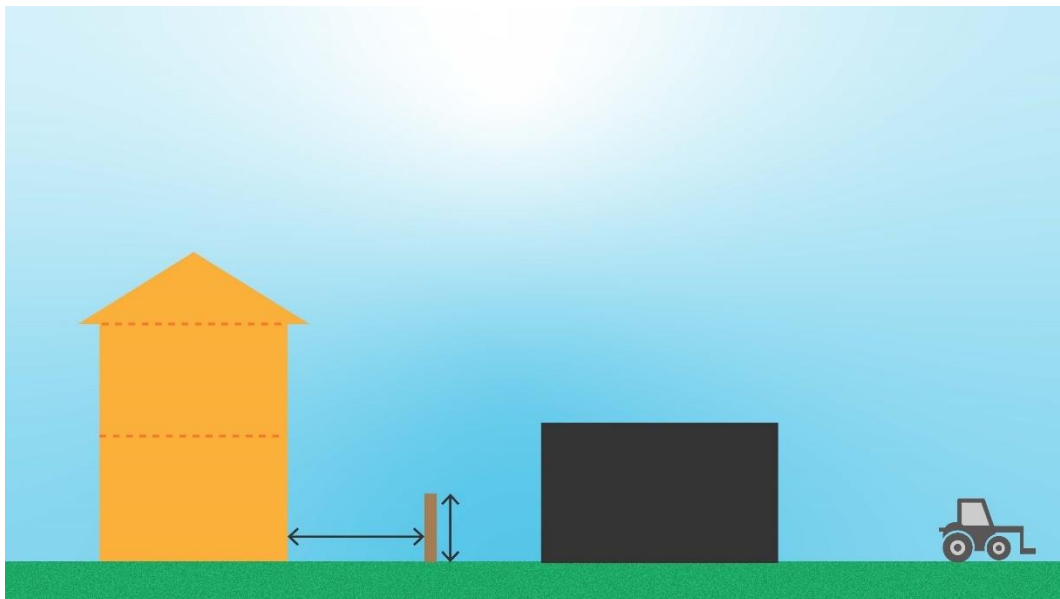


Figure 2 Two-storey residential development (legal existing environment)

3.3 Scenario 3 → the MDRS environment- three story dwellings

Figure 3 depicts the MDRS scenario where a three-storey dwelling is established next to an industrial activity at the zoning interface.

The MDRS elevates the highest potential assessment location in the legal existing noise environment from 4m-4.5m above the ground to 7.5m above the ground.

Figure 3 demonstrates that the presence of a 2m high acoustically effective fence provides effective screening at ground level, however no screening is provided to the second and third levels. The top floors of a three-storey development will overlook industrial yards and low industrial buildings¹ in most cases.

In this scenario, the industrial noise maker is still subject to similar constraints as in Scenario 1 and 2. However new non-compliances may arise at the third floor because this assessment location would be difficult or impossible to effectively screen by acoustic fencing or buildings. The addition of a third floor in the residential zone is likely to increase the number of industrial activities facing compliance challenges.

The noise maker will need to apply additional noise mitigation measures to operate in compliance with the residential noise limits when measured and assessed at the second and third floors of the dwelling. These steps may take the form of:

- Controlling the location and limiting the extent of activity in outdoor yard areas to ensure that particularly noisy activities are either conducted inside a building or in a location that is well screened from the third floor residential receiver;
- Limiting noisier activities (such as loading or moving trucks) to the daytime hours only when higher noise limits apply;
- Implementing acoustic treatment to the building envelope to screen rooftop mechanical plant, improve roof insulation to reduce noise breakout or to change the orientation of doors and openings to ensure they face away from the residential interface.

¹ We understand the ODP provides for 15m high buildings in the Industrial 1 and 1E zone.

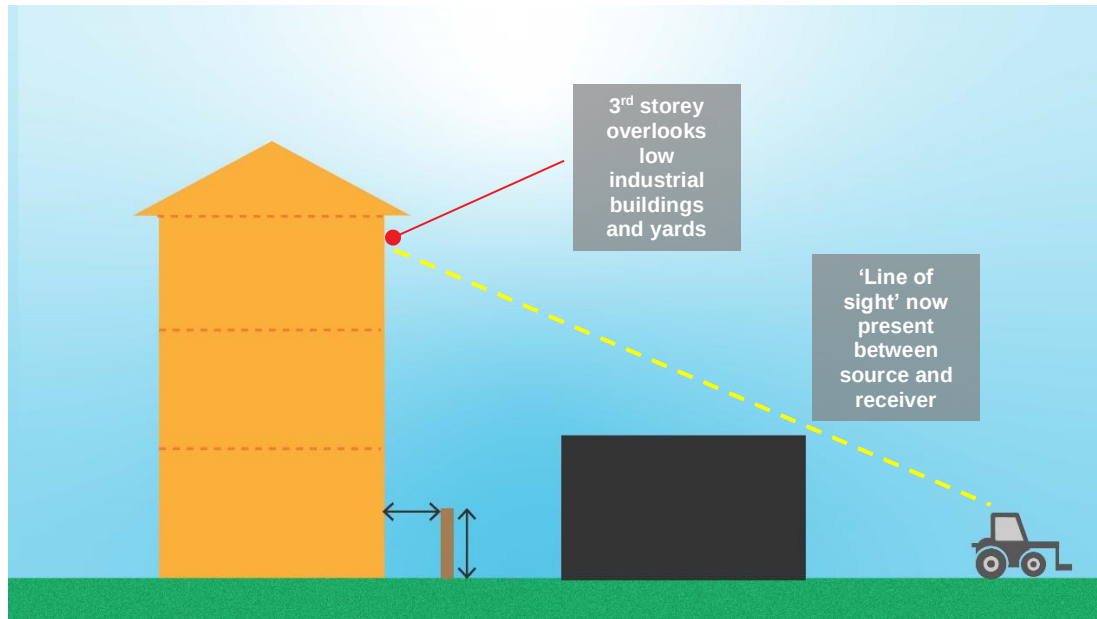


Figure 3 Three-story residential development (MDRS)

4.0 Change in the level of “new non-compliance”

As set out above, if a single-storey residential receiver is screened from most or all of the industrial activity by acoustically effective fencing, bunds or buildings, the industrial operator may not be particularly constrained by compliance with the noise limits at the residential interface.

If a residential receiver overlooks the industrial activity, the noise will not be effectively screened and the industrial activity may need to resort to other noise mitigation options to maintain compliance with the noise limits, such as those outlined in the previous section.

We expect that the transition from single-storey dwellings to two-storey dwellings will yield a considerable number of new non-compliances. These changes are permitted by the ODP.

The change in noise effects arising from moving from the legal existing environment in the ODP (two-storey development) to the MDRS proposal (three-storey development) is likely to increase the degree of overlooking and new non-compliances. We expect that this change will only increase the new non-compliances by a modest amount, as most will have occurred during the change from single-storey to two-storey development.

5.0 Conclusion

Many of the Industrial Zones of the Rotorua Lakes District Plan operate in proximity to residential zones containing established residential development. The requirement for the industrial activities operating to meet the residential noise limits applying in the Residential Zone forms part of the existing environment. This requirement will continue to control the noise generating potential of the industrial activities that operate near to the residential interface. The MDRS does

not seek to change the permitted noise levels or rezone land previously set aside as an industrial buffer.

We consider the key potential noise effects on the Industrial Zone operators of introducing the MDRS is the increase in residential development height authorised by the MDRS.

If a three-storey residential development is established on or near to the Industrial Zone, the industrial activity will be required to meet the residential noise limits when assessed at the second and third floors of the residential dwelling. These assessment locations will be difficult to screen effectively by acoustic fencing or buildings, and therefore the MDRS may give rise to new non-compliance issues at the zoning interface.

The practical implications for the industrial noise makers are described generally in this advice.

The change in noise effects arising from moving from the legal existing environment in the ODP (two-storey development) to the MDRS proposal (three-storey development) is likely to increase the degree of overlooking and new non-compliances. We expect that this change will only increase the new non-compliances by a modest amount, as most will have occurred during the change from single-storey to two-storey development that is already authorised by the ODP.

Please contact me if you require any further information.

Yours sincerely,



Jon Styles, MASNZ
Director and Principal