Construction Noise and Vibration Assessment

Waitākere District Courthouse – New Courthouse Project

Ministry of Justice

Prepared by:
SLR Consulting New Zealand

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Revision Record

Revision	Date
1.4	7 August 2025
1.3	28 July 2025
1.2	26 May 2025
1.1	7 May 2025
1.0	15 April 2025

[redacted]

Basis of Report

This report has been prepared by SLR Consulting New Zealand (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Ministry of Justice (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

The information provided in the report is prepared for the Ministry of Justice, Waitākere Project Design Team, Ministry for the Environment Fast Track Review Panel, Environmental Protection Authority and Associated Stakeholders.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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Acronyms and Abbreviations

A' weighted	A frequency adjustment which represents how humans hear sounds.
Ambient noise level	The all-encompassing sound associated with an environment or area.
AUP	Auckland Unitary Plan Operative in part.
dB	Decibel
dBA	'A' weighted decibel
DIN 4150-3	German Industrial Standard DIN 4150-3 (1999): Structural vibration – Part 3 Effects of vibration on structures.
Free field	A monitoring location where the microphone is positioned sufficiently far from nearby surfaces for the measured data to not be influenced by reflected noise.
Hz	Hertz
Impulsive noise	Noise with a high peak of short duration, or sequence of peaks.
Intermittent noise	Noise which varies in level with the change in level being clearly audible.
L90 , L10 , etc.	Statistical exceedance levels, where LN is the sound pressure level exceeded for N% of a given measurement period.
L_{Aeq}	The 'A' weighted equivalent noise level. It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.
L_{Amax}	The A' weighted maximum sound pressure level of an event.
Low frequency	Noise containing energy in the low frequency range.
L_P or SPL	Sound Pressure Level.
Lw or SWL	Sound Power Level.
NZS 6801:2008	New Zealand Standard NZS 6801:2008 "Measurement of Environmental Sound".
NZS 6802:2008	New Zealand Standard NZS 6802:2008 "Assessment of Environmental Noise".
NZS 6803:1999	New Zealand Standard NZS 6803:1999 "Acoustics – Construction Noise".
Octave-band	A frequency band where the highest frequency is twice the lowest frequency.
Rating level	A derived level used for comparison with a noise limit.
Rw	Weighted Sound Reduction Index of a building element. That is, the laboratory tested (or theoretically calculated) sound insulation. performance of a single element.
Tonality	Noise containing a prominent frequency.

1.0 Introduction

This report has been prepared to support a Substantive Application made by Ministry of Justice (on behalf of the Requiring Authority - Minister of Justice) under the Fast Track Approval Acts 2024 in accordance with the requirements of Section 42. The proposal is a Referred Project and this report has been prepared to support a Notice of Requirement Application to designate the site at 14 Edmonton Road, Henderson for *'Judicial and Court purposes'* known as the Waitākere District Courthouse - New Courthouse project.

Under s42(4)(d), this substantive application is giving notice of a requirement to designate the site that would otherwise be applied for under the Resource Management Act 1991. Section 43 of the Fast Track Approval Act sets out the information to be included in a substantive application, which includes an assessment of adverse effects of the project on the environment. This report has been prepared to assess the noise effects of the project, and presents the findings, conclusions and recommendations relating to construction and operational noise assessment.

Although this application is not before the Environment Court, this report has been prepared in accordance with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. A copy of the qualifications and experience of the authors is provided with this assessment.

The advice included herein is based on the concept bulk and location plans dated 02/04/2025 prepared by Architectus and design features report – structural dated 03/04/2025 prepared by Holmes. The bulk and location study has informed the acoustic assessment and recommendations outlined in this report.

2.0 Site Location and Project Description

The site and properties to the north and west are on land zoned *Business - Mixed Use* under the Auckland Unitary Plan (AUP). Properties to the southeast and southwest are on land *Residential - Mixed Housing Urban Zone,* with commercial buildings to the east on land zoned *Business - Local Centre*. The site and surrounds are shown in **Figure 1**. **Table 1** below identifies receivers' addresses and relevant comments.

Figure 1 Site Location, AUP Zoning and Surrounding Receivers

Table 1 Identification of Surrounding Receivers

Receiver	Address	Comments
R1	22 Alderman Drive	Two-storey dwelling - Historic Heritage and Special Character overlay
R2	28 Edmonton Road	Multi-storey building at higher ground level
R3	26 Edmonton Road	Single storey dwelling at higher ground level
R4	27 Edmonton Road	Single storey dwelling at lower ground level
R5	23 Edmonton Road	Single storey dwelling
R6	21 Edmonton Road	Single storey dwelling
R7	1/2A and 2/2A Takapu Street	Single storey dwelling at lower ground level
R8	1 Takapu Street	Single storey dwelling at lower ground level
R9	1/15 Edmonton Road	Single storey dwelling at lower ground level
R10	11 Edmonton Road	Two-storey dwelling at higher ground level

The concept bulk and location study features a six-storey building with a large footprint as indicated in **Figure 2** below.

Figure 2 Proposed Landscape Plan

3.0 Performance Standards

3.1 Construction Noise

The total construction duration for the future Justice Facility that is enabled through the proposed designation is expected to exceed 20 weeks. Standard E25.6.27 of the AUP states that noise from construction activities must not exceed the limits in **Table 2** below. The limits apply when measured 1 m from the façade of any building that is occupied during the works which contains an activity sensitive to noise. The AUP defines *"activities sensitive to noise"* as:

> *Any dwelling, visitor accommodation, boarding house, marae, papakāinga, integrated residential development, retirement village, supported residential care, care centres, lecture theatres in tertiary education facilities, classrooms in education facilities and healthcare facilities with an overnight stay facility.*

Table 2 Construction Noise Limits at Activities Sensitive to Noise

Time of Week	Time Period	Long-term duration of Construction work (more than 20 weeks)	
		L_{Aeq}	L_{Amax}
Weekdays	6:30 am – 7:30 am	55	70
	7:30 am – 6:00 pm	70	85
	6:00 pm – 8:00 pm	65	80
	8:00 pm – 6:30 am	40	70
Saturdays	6:30 am – 7:30 am	40	70
	7:30 am – 6:00 pm	70	85
	6:00 pm – 8:00 pm	40	70
	8:00 pm – 6:30 am	40	70
Sundays and public holidays	6:30 am – 7:30 am	40	70
	7:30 am – 6:00 pm	50	80
	6:00 pm – 8:00 pm	40	70
	8:00 pm – 6:30 am	40	70

Construction noise levels for noise affecting any other activity when measured 1m from the façade of any other building that is occupied during the works must not exceed the levels in **Table 3**.

Table 3 Construction noise levels for noise affecting any other activity

Time Period	maximum Noise Levels L_{eq} dBA
7:30 am – 6:00 pm	70
6:00 pm – 7:30 pm	75

AUP Objective E25.2 (4) provides that "Construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects".

In general accordance with the guidance in NZS 6803[1] and the objectives of the AUP, it is common in Auckland to permit higher noise limits during short-term high noise-generating activities such as excavation, piling and compaction, subject to implementation of the best practicable options to control emitted noise levels. This is due to the limited duration of such effects and the limited available options to mitigate associated noise effects from necessary construction activities.

[1] New Zealand Standard NZS 6803:1999 Acoustics – Construction Noise.

3.2 Construction Vibration

AUP Standard E25.6.30 states that construction activities must be controlled to ensure resulting vibration does not exceed:

a) the limits set out in DIN 4150-3 when measured in accordance with that Standard on any structure not on the same site; and

b) the limits in **Table 4** (as transcribed from Table 1 of E25.6.30) in any axis when measured in the corner of the floor of the storey of interest for multi-storey buildings, or within 500 mm of ground level at the foundation of a single storey building.

Table 4 Construction Vibration Human Amenity Limits

Receiver	Period	Peak Particle Velocity Limit [1]
Occupied building containing activity sensitive to noise[2]	Night-time 10:00 pm to 7:00 am	0.3 mm/s
	Daytime 7:00 am to 10:00 pm	2.0 mm/s
Other occupied buildings	At all times	2.0 mm/s

1. In any axis direction.
2. As defined in the AUP.

Standard E25.6.30 also states that works generating vibration for three days or less between the hours of 7:00 am to 6:00 pm may exceed the limits above, but must comply with a limit of 5 mm/s peak particle velocity in any axis when measured at the corner of the floor/level of interest within a multi-storey building, or within 500 mm of ground level at the foundation of a single storey building, where:

- All occupied buildings within 50 m of the extent of the works generating vibration are advised in writing no less than three days prior to the vibration-generating works commencing; and
- The written advice must include details of the location of the works, the duration of the works, a phone number for complaints and the name of the site manager.

3.3 Operational Noise

The following AUP Standards relating to operational noise emissions are relevant considerations for the future development of a Justice Facility on the site, and are expanded in the following subsections:

- E25.6.8 Noise Limits in the *Business* zone.
- E25.6.19 Noise Levels at the *Business* and *Residential* Zone Interface (limits at *Residential* zoned land).

E25.6.8 Noise Limits in the Business Zone

Standard E25.6.8 of the AUP states that noise levels arising from activity within the *Business* zone, measured or assessed as the incident level on the facade of any building on any other site in the *Business* zone must not exceed the limits in **Table 5** below.

Table 5 Noise Limits in the Business – Metropolitan Centre Zone

Time	Noise Level
7:00 am to 11:00 pm	65 dB L_{Aeq}
11:00 pm to 7:00 am	60 dB L_{Aeq} 65 dB L_{eq} at 63 Hz 60 dB L_{eq} at 125 Hz 75 dB L_{AFmax}

Note: The 63Hz and 125Hz octave band limits do not apply to fixed mechanical plant.

E25.6.19 Noise Levels at the Business Zone Interface

Standard E25.6.19 of the AUP states that noise levels arising from activity within the *Business* zone when measured within the boundary of a site in a *Residential* zone (properties to the east and south of the subject site – refer to **Figure 1**) must not exceed the limits in **Table 6** below.

Table 6 Noise Limits in the Surrounding Residential Zones

Time	Noise Level
Monday to Saturday 7:00 am to 10:00 pm	55 dB L_{Aeq}
Sunday 9:00 am to 6:00 pm	
All other times	45 dB L_{Aeq} 60 dB L_{eq} at 63 Hz 55 dB L_{eq} at 125 Hz 75 dB L_{AFmax}

4.0 Construction Assessment

4.1 Proposed Construction Works

Details of the specific construction plan and methodology for the future Justice Facility are not known at this stage and would be submitted as part of the Outline Plan of Works. Notwithstanding, excavation and bored piling activities are envisaged to form part of the future development works. Excavation have been conservatively assumed across the entire site, while piling has been assumed for building foundations.

The bulk and location study indicates the approximate distances from the identified noise and vibration construction activities relative to each identified receiver (**Figure 1**) are provided in **Table 7**. However, the acoustic modelling methodology considers slant distances due to differences in source to receiver heights, therefore, the distances in **Table 7** below should be considered conservative.

The dominant noise source associated with excavation activities (the engine) is typically 5 m away from the excavation work (setback inward), due to the available reach of the boom and arm. Similarly, for piling activities, the noise source has been assumed 3 m setback inward from the pile position. These assumptions have been factored in **Table 7**.

Table 7 Approximate Distance from Receivers to Closest Construction Activities

Receiver	Address	Approximate Distance to Closest Activity (m)		
		Excavation	Bored Piling	CFA Piling
R1	22 Alderman Drive	20	26	24
R2	28 Edmonton Road	40	38	36
R3	26 Edmonton Road	18	18	16
R4	27 Edmonton Road	80	78	76
R5	23 Edmonton Road	53	52	50
R6	21 Edmonton Road	35	37	35
R7	1/2A and 2/2A Takapu Street	31	34	32
R8	1 Takapu Street	61	63	61
R9	1/15 Edmonton Road	33	37	35
R10	11 Edmonton Road	60	65	63

4.2 Construction Noise

Construction Works

The highest noise levels during the construction of the development are expected to be associated with excavation and bored/continuous flight auger (CFA) piling works.

A summary of equipment and reference sound pressure levels has been provided in **Table 8**. These sound pressure levels are based on published data[2] and in-house measurements undertaken across New Zealand, considered representative of the proposed activities.

The noted setback distances to compliance have been calculated following the methodology in standard NZS 6803 and include façade corrections.

Table 8 Plant Items and Typical Noise Emission Levels

Plant Item	Noise level at 10 m, dB L_{Aeq}	Approximate Setback Distances to Compliance (70 dB L_{Aeq}), m	
		No Mitigation	With Screening
Excavator with either bucket or bored piling attachment.	75	25	7
Dedicated piling rig	80	42	11

Please note that the above setback distances *With Screening* are provided for reference and assume temporary acoustically effective screening blocking the line of sight between the affected receivers (typically ground level relative to the noise source) and the plant item.

[2] BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1; Noise

Predicted Noise Levels

Construction noise levels generated by the proposal have been predicted in accordance with NZS 6803 (including façade correction) and the calculation methods detailed in ISO 9613[3] *and ISO 17534*[4].

The following assumptions have been considered in the model:

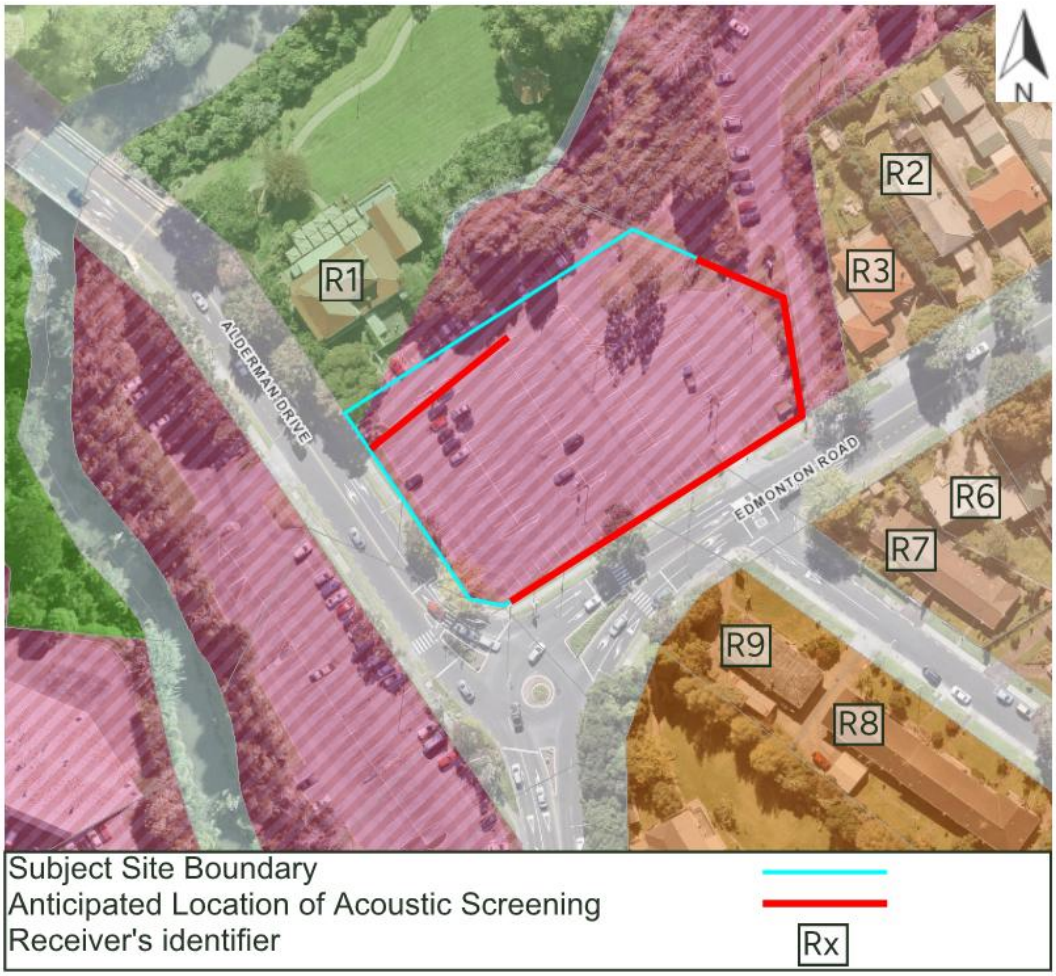
- Maximum sound levels (L_{Amax}) during instant events in the order of 10 to 15 dB higher than those presented in Table 8.
- Relative height of noise sources consistent with the line contours provided by the Auckland Council's GIS database.
- Receivers' relative height consistent with the buildings' terrain level as provided by the Auckland Council's database.
- CFA piling modelled as a 3 m source height.
- Temporary acoustically effective screening at least 2 m high between the immediately neighbouring receivers and construction plant during excavation and piling activities. The anticipated location of acoustic screening is shown in **Figure 3**.

Please note that the acoustic barrier must be fitted with no gaps between panels or planks or between the barrier and the ground. The barrier material must typically at least 7 kg/m^2, such as plywood with a thickness of 12 mm or mass-loaded blanket products attached to a mesh fence/scaffolding.

[3] ISO 9613:1993/1996 Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere. Part 2: General method of calculation.

[4] ISO 17534:2015 Acoustics — Software for the calculation of sound outdoors – Part 1: Quality requirements and quality assurance.

Figure 3 Anticipated locations of acoustic screening



Noise levels from the construction phase of the development can be managed to comply with the relevant limits (70 dB L_{Aeq}) outlined in **Section 3.1** at most surrounding receivers for the majority of the construction period. This is based on the setback distances of receivers to the closest works, the implementation of acoustic screening as described above and the adoption of the Best Practicable Options (BPO) mitigation measures summarised in **Section 4.4** below.

Noise levels of 70 - 75 dB L_{Aeq} (an exceedance of up to 5 dB) are predicted at 22 Alderman Drive, 28, 26 and 21 Edmonton Road, and 2A Takapu Street (R1, R2, R3, R6 and R7 respectively). These are expected to occur intermittently during CFA piling activities over a period of up to two weeks relative to each individual receiver.

Temporary noise levels of 75 - 80 dB L_{Aeq} (an exceedance of up to 10 dB) are predicted to occur at the upper level of 22 Alderman Drive and 28 Edmonton Road (R1 - upper level only and R3 respectively). These are expected to occur intermittently during CFA piling activities. Given that the CFA technique is significantly quicker than other piling methods, this is anticipated for a period of up to three days when works are undertaken in the closest proximity to these receivers, reducing as the works move across the site.

Noise from other construction activities (on the basis that they would be quieter than those discussed above) would be expected to be able to be controlled to generally achieve the AUP typical construction noise limits at surrounding receivers – for most of the construction period noise levels are expected to be significantly lower than the AUP permitted noise limit.

Assessment of Noise Effects

Table 9 below describes the potential effects of construction noise levels. Please note that:

- External noise levels above are predicted 1 m from the façade and include façade corrections.
- Internal noise levels assume closed windows, and typical façade elements (weatherboard/glazing) with a sound reduction of at least 20 dB.
- Effects associated with the above identified exceedances are shown in **bold**.

Table 9 Potential Construction Noise Effects Indoors

Level (dB L_{Aeq})	Location	Potential Effects Indoors
< 45	R8 for most of the construction duration.	Unlikely to interfere with daily residential and commercial activities.
45 - 50	R4, R5, R9 and R10 during the noisiest parts of construction.	May be audible within the building if quiet activities are occurring. Concentration may be affected.
50 - 55	**R1, R2, R6 and R7 – expected to occur intermittently during CFA piling over a period of up to two weeks when works are undertaken at the closest area of these receivers.**	**Annoyance for some occupants. Concentration may be affected but residential and office activities can generally continue. Sound levels for television, radio, and phone conversations would need to be slightly raised.**
55 - 60	**Upper level of R1 and R3 – expected to occur intermittently during CFA piling over a period of up to 3 days when works are undertaken at the closest area of these receivers.**	**Concentration likely to be affected and phone conversations may become difficult. Television, and radio levels would need to be raised. If noise continues for extended periods, people are likely to seek respite by moving to another room.**

The above effects of the predicted construction noise exceedances are considered reasonable and acceptable due to their temporary nature and the adopted BPO mitigation measures and management.

4.3 Construction Vibration

Piling

Bored piling does not typically generate significant levels of vibration. Accordingly, the selection of this method could be considered BPO as the methodology typically generates significantly lower levels of vibration when compared to other piling techniques.

Recent on-site measurements indicate that bored piling can achieve 2 mm/s PPV at distances of up to 1-1.5 m, and at 4 m in the case of CFA piling; noting that these levels should be considered indicative only due to the potential difference in machinery, ground conditions and other variable factors.

As there are no receivers within 4 m of the proposed piling works, compliance with the human amenity and building damage requirements in **Section 3.2** is expected at all receivers.

Other Activities

There is also potential for the generation of intermittent vibration by dropping heavy objects, running over ledges, or impacting unexpected items. It is not feasible to predict how regularly these events may occur, or what levels of vibration may be generated from these individual events, due to their arbitrary nature. They can, however, be readily minimised or avoided through considered management practices.

Vibration is likely to be perceptible during some of the works (vibration can be felt at levels as low as 0.3 mm/s PPV – significantly lower than the cosmetic damage threshold of 5 mm/s PPV). This can give rise to concern related to potential damage even though levels are expected to be beneath the guideline values. These potential effects can be managed by way of providing advice before commencing construction (e.g., via letter drop) to avoid unexpected perceivable vibration giving rise to concern about property damage.

4.4 Management and Mitigation of Construction Noise and Vibration Effects

Standard and routinely employed measures shall be implemented to mitigate noise and vibration effects. Such measures may include the selection of plant which generates less noise, careful maintenance of the plant, controlling ‘on-time’ of the plant and monitoring of noise and vibration levels.

The following site-specific mitigation measures, in combination with advising neighbours prior to commencing works, can be considered BPO and can assist in achieving acceptable construction noise outcomes:

- Boundary acoustically effective screening at least 2 m tall during excavation and piling activities. The anticipated locations of acoustic screening are shown in **Figure 3** above.
- The selection of equipment no larger than necessary to undertake the works.
- Advise the immediate neighbours in writing, no less than three (3) days prior to earthworks and piling commencing. The written advice should include details of the location of the works, the duration of the works, a phone number for complaints and the name of the site manager.
- Where practicable, scheduling of works closest to the neighbouring properties to avoid periods where the buildings are occupied.

It is recommended that the mitigation and management measures are set out and implemented through a Construction Noise and Vibration Management Plan (CNVMP).

4.5 Operational Noise Assessment

Noise from the operation of the facility is envisaged to involved vehicle movements and mechanical plant serving the facility. It is understood that the Justice Facility will operate during daytime hours during weekdays. With List Courts also being held from 9am to 1pm on Saturdays.

Vehicle Movements

[redacted]

[redacted]

Given the limited parking spaces and anticipated vehicle movements and considering that the indicative parking areas based on the bulk and location study are generally enclosed, noise generated during the operational phase of the facility is expected to comply with standards E25.6.8 and E25.6.19 of the AUP. Furthermore, noise from vehicle movements is anticipated to be negligible and immaterial compared to the existing traffic noise from Edmonton Road and Alderman Drive.

Heating, ventilation, and air conditioning (HVAC)

At the time of writing, the specific plant items and locations are not known and will be submitted as part of the Outline Plan of Works. However:

- HVAC plant of the type and size expected to be used at the Justice Facility can be readily controlled using standard mitigation measures (noise reduction screening, in-duct attenuators, careful plant selection and positioning, etc.) to meet the established criteria.
- It is recommended that a comprehensive acoustic review be undertaken as part of the building consent/detailed design process when the HVAC plant selection, location and design has been finalised to ensure compliance with the requirements in **Table 5** and **Table 6**, which are considered appropriate noise limits.

5.0 Recommended Conditions

The following conditions are recommended (if considered necessary) to provide suitable control of noise and vibration levels.

1. The Requiring Authority shall prepare and implement a Construction Noise and Vibration Management Plan (CNVMP) with reference to Annex E of *NZS 6803:1999 Acoustics – Construction Noise*. The CNVMP shall be provided to Auckland Council at least 10 days prior to construction commencing and shall include as a minimum:
    a. Applicable site noise and vibration criteria;
    b. Programme of works and hours of operation;
    c. Identification of surrounding noise and/or vibration sensitive receivers;
    d. Details of the specific management and mitigation measures required to comply with the relevant noise and vibration criteria, including but not limited to acoustic screening;
    e. The requirement to provide written communication to occupants of all immediately neighbouring buildings prior to the commencement of activities on site. The written advice shall set out:
        - a brief overview of the construction works;
        - the working hours and expected duration;
        - all mitigation measures to be implemented;
        - the procedure for recording concerns/complaints regarding noise and vibration;
        - the procedure for noise and vibration monitoring where concerns are raised by receivers; and
        - contact details for site personnel for any concerns regarding noise and vibration.
2. Noise arising from construction activity on-site shall not exceed the following limits when measured or assessed at any occupied building on any other site, where affected party approval has not been obtained:

    26 and 21 Edmonton Road, and 1/2A and 2/2A Takapu Street

    Up to 75 dB L_{Aeq} during piling.

    Noise limits in Standard E25.6.27 at all other times.

    22 Alderman Drive and 28 Edmonton Road

    Up to 80 dB L_{Aeq} during piling.

    Noise limits in Standard E25.6.27 at all other times.

    All other properties

    Noise limits in Standard E25.6.27 at all times.
3. Vibration from construction activities shall meet the requirements set out in DIN 4150-3 and **Table 4**.
4. Within 2 months of the operation of the Waitākere District Courthouse/Project, a statement from a suitably qualified acoustic professional shall be provided that certifies all fixed mechanical plant and equipment within the Justice Facility will achieve compliance with the following operational noise standards:

- Noise levels when measured within the boundary of any residential zoned site:

Time	Noise Level
Monday to Saturday 7:00 am to 10:00 pm	55 dB L_{Aeq}
Sunday 9:00 am to 6:00 pm	
All other times	45 dB L_{Aeq} 60 dB L_{eq} at 63 Hz 55 dB L_{eq} at 125 Hz 75 dB L_{AFmax}

- Noise levels when measured or assessed as the as the incident level on the façade of any building in the Business – Metropolitan Centre Zone:

Time	Noise Level
7:00 am to 11:00 pm	65 dB L_{Aeq}
11:00 pm to 7:00 am	60 dB L_{Aeq} 65 dB L_{eq} at 63 Hz 60 dB L_{eq} at 125 Hz 75 dB L_{AFmax}

6.0 Conclusion

SLR has assessed construction noise and vibration associated with the concept bulk and location study provided to support the Notice of Requirement application for a Justice Facility at 14 Edmonton Road in Henderson, Auckland with regard to the Auckland Unitary Plan requirements. The findings of the assessment are summarised as follows:

1. With BPO mitigation measures in place, noise limits in **Table 2** above may be temporarily exceeded by up to 5 dB at 22 Alderman Drive, 28, 26 and 21 Edmonton Road, and 1/2A and 2/2A Takapu Street (R1, R2, R3, R6 and R7 respectively) intermittently over a period of up to two weeks during piling activities. Internal noise levels may cause annoyance for some occupants. Concentration may be affected but residential and office activities can generally continue.
2. Noise limits in **Table 2** may be temporarily exceeded by up to 10 dB at the upper level of 22 Alderman Drive and 28 Edmonton Road (R1 and R3 respectively) during CFA piling activities. This is expected over a period of up three days relative to each receiver. Concentration is likely to be affected and phone conversations may become difficult. Television, and radio levels would need to be raised. If noise continues for extended periods, people are likely to seek respite by moving to another room.
3. Human amenity limits in **Table 4** relating to construction vibration levels is expected to be complied with at all neighbouring properties.
4. Following the implementation of mitigation and management measures summarised in **Section 4.4**, and noting the short time frame of the predicted exceedances, noise and vibration effects associated with the construction works would be considered acceptable and reasonable.
5. Operational activities associated with the development are expected to comply with the noise limits in **Section 3.3** above at surrounding receivers and are considered appropriate for the site and activity.
6. Recommended conditions related to noise and vibration have been included in **Section 5.0**.

SLR Consulting New Zealand

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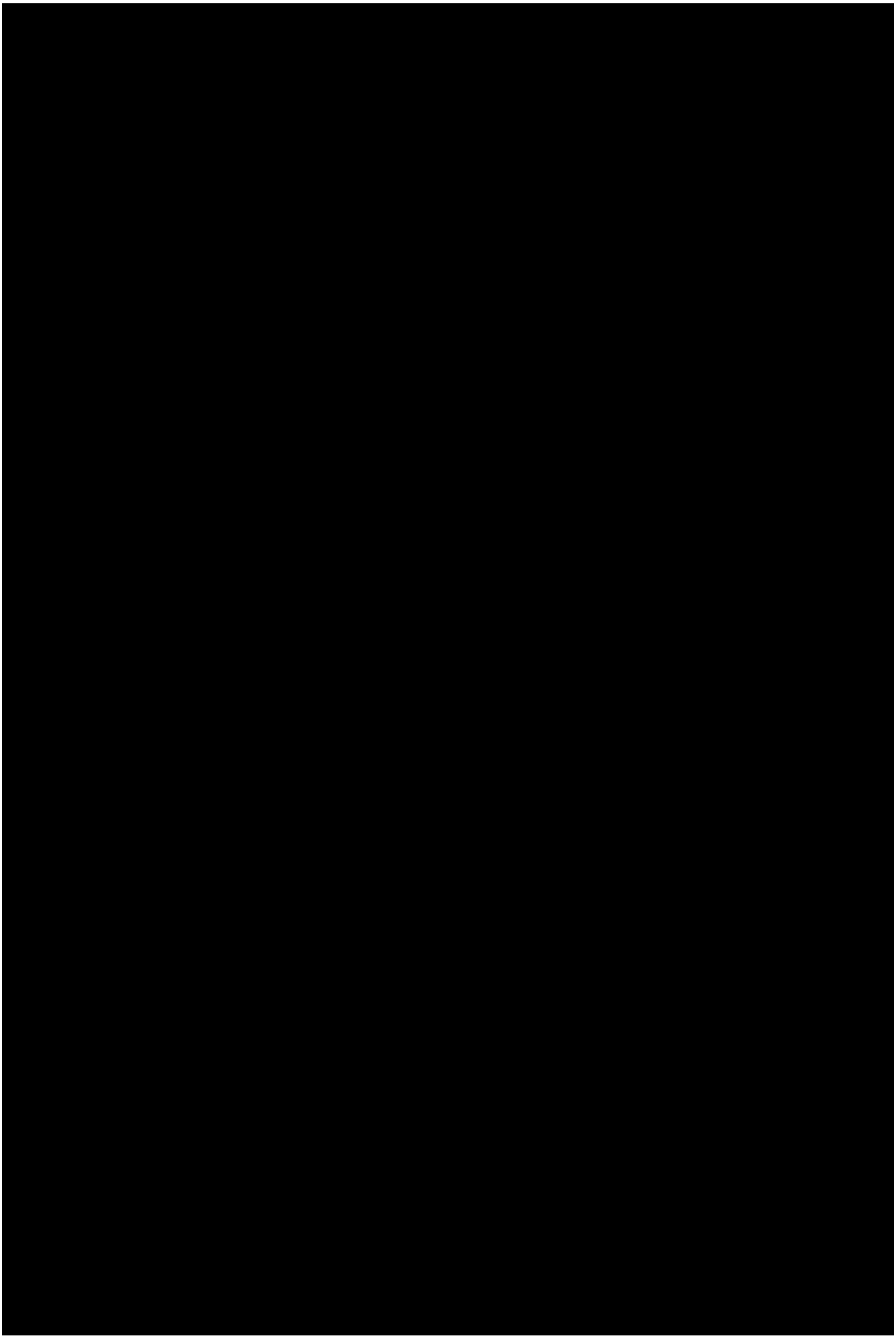

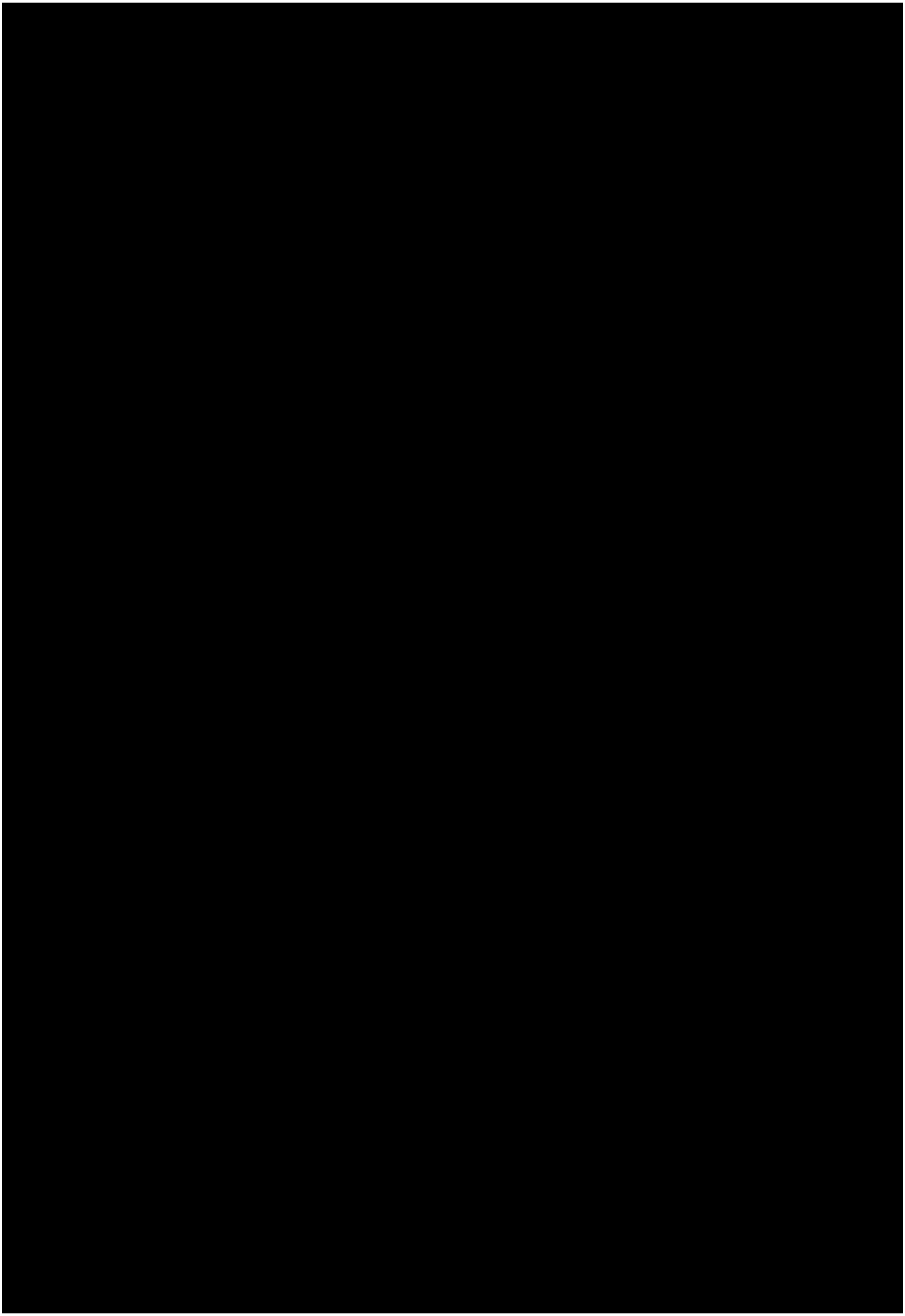

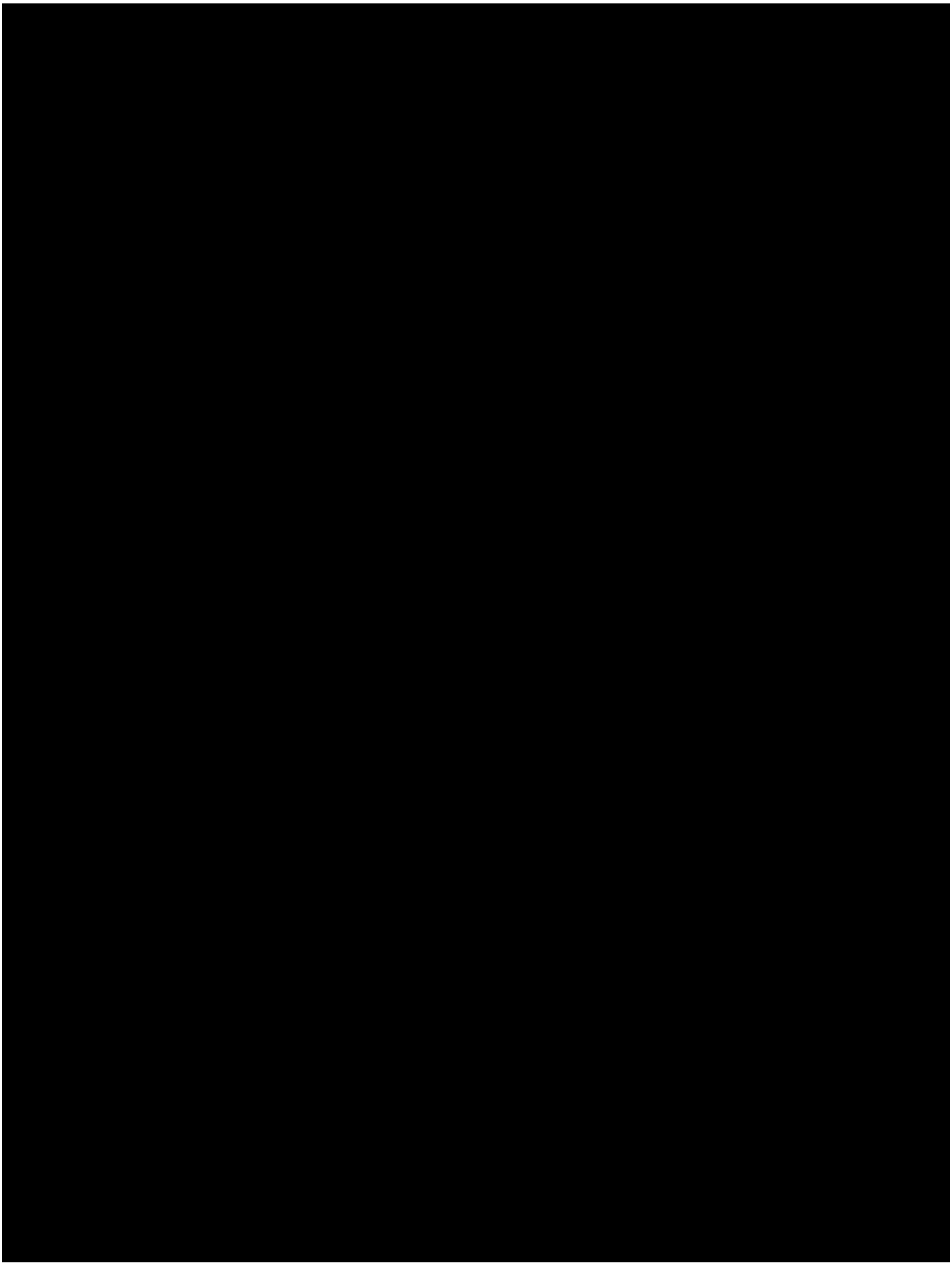

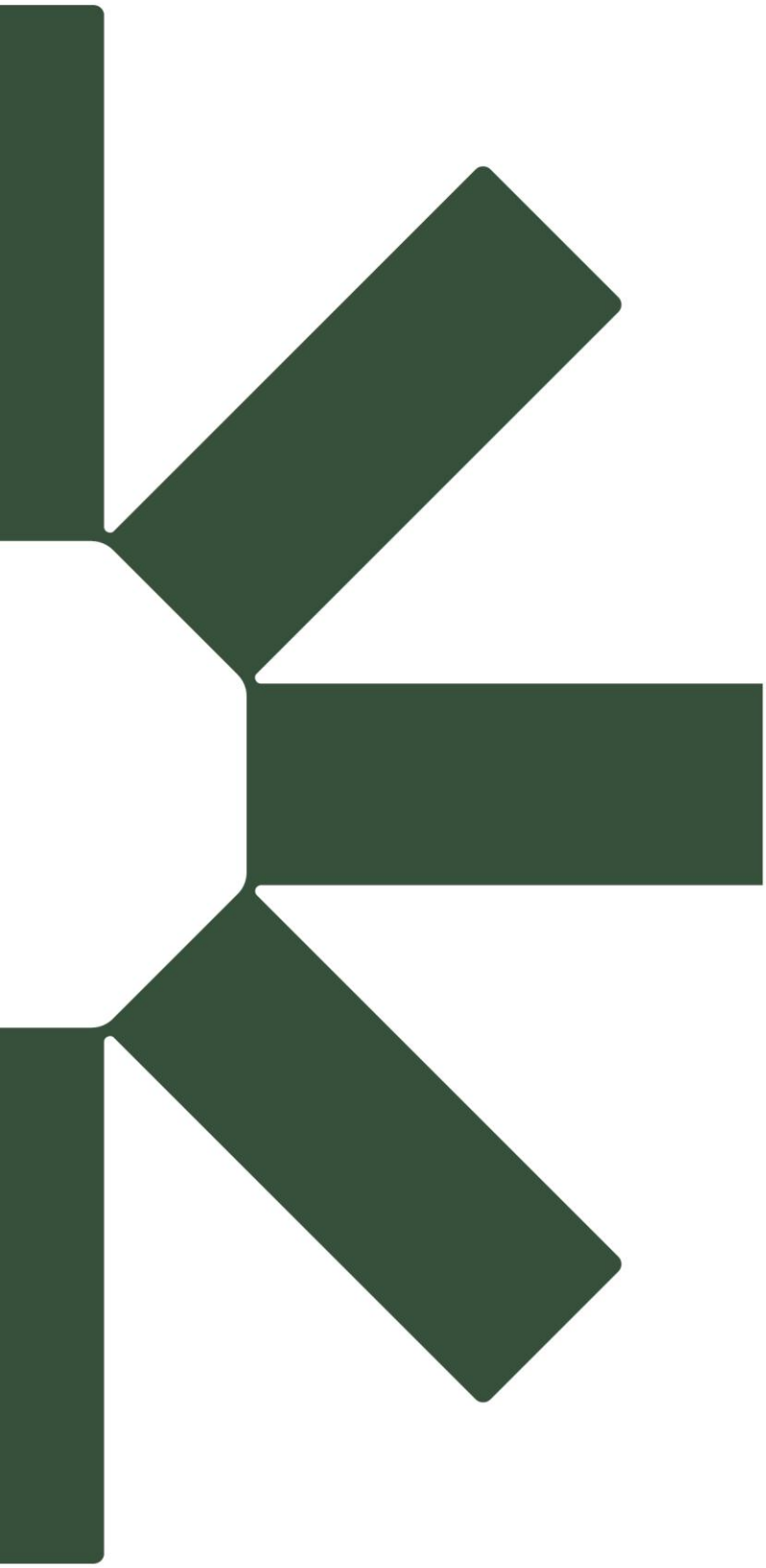

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