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Memorandum

To	Roger Kennard [redacted]	Accent Superannuation and Neighbours	
From	Anthony Kielniacz	**Date**	16 Nov 2021
Subject	Vibration Trial Report Gindurra Rd and Debenham Rd South Somersby NSW	**Project No.** **Doc. No.**	210882.00 210882.00.R.001.Rev0

Vibration Trial
Gindurra Rd and Debenham Rd South

1. Introduction

A building that will eventually house a concrete crushing plant has recently been constructed at the above site. Vibration during construction allegedly caused considerable discomfort to at least one of the local residents. Concern about the log-term effects of running the crusher continuously has led to action by residents, including a trial to quantify vibration transmissibility across the neighbouring properties.

This report presents the results of a vibration trial carried out by Douglas Partners (DP) at the above site on 13 November 2021. The trial related to testing the transmission of ground-borne vibration generated at five locations and measured at six locations at various distances across neighbouring properties up to 470 m from the source, see Figure 1.

A smooth-drum vibratory roller (STA VV1500 D, operating weight 15.5 t) was used to generate short durations of vibration over periods of a few minutes at each location. A reference monitor was placed nearby to ensure the start and end timings were accurately captured by all the time-synchronised monitors. Texcel construction monitors were used and configured for both continuous monitoring (recording the maximum within contiguous 5 minute moving windows) and for triggered events, producing a 2 second record of the received waveform.

The aim of the trial was to establish the relationship between vibration levels near the source and the rate of attenuation over long distances at various locations in the vicinity of the waste recycling (concrete crushing) plant, refer Figure 1.

The trial results may be used to predict vibration levels at other locations within the area of influence and the rate of attenuation and distribution of vibration levels obtained over long distances may be used to infer depth, strength (degree of weathering, joint spacing, etc.) and continuity of the subsurface rock.

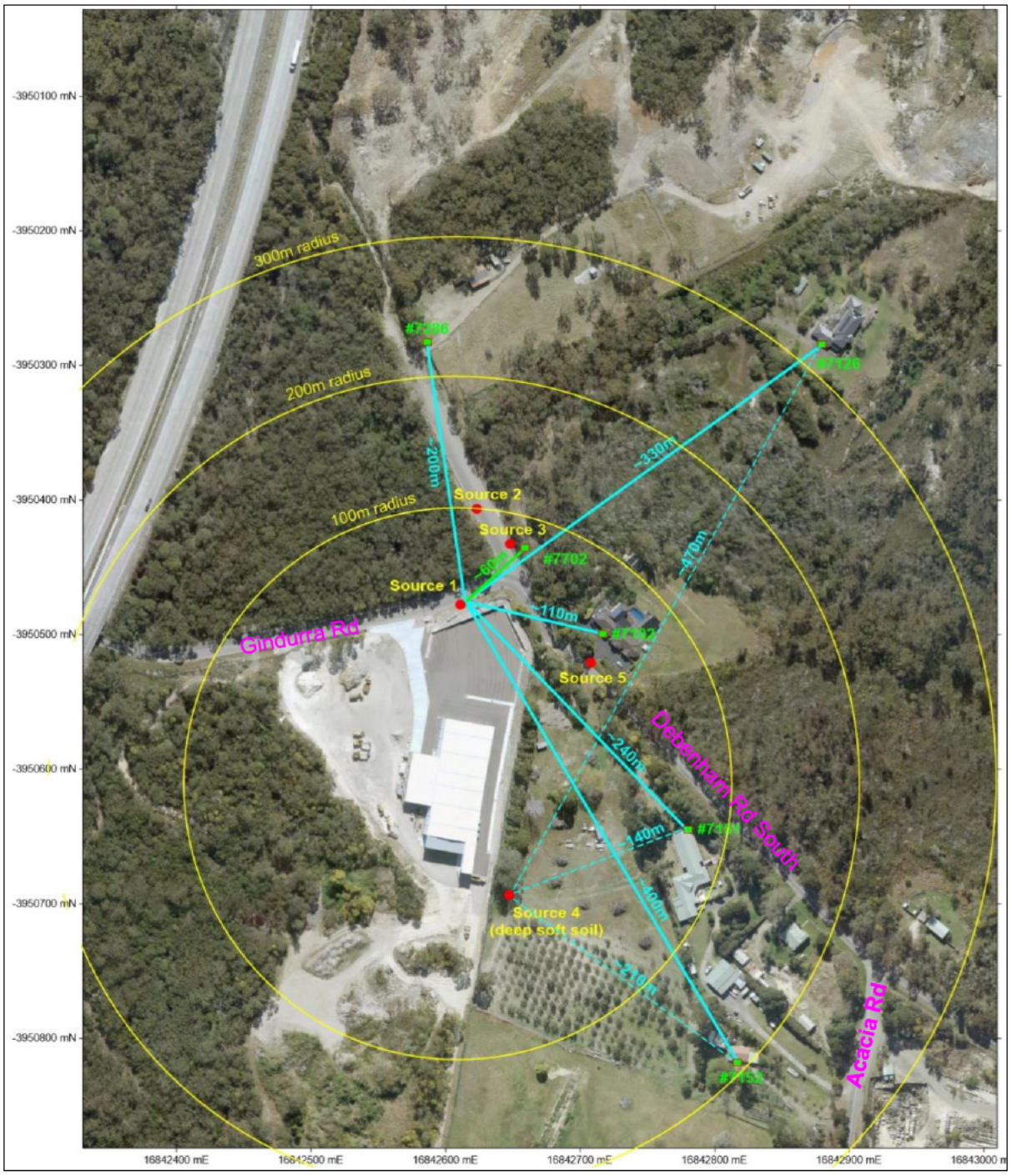

Figure 1. Trial layout showing geometry of distribution of vibration-source locations and distances to monitors, including at the nearest residences.

2. Vibration Trial Results

Maximum vibration levels recorded during the trial are graphed below. Background vibration levels (in the absence of road traffic and commercial activity) were 0.06 mm/s - 0.08 mm/s. Maximum vibration levels during the trial were ~9 mm/s VSPPV (vector sum peak particle velocity).

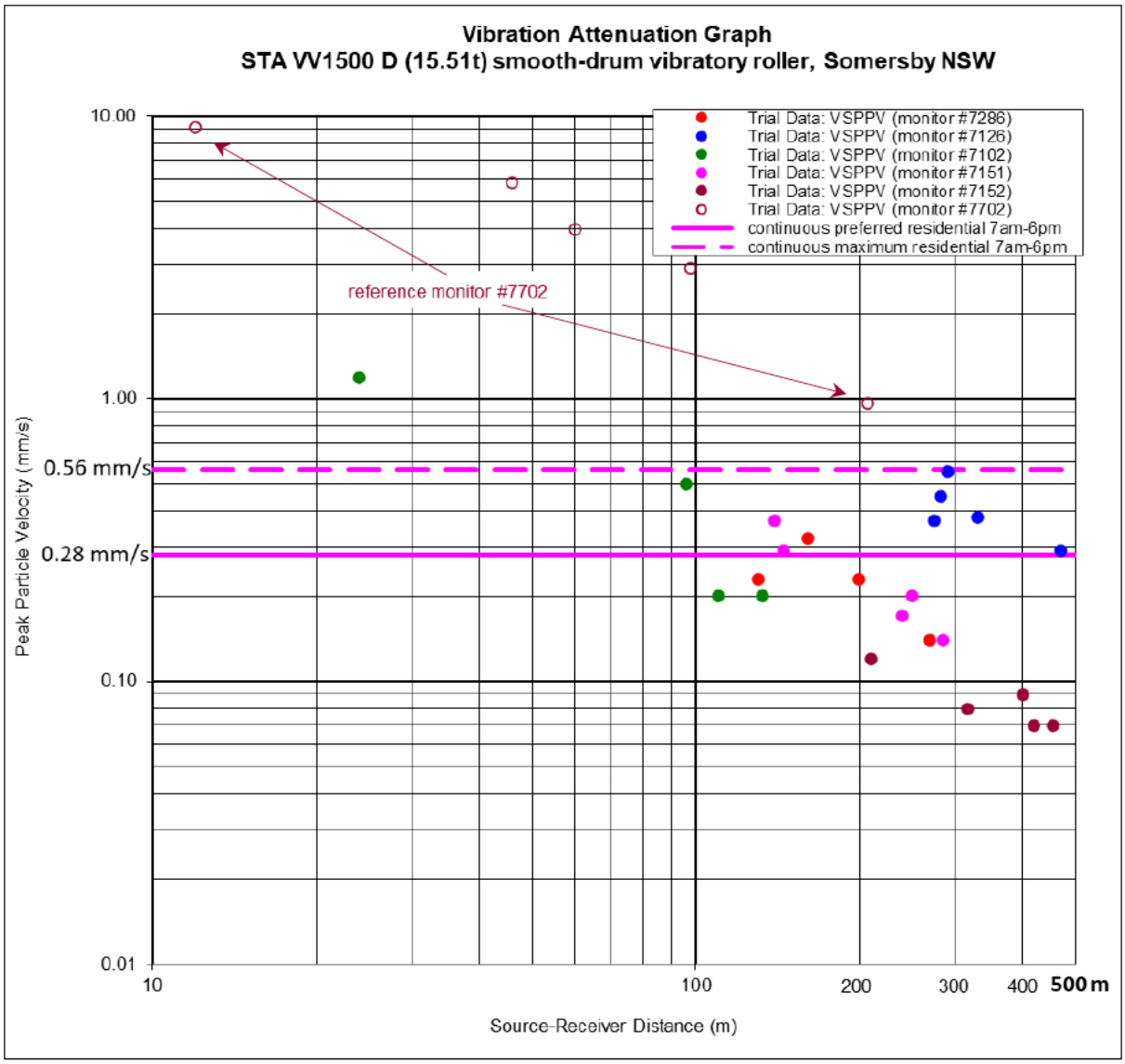

Figure 2. Graph of results between distances from 24 m to 470 m from various source locations in various directions, showing the "preferred" level (solid magenta line) and the "maximum" level (dashed magenta line) Standard AS 2670.2 whole body vibration - continuous vibrations, residential, 7am - 6pm) and NSW-EPA DECC Assessing Vibration: A Technical Guideline, Feb 2006.

An Allowed Limit of 15 mm/s VSPPV for the trial was set with respect to structural integrity of the residences. Sensors were coupled to the concrete slabs at the foundation level of residences or to the ground with a surcharge. The roller was run for short durations over short distances in vibratory (dynamic) mode. Frequencies of vibration ranged approximately 30 Hz to 60 Hz, see attached sample waveforms plots.

3. Summary and Comment

A graph of results is shown in Figure 2, which is a compilation of all source locations, distances and directions with respect to receptors, summarised as follows:

- 260 Debenham Rd South max 0.32 mm/s (160 m), 0.23 mm/s (200 m), 0.14 mm/s (270 m)
- 252 Debenham Rd South max 0.55 mm/s (290 m), 0.45 mm/s (283 m), 0.29 mm/s (470 m)
- 242 Debenham Rd South max 1.19 mm/s (24 m), 0.50 mm/s (96 m), 0.20 mm/s (133 m)
- 10 Acacia Rd max 0.37 mm/s (140 m), 0.20 mm/s (250 m), 0.14 mm/s (285 m)
- 12 Acacia Rd (soft soil) max 0.12 mm/s (210 m)

Results show minimal attenuation over long distances from the source in both north - south and east - west directions, indicative of competent and shallow rock, which can be observed as an exposed sandstone wall at the front of 242 Debenham Rd South. This has the potential to transmit even low-level vibration from the waste recycling (rock crushing) plant over a few hundred metres, which would be noticeable in terms of human comfort. If ground-borne nuisance vibration is ongoing and persistent then even very low levels may be disruptive as individual tolerance levels vary.

Vibrations categorised as *continuous* are described in NSW-EPA DECC Assessing Vibration: A Technical Guideline, Feb 2006 (Appendix C, Table C1.1) with “preferred” and “maximum” levels (shown in Figure 2) being 0.28 mm/s and 0.56 mm/s PPVi respectively.

Vibrations categorised as *intermittent* (short bursts of continuous vibration, before development of harmonics and typical of construction vibrations) are also described in the same document, which refers to AS 2670.2 Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration, Part 2: Vibration in buildings (1 Hz to 80 Hz), which was derived from BS 6472.

Intermittent vibrations are quantified in terms of an estimated Vibration Dose Value (eVDV), which is a compilation of the sum of all amplitudes and frequencies of vibration over a set period of time, usually 1 day and is expressed in term of acceleration (mm/s^2), which can be estimated from velocity if not measured directly. Depending on the equipment that will be running in the crushing plant, either *continuous* or (almost certainly) *intermittent* vibration calculations / measurements will be relevant.

The construction of the crusher plant building included excavation to ~3 m below ground level (adjacent the intersection of Gindurra Rd and Debenham Rd South) which would have exposed more vibration-transmissible ground which means less damping effect than for the vibration source used for the trial.

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Reviewed by

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Attachments: Graph of Vibration Levels, Trial Location Plan, Sample Waveform Plots
About This Report

Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for Accent Superannuation and Neighbours. The report is provided for the exclusive use of Accent Superannuation and Neighbours for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the vibration levels at the sensor location(s) only and only during the specified period of monitoring. Vibration levels in other locations may therefore differ from those reported herein.

As neither estimations of safe operating distances for vibrations (if provided) nor the presence of an unattended vibration monitor can prevent exceedances, the real-time management of vibration remains the responsibility of Accent Superannuation and Neighbours and its plant operators. Interference with (e.g., movement or damage to) the monitoring equipment may influence readings and Accent Superannuation and Neighbours is responsible for advising DP immediately to assess whether readings are affected, re-installation and / or repair is required.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.