



Forth Replacement Crossing

**Employer's Delivery Team
Construction Vibration Monitoring Report**

**M9 Junction 1a Contract
(May & June 2012)**



An agency of  The Scottish Government



FORTH REPLACEMENT CROSSING

**EMPLOYER'S DELIVERY TEAM
CONSTRUCTION VIBRATION MONITORING REPORT**

**M9 JUNCTION 1A CONTRACT
(MAY & JUNE 2012)**

Revision Status

Revision	Date	Description	Author	Approved for Use
0	August 2012	Original	DGC	AMM

FORTH REPLACEMENT CROSSING

**EMPLOYER'S DELIVERY TEAM
CONSTRUCTION VIBRATION MONITORING REPORT**

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1. INTRODUCTION

1.1 This report sets out the results of the construction vibration monitoring undertaken on the M9 Junction 1a Contract in May 2012 and June 2012 as part of the Forth Replacement Crossing project.

2. M9 J1A CONTRACT VIBRATION MONITORING

VIBRATION MONITORING LOCATIONS

2.1 Continuous vibration monitoring was carried out at fixed monitor locations in May 2012 and June 2012 as outlined in Tables 2.1a and 2.1b below. The main construction activities carried out adjacent to the monitor locations are also listed.

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	May 2012	<ul style="list-style-type: none"> • Excavation north and south of M9 • Installation of drainage • M9 earthworks close to Gateside • M9 pavement works • Structural concrete pours • Piling works
15-17 Buie Rigg (CNV07)	May 2012	<ul style="list-style-type: none"> • Earthworks close to Kirklands Park • Drainage works • Piling works • Structural concrete pours • Swine Burn culvert
8 Kirklands Park Grove (CNV16)	May 2012	<ul style="list-style-type: none"> • Earthworks • Piling works • Traffic management on M9 Spur • Construction of temporary ramps to M9 Spur

Table 2.1a Long Term Monitoring Locations - May

Monitoring Location	Monitoring Period	Main Construction Activities
93/95 King Edwards Way (CNV02)	June 2012	<ul style="list-style-type: none"> • Excavation north and south of M9 • Installation of drainage • M9 earthworks close to Gateside • M9 pavement works • Structural concrete pours • Piling works
15-17 Buie Rigg (CNV07)	June 2012	<ul style="list-style-type: none"> • Earthworks close to Kirklands Park • Drainage works • Piling works • Structural concrete pours • Swine Burn culvert
8 Kirklands Park Grove (CNV16)	June 2012	<ul style="list-style-type: none"> • Earthworks close to Kirklands Park • Utilities works

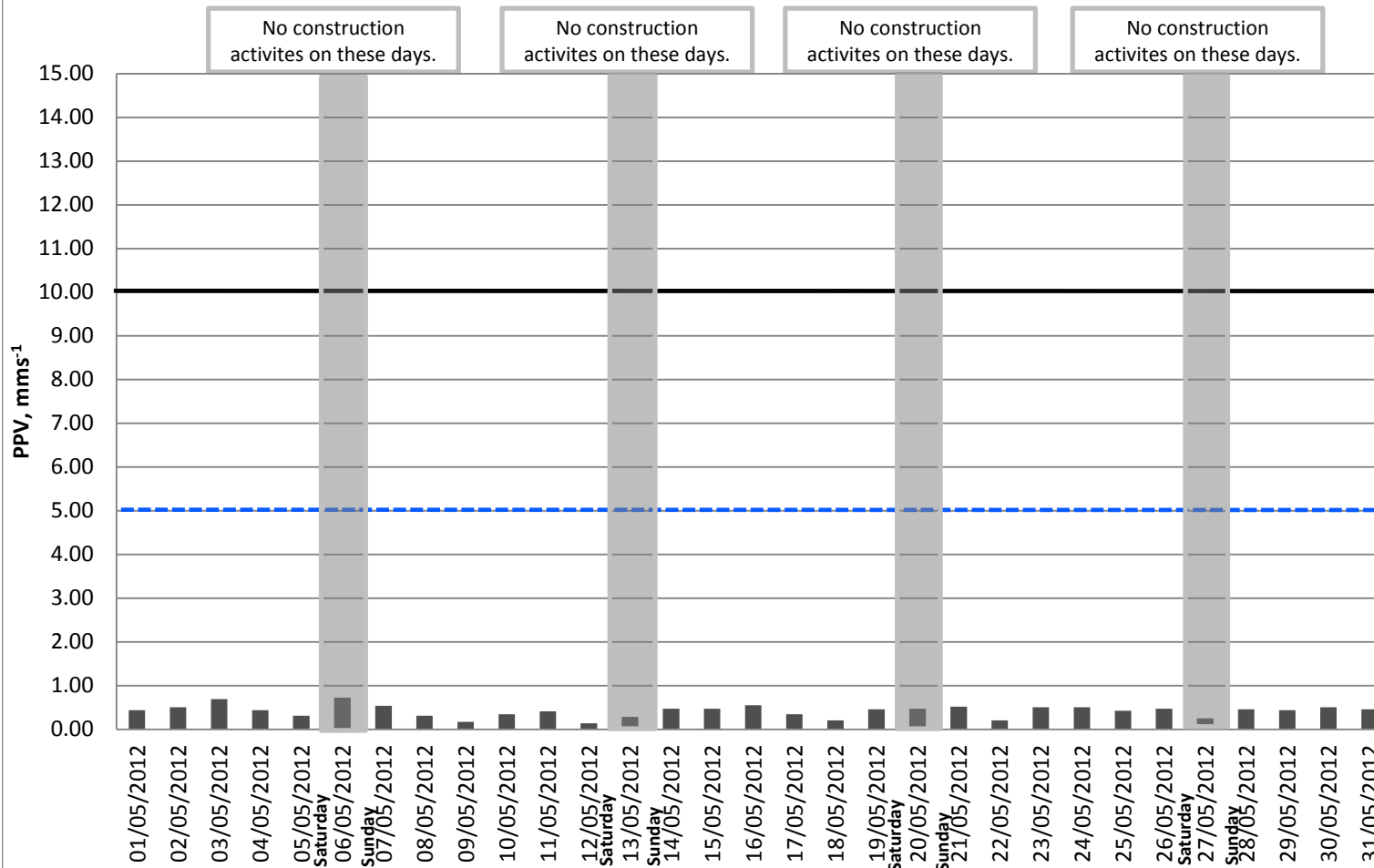
Table 2.1b Long Term Monitoring Locations – June

VIBRATION MONITORING RESULTS

- 2.2 The results of the M9 J1a Contract construction vibration monitoring are provided in chart format in Appendix A of this report.
- 2.3 The charts show the Vibration Dose Values (VDV) and Peak Particle Velocities (PPV) recorded at receptors. VDV levels are recorded in order to monitor the potential for disturbance to the occupants of buildings (as discussed in BS 6472) and PPV values are recorded in order to monitor the potential for damage to buildings (as discussed in BS 7385).
- 2.4 The charts indicate that all construction activities in the period were carried out in accordance with the vibration thresholds set out in the project Code of Construction Practice.
- 2.5 Two exceedances of the VDV threshold were recorded at King Edwards Way and Kirklands Park Grove on 02/06/2012 and 17/06/2012 respectively. However, these exceedances occurred during the night when no activities were being carried out on site and are therefore not attributed to construction works.

**APPENDIX A - M9 J1A CONTRACT CONSTRUCTION VIBRATION
CHARTS**

**Measured highest daily Peak Particle Velocity (PPV),
93/95 King Edwards Way (CNV02)
Measurement period 1st May 2012 to 31st May 2012**



Construction PPV Thresholds

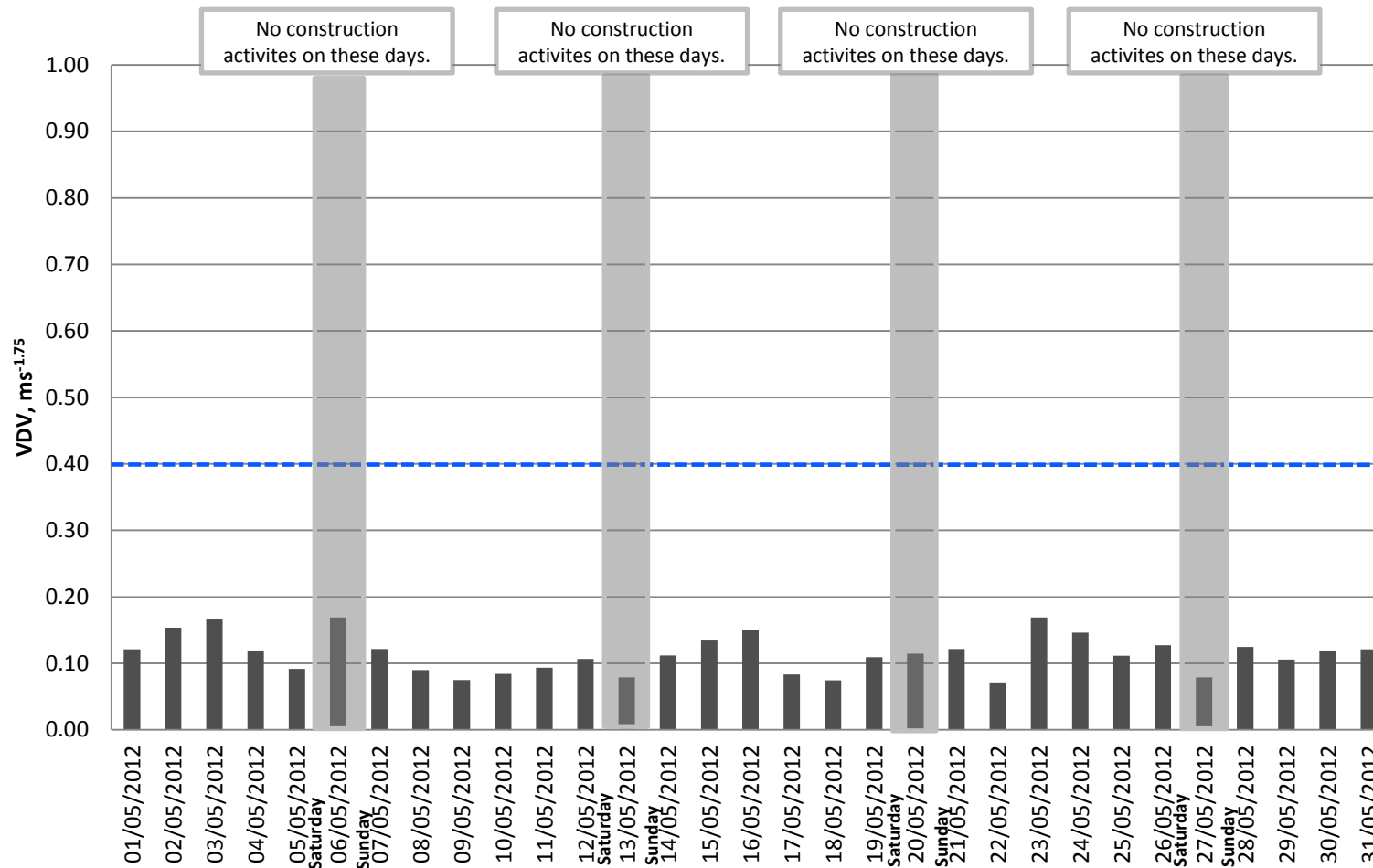
- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

Measured VDV

- Daily highest PPV (z-axis) (n) = Investigation Report Number (represented by grey bars)

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
93/95 King Edwards Way (CNV02)
Measurement period 1st May 2012 to 31st May 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

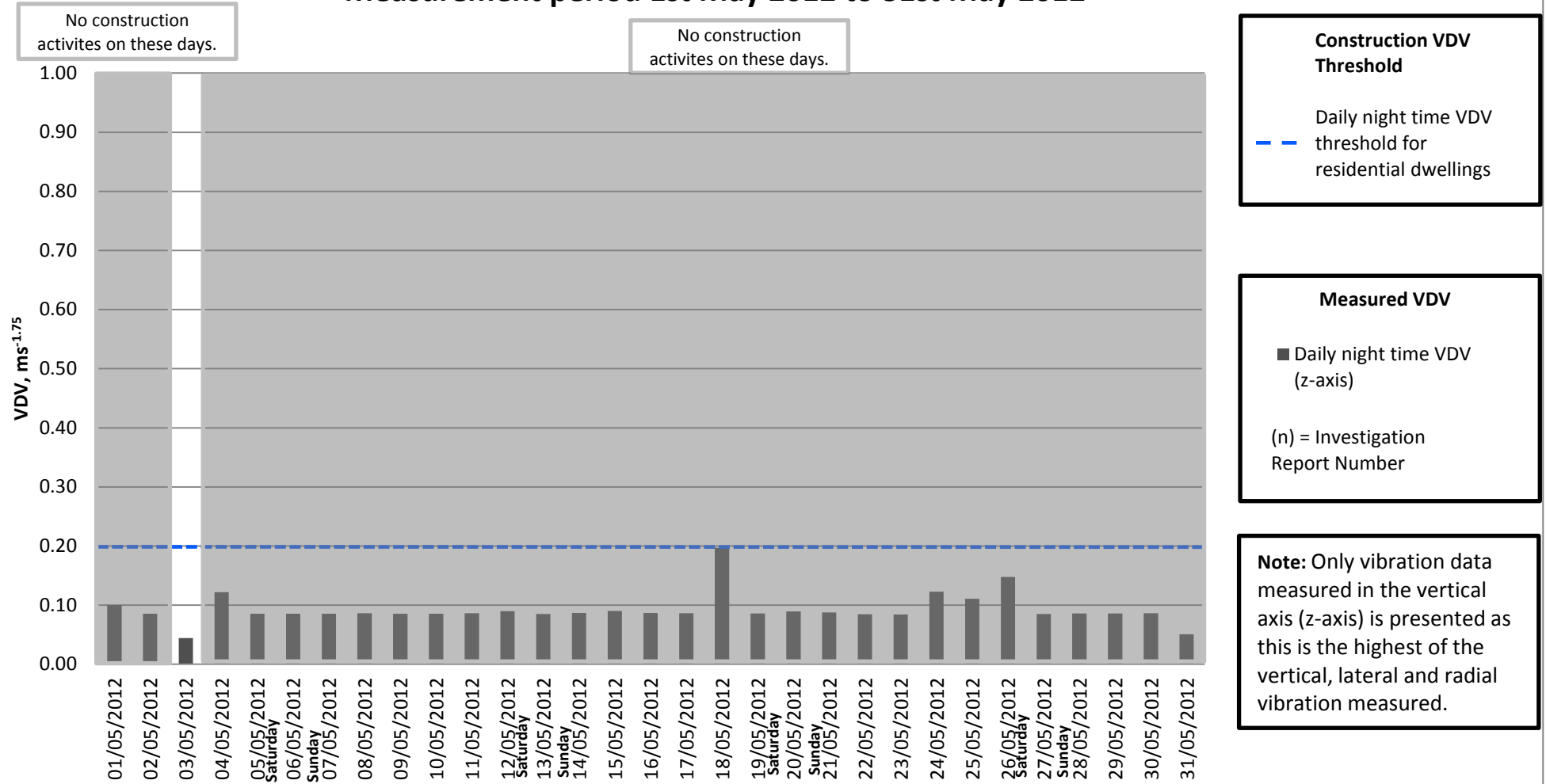
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

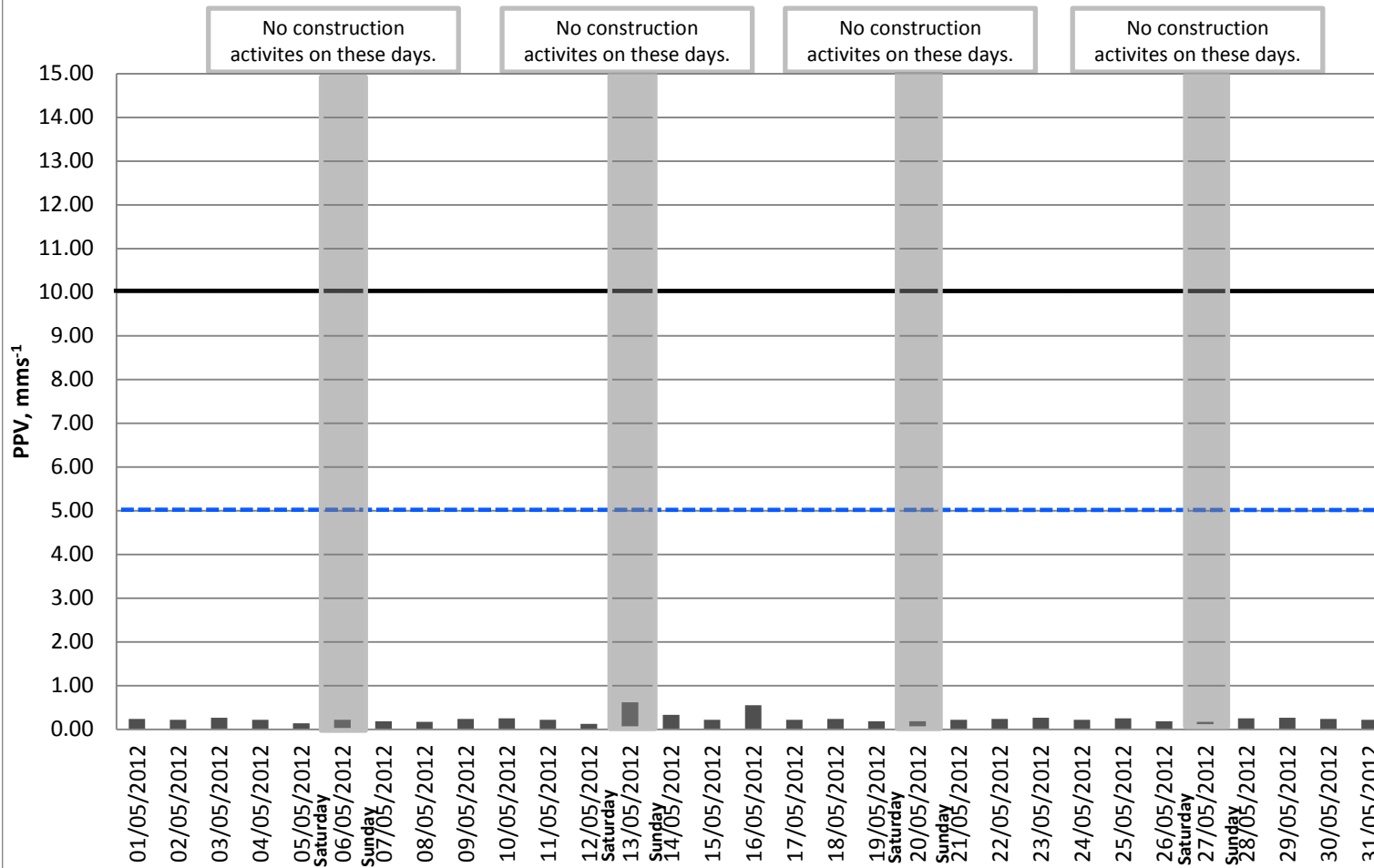
Measured night time (23:00-07:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02) Measurement period 1st May 2012 to 31st May 2012



VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

**Measured highest daily Peak Particle Velocity (PPV),
15-17 Buie Rigg (CNV07)
Measurement period 1st May 2012 to 31st May 2012**



Construction PPV Thresholds

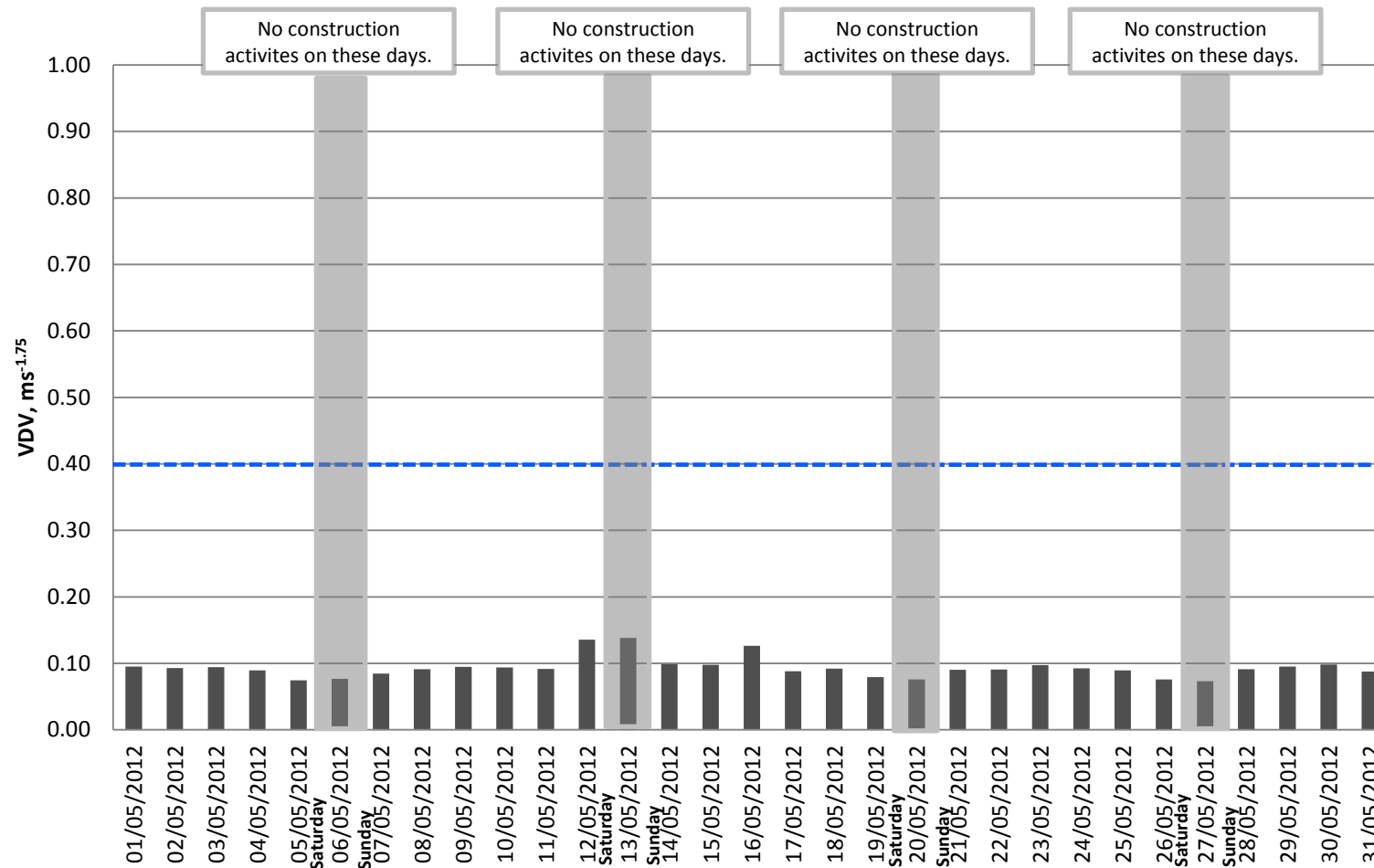
- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

Measured VDV

- Daily highest PPV (z-axis) (black bar)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07) Measurement period 1st May 2012 to 31st May 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

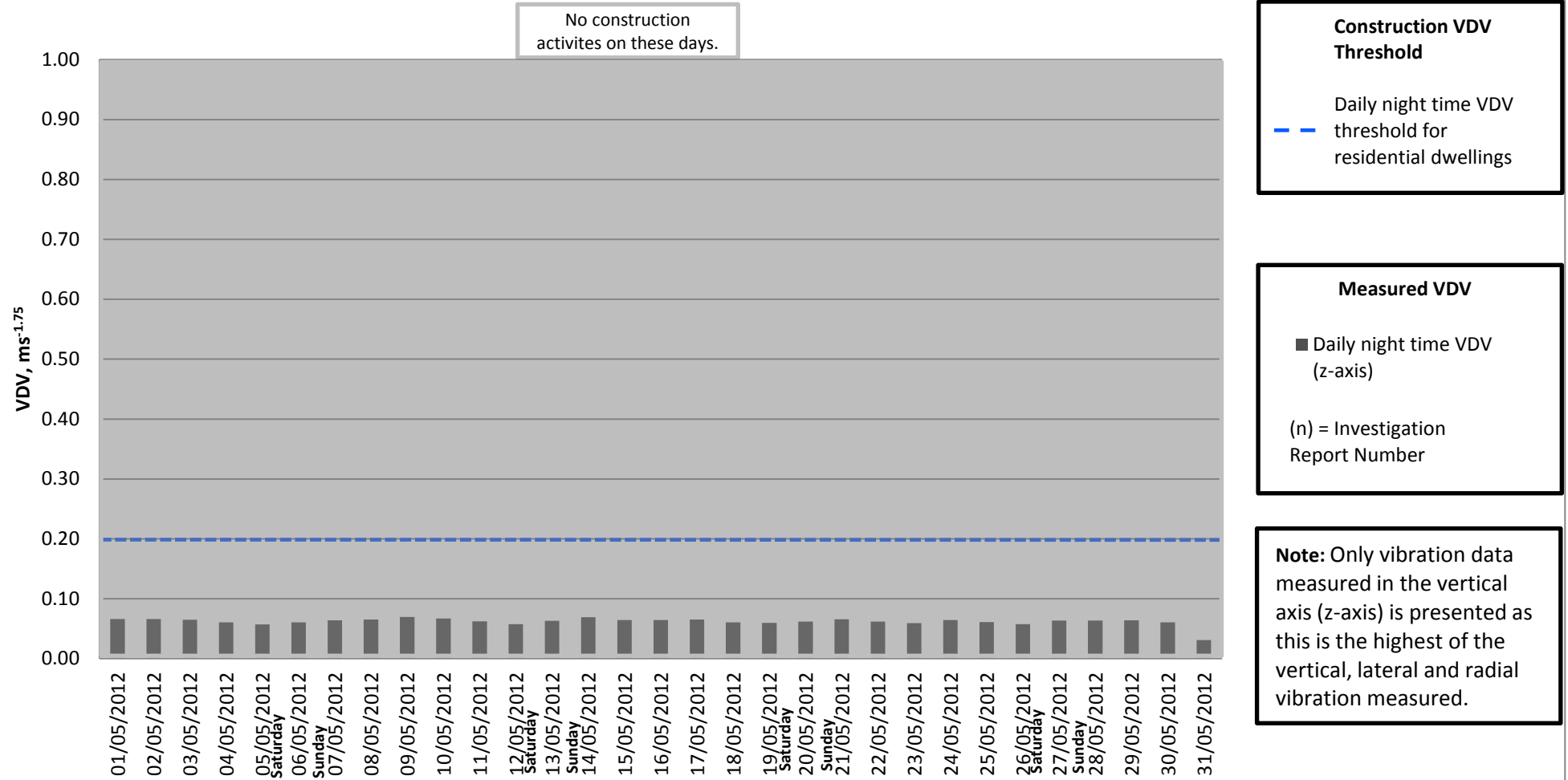
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07) Measurement period 1st May 2012 to 31st May 2012



Construction VDV Threshold

Daily night time VDV threshold for residential dwellings

Measured VDV

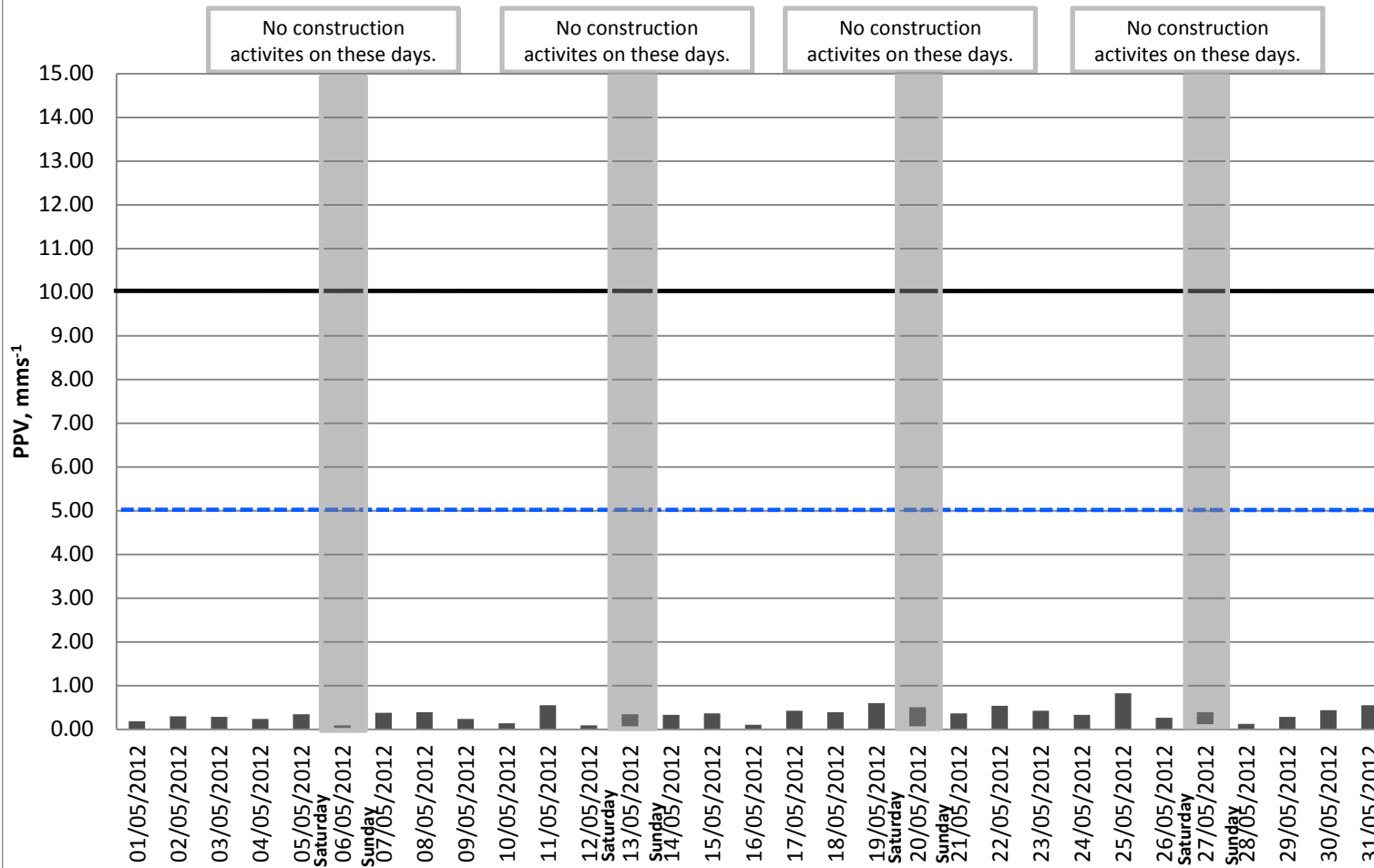
■ Daily night time VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

**Measured highest daily Peak Particle Velocity (PPV),
8 Kirklands Park Grove (CNV16)
Measurement period 1st May 2012 to 31st May 2012**



Construction PPV Thresholds

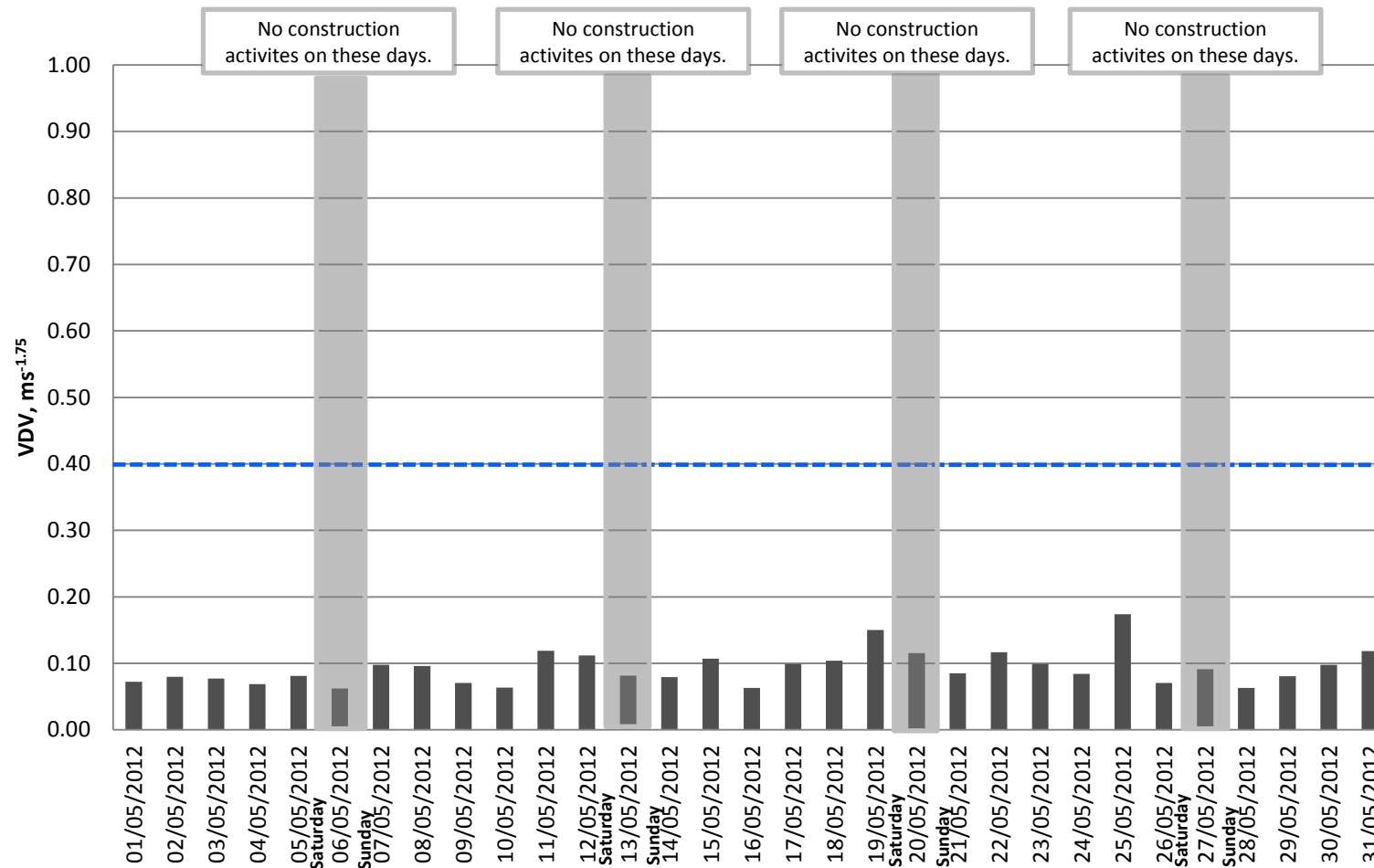
- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

Measured VDV

- Daily highest PPV (z-axis) (n) = Investigation Report Number (represented by grey bars)

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st May 2012 to 31st May 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

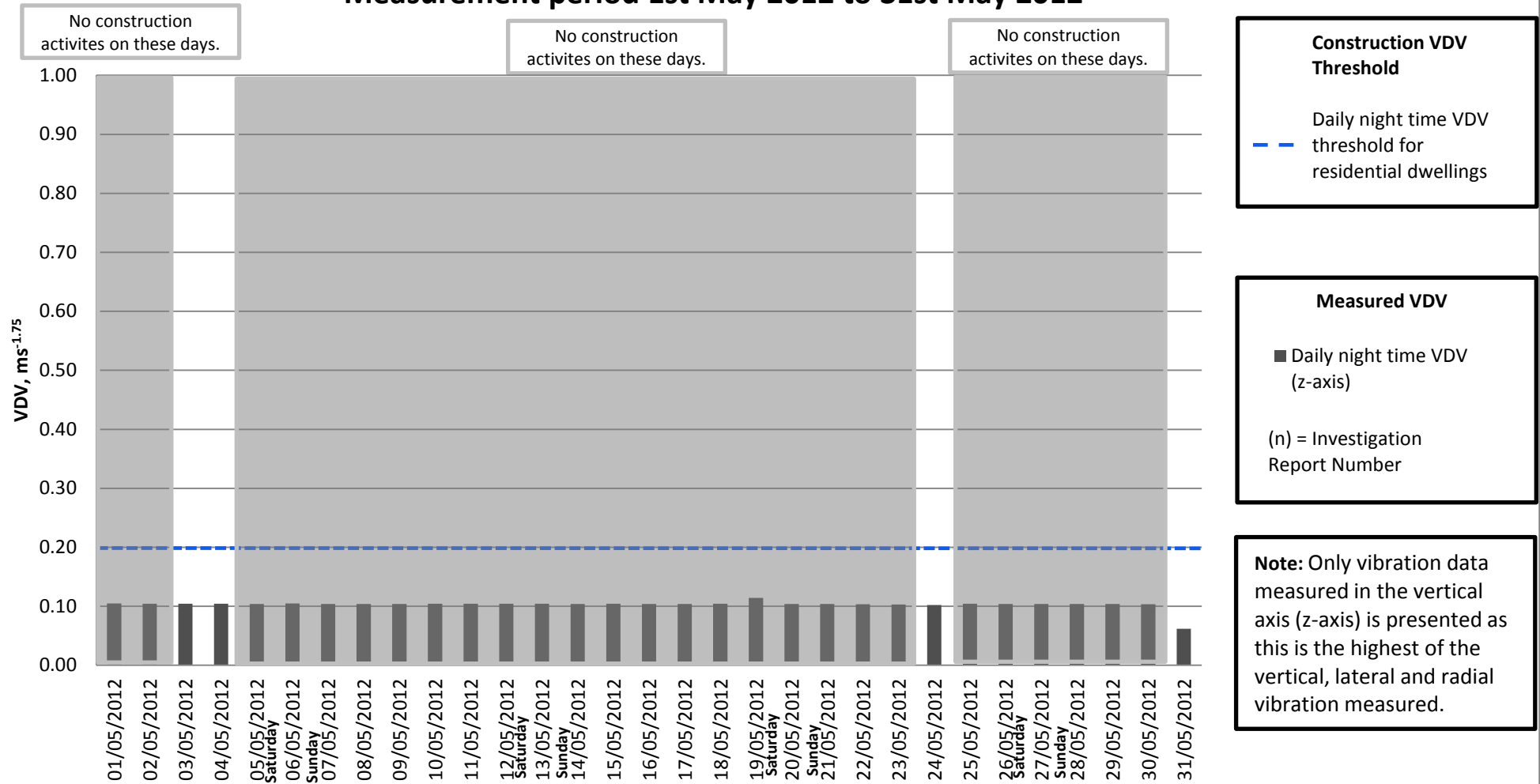
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

VDV threshold for Education establishments, offices and similar is $0.40\text{ms}^{-1.75}$ and Commercial is $0.80\text{ms}^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st May 2012 to 31st May 2012



VDV threshold for Education establishments, offices and similar is $0.40ms^{-1.75}$ and Commercial is $0.80ms^{-1.75}$. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed..

Construction VDV Threshold

Daily night time VDV threshold for residential dwellings

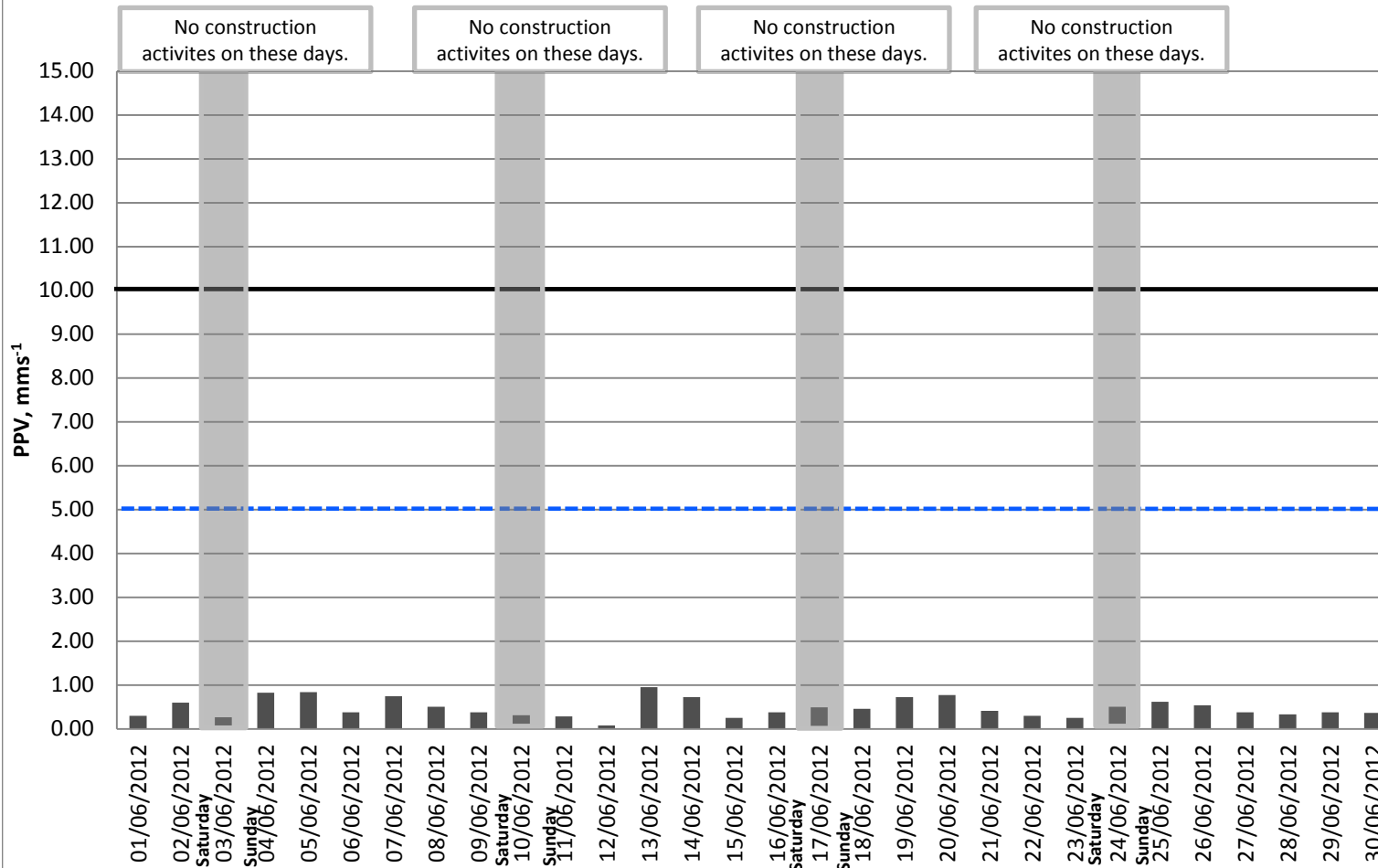
Measured VDV

■ Daily night time VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Measured highest daytime Peak Particle Velocity (PPV), 93/95 King Edwards Way (CNV02) Measurement period 1st June 2012 to 30th June 2012



Construction PPV Thresholds

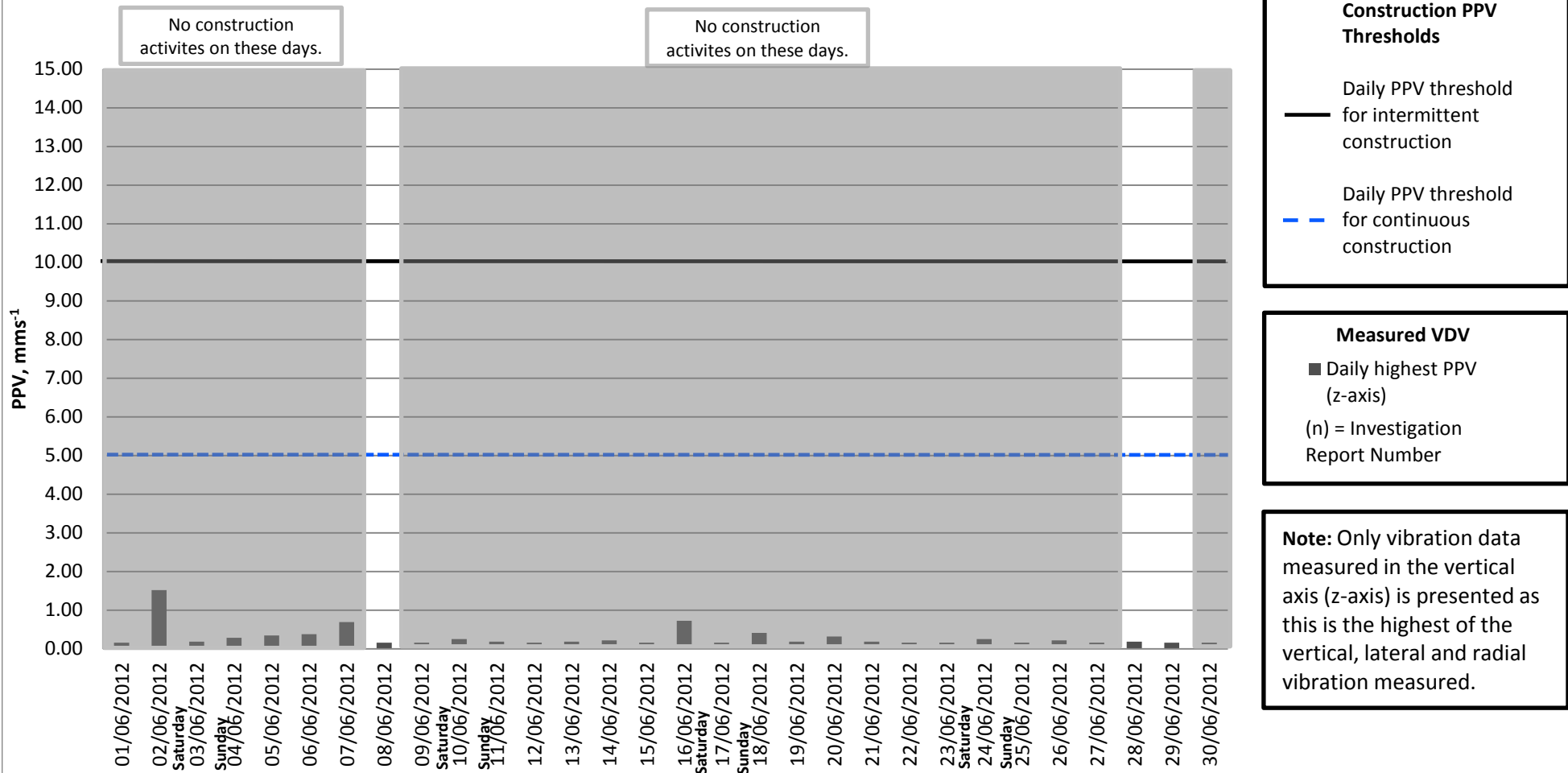
- Daily PPV threshold for intermittent construction (Solid black line)
- Daily PPV threshold for continuous construction (Dashed blue line)

Measured VDV

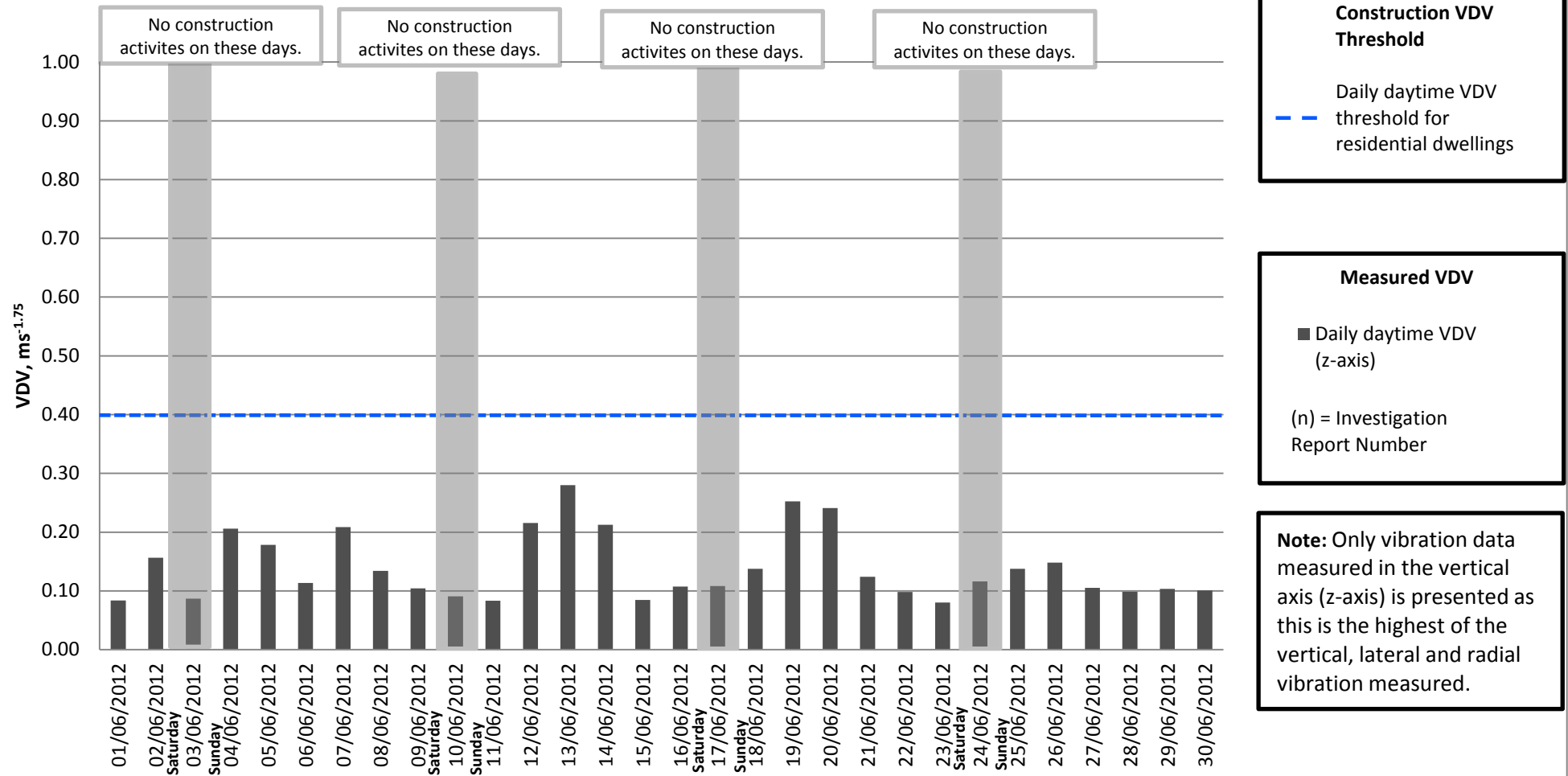
- Daily highest PPV (z-axis) (n) = Investigation Report Number (Grey bar)

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

**Measured highest night-time Peak Particle Velocity (PPV),
93/95 King Edwards Way (CNV02)
Measurement period 1st June 2012 to 30th June 2012**



**Measured daytime (07:00-23:00) Vibration Dose Values (VDV),
93/95 King Edwards Way (CNV02)
Measurement period 1st June 2012 to 30th June 2012**



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

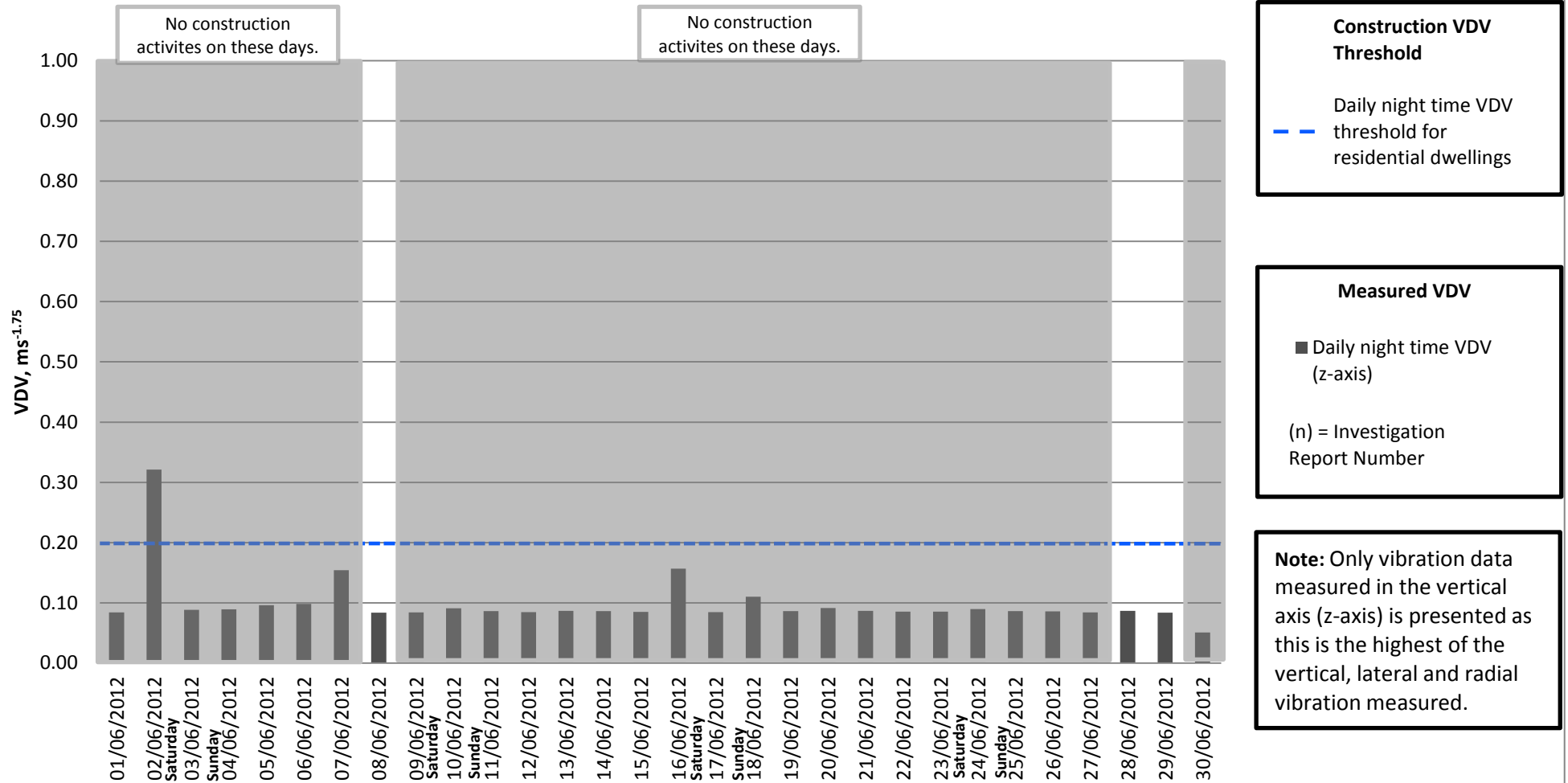
■ Daily daytime VDV (z-axis)

(n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

VDV threshold for Education establishments, offices and similar is 0.40ms^{-1.75} and Commercial is 0.80ms^{-1.75}. Therefore it may be necessary to adjust the threshold displayed on the graph if buildings other than residential dwellings are being assessed.

Measured night time (23:00-07:00) Vibration Dose Values (VDV), 93/95 King Edwards Way (CNV02) Measurement period 1st June 2012 to 30th June 2012



Construction VDV Threshold

Daily night time VDV threshold for residential dwellings

Measured VDV

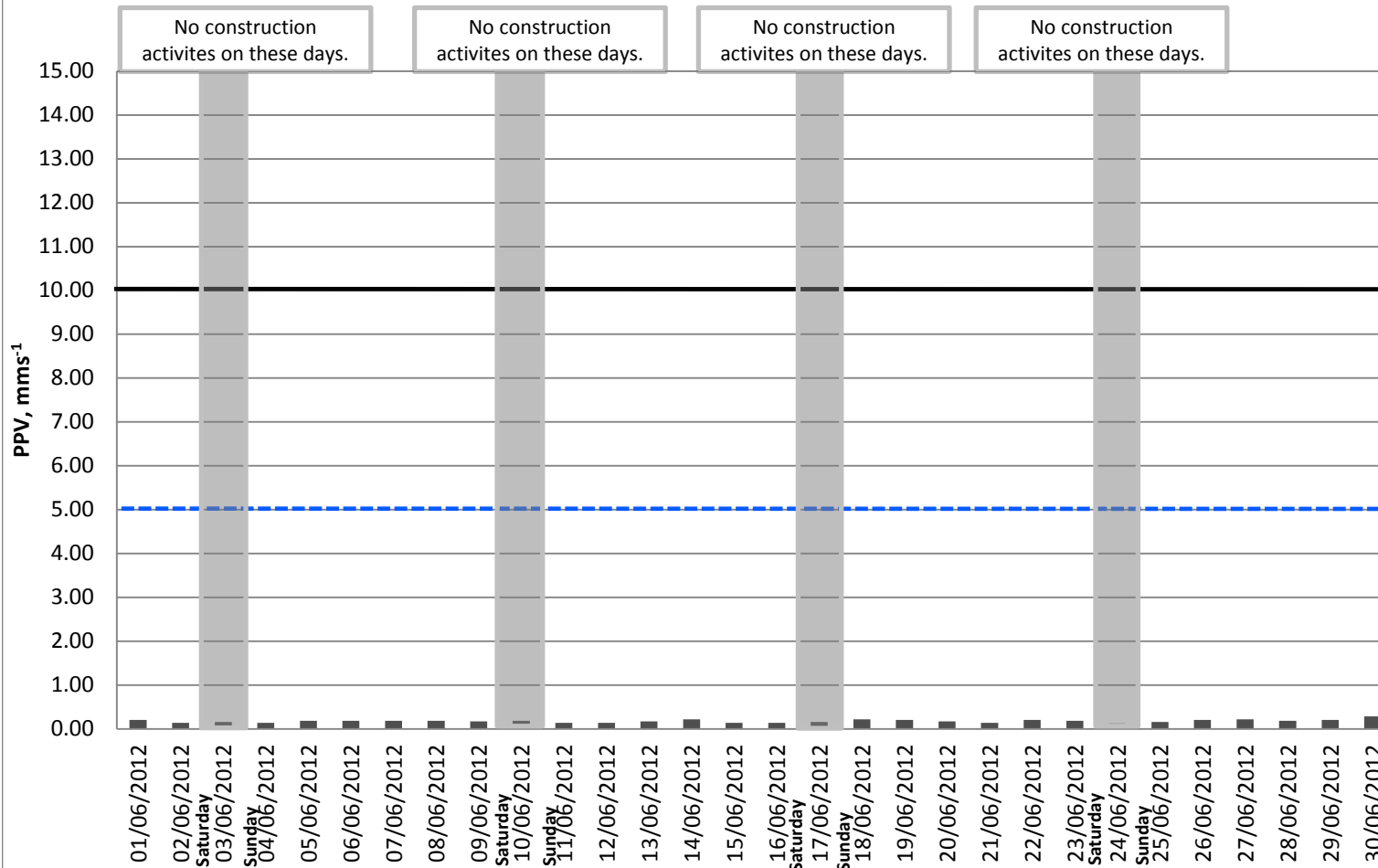
■ Daily night time VDV (z-axis)

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Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

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Measured highest daytime Peak Particle Velocity (PPV), 15-17 Buie Rigg (CNV07) Measurement period 1st June 2012 to 30th June 2012



Construction PPV Thresholds

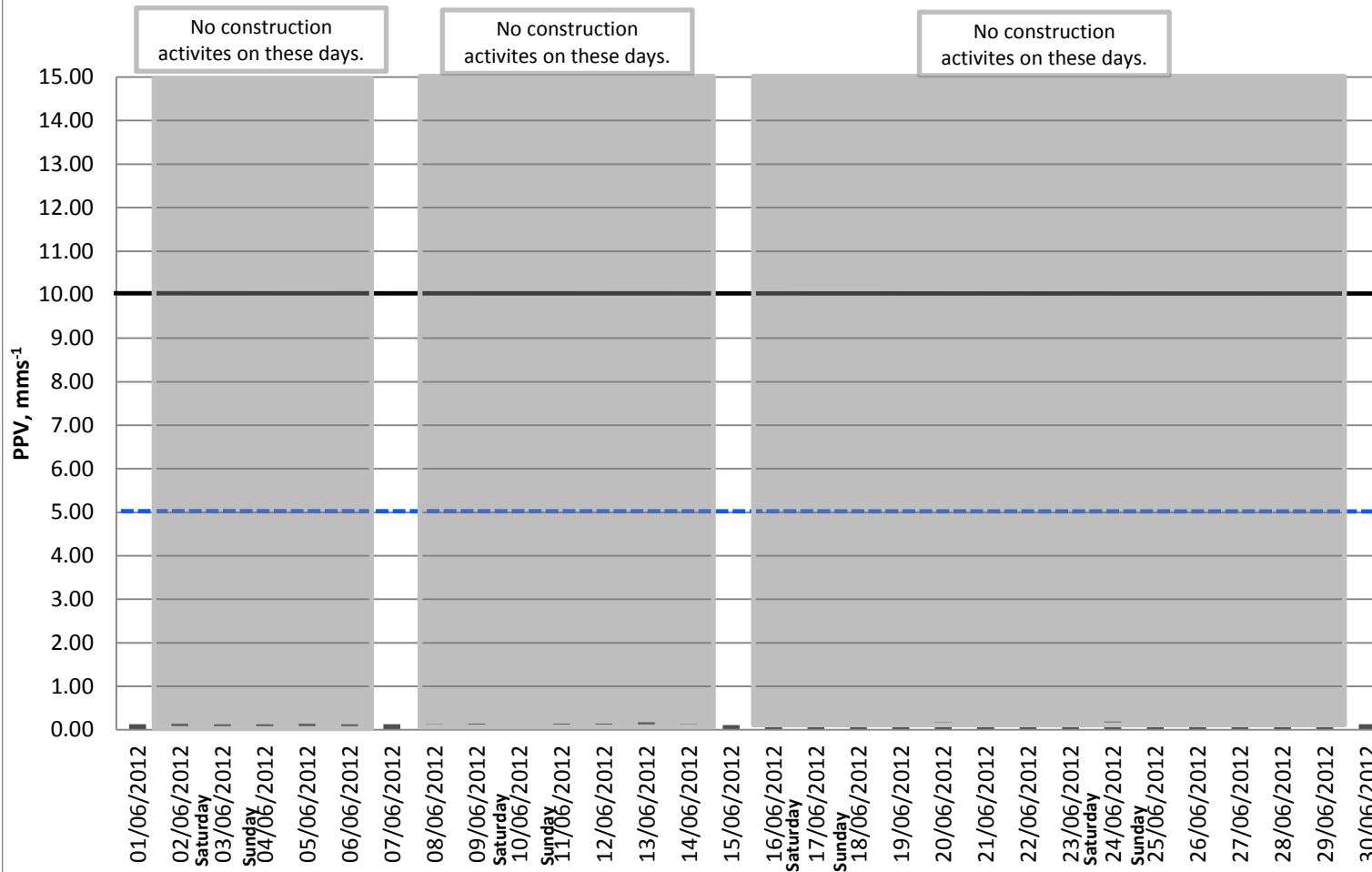
- Daily PPV threshold for intermittent construction (Solid black line)
- Daily PPV threshold for continuous construction (Dashed blue line)

Measured VDV

- Daily highest PPV (z-axis) (Small black bars)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

**Measured highest night-time Peak Particle Velocity (PPV),
15-17 Buie Rigg (CNV07)
Measurement period 1st June 2012 to 30th June 2012**



Construction PPV Thresholds

- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

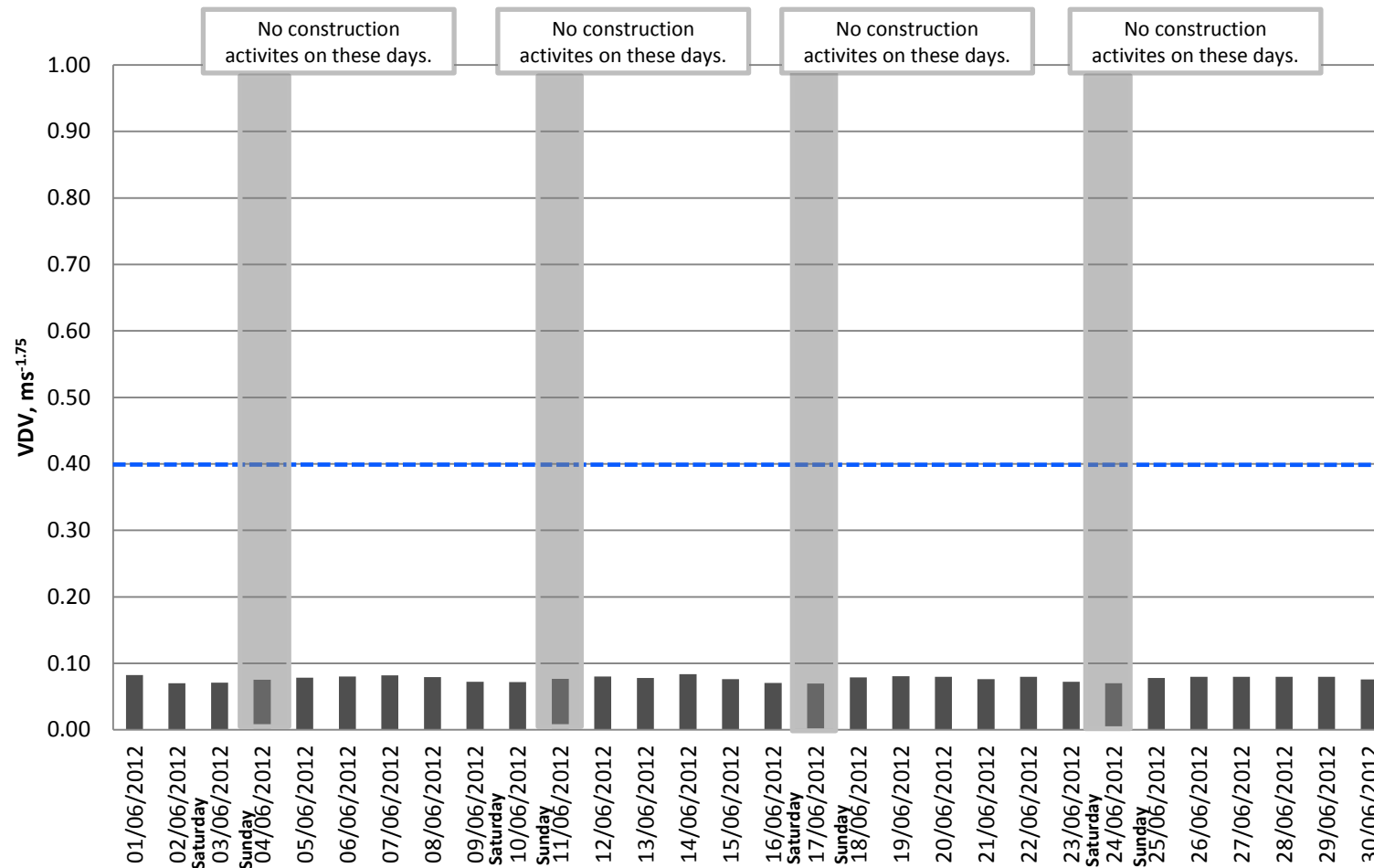
Measured VDV

- Daily highest PPV (z-axis) (small black bars)
- (n) = Investigation Report Number

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07)

Measurement period 1st June 2012 to 30th June 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

■ Daily daytime VDV (z-axis)

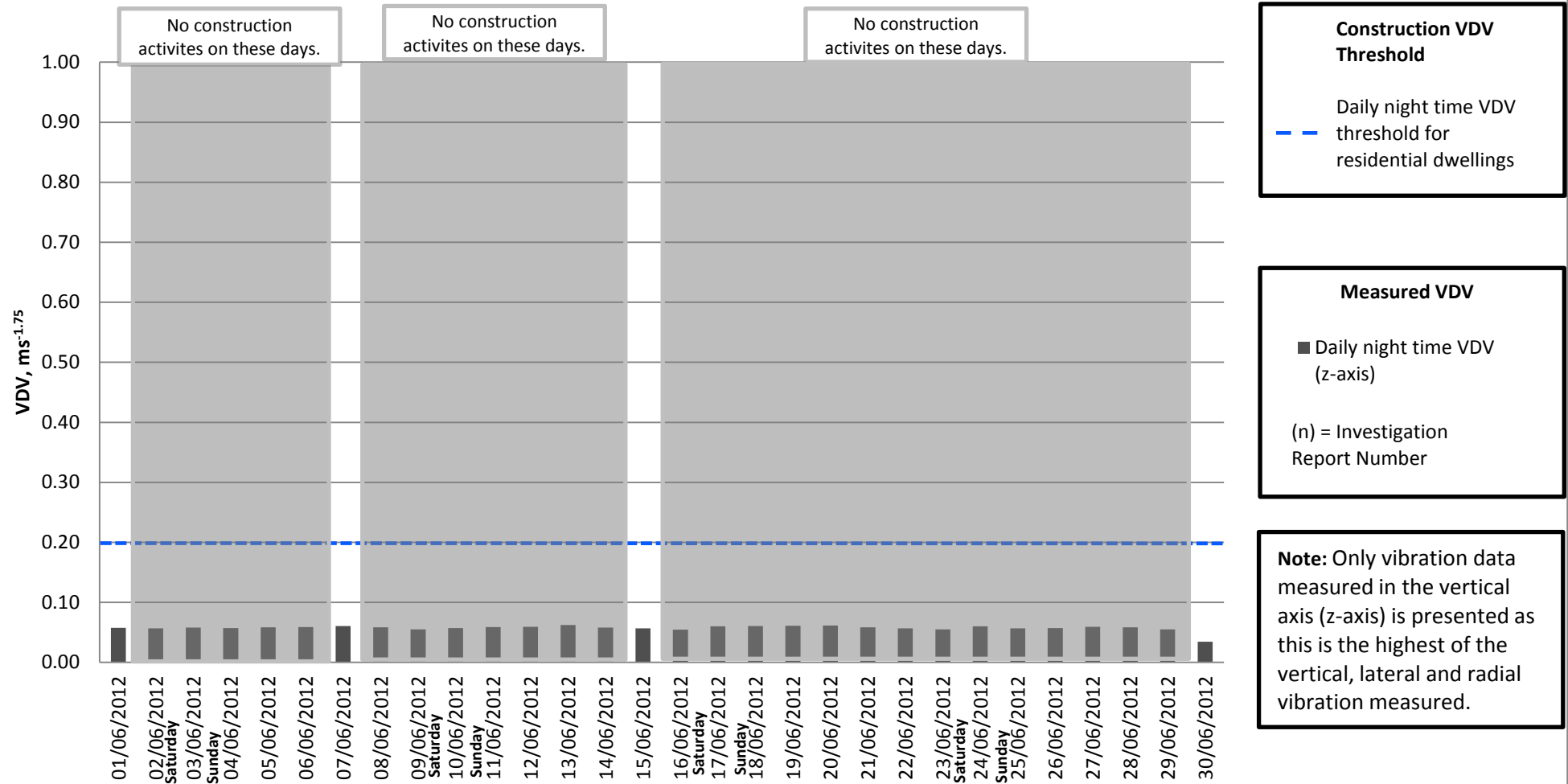
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Measured night time (23:00-07:00) Vibration Dose Values (VDV), 15-17 Buie Rigg (CNV07)

Measurement period 1st June 2012 to 30th June 2012



Construction VDV Threshold

Daily night time VDV threshold for residential dwellings

Measured VDV

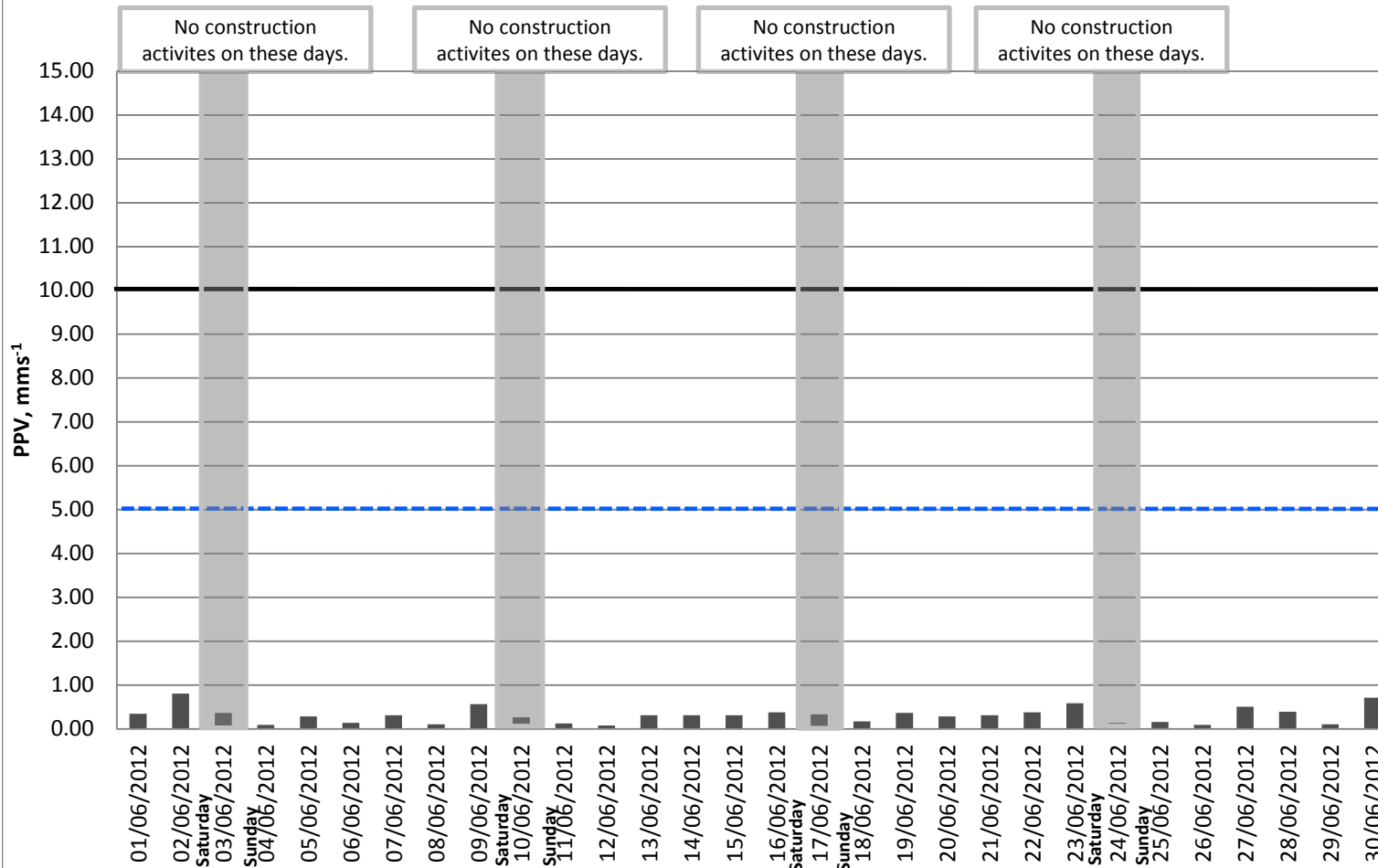
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Measured highest daytime Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st June 2012 to 30th June 2012



Construction PPV Thresholds

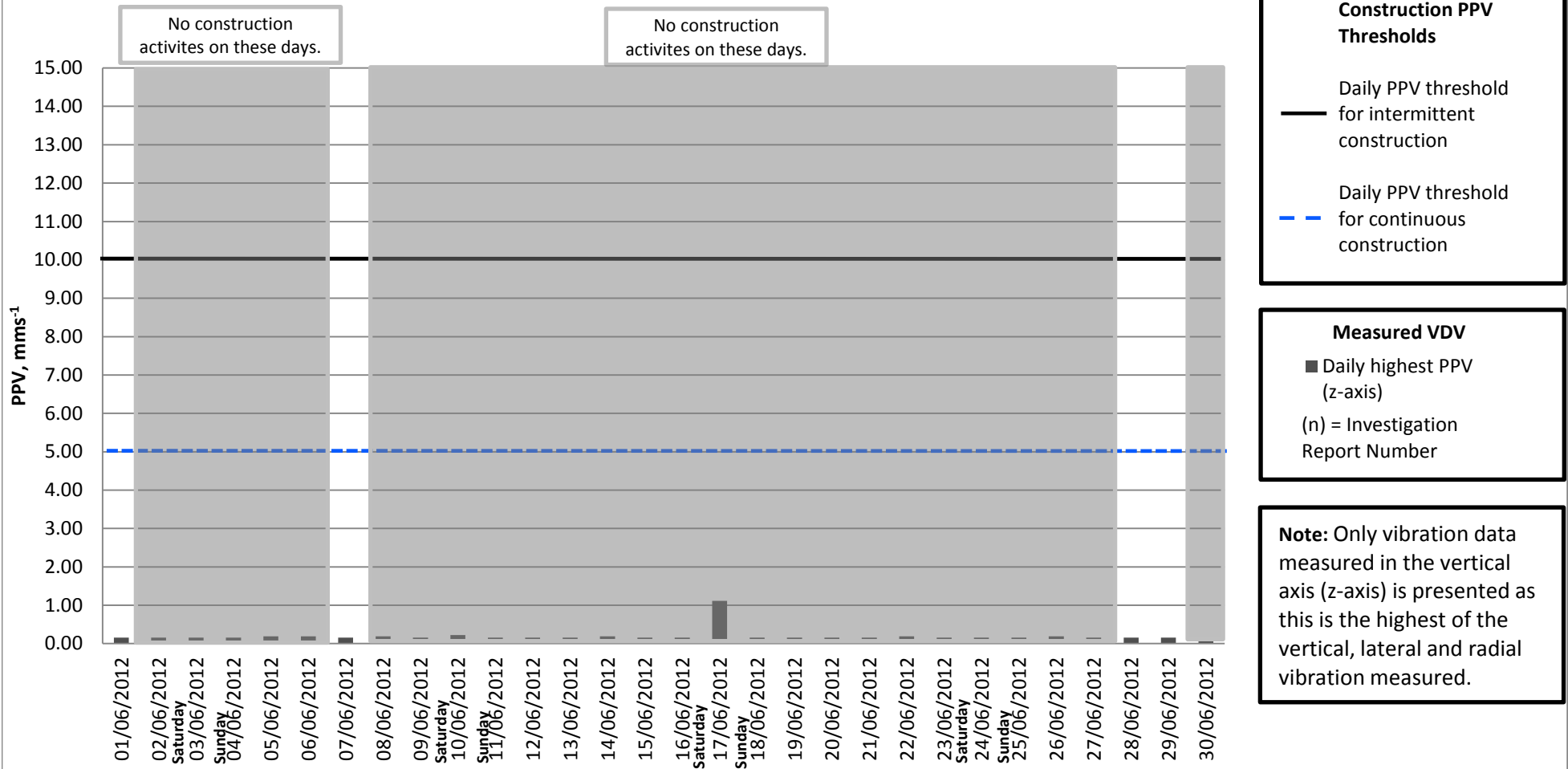
- Daily PPV threshold for intermittent construction (solid black line)
- Daily PPV threshold for continuous construction (dashed blue line)

Measured VDV

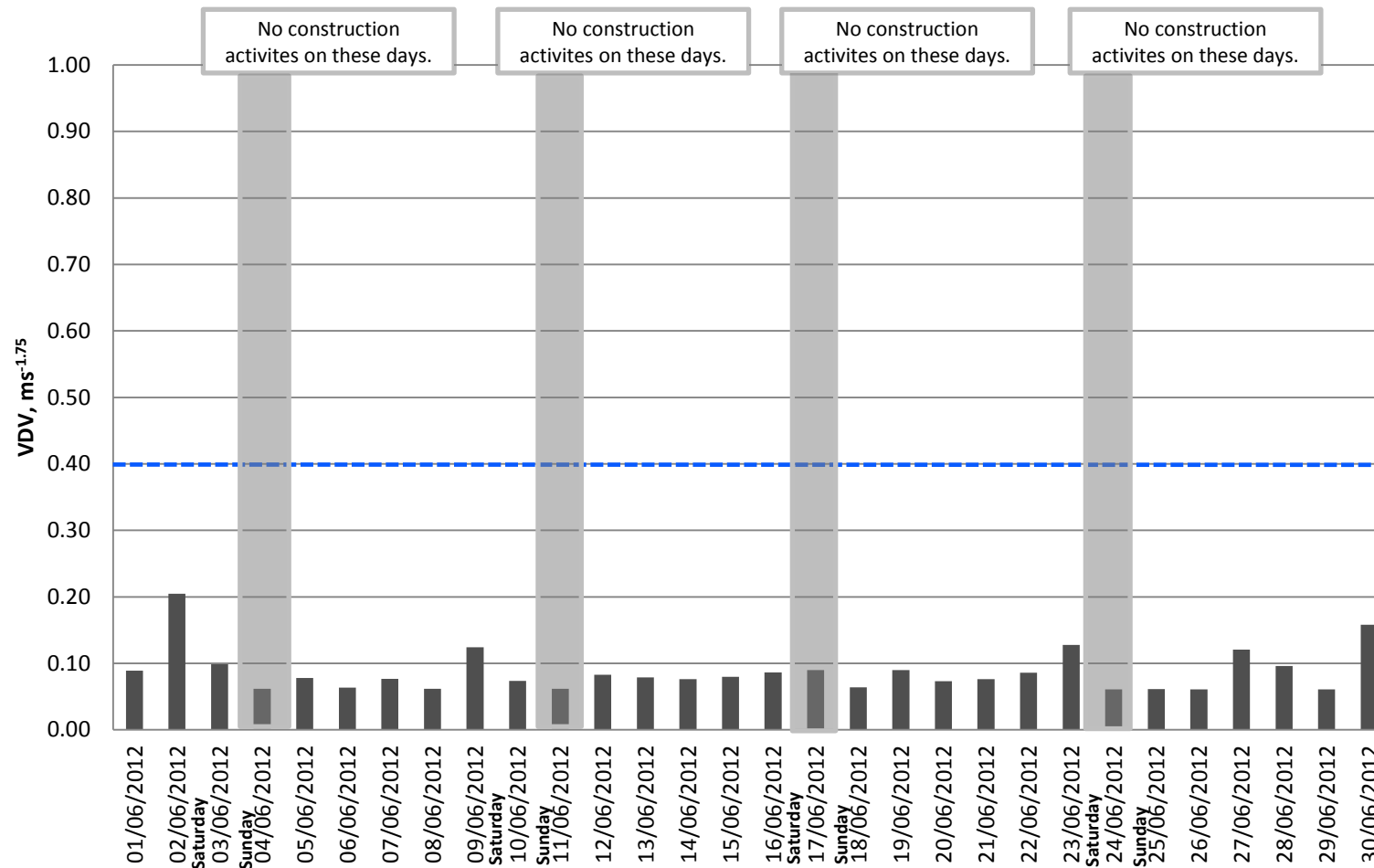
- Daily highest PPV (z-axis) (n) = Investigation Report Number (represented by grey bars)

Note: Only vibration data measured in the vertical axis (z-axis) is presented as this is the highest of the vertical, lateral and radial vibration measured.

Measured highest night-time Peak Particle Velocity (PPV), 8 Kirklands Park Grove (CNV16) Measurement period 1st June 2012 to 30th June 2012



Measured daytime (07:00-23:00) Vibration Dose Values (VDV), 8 Kirklands Park Grove (CNV16) Measurement period 1st June 2012 to 30th June 2012



Construction VDV Threshold

Daily daytime VDV threshold for residential dwellings

Measured VDV

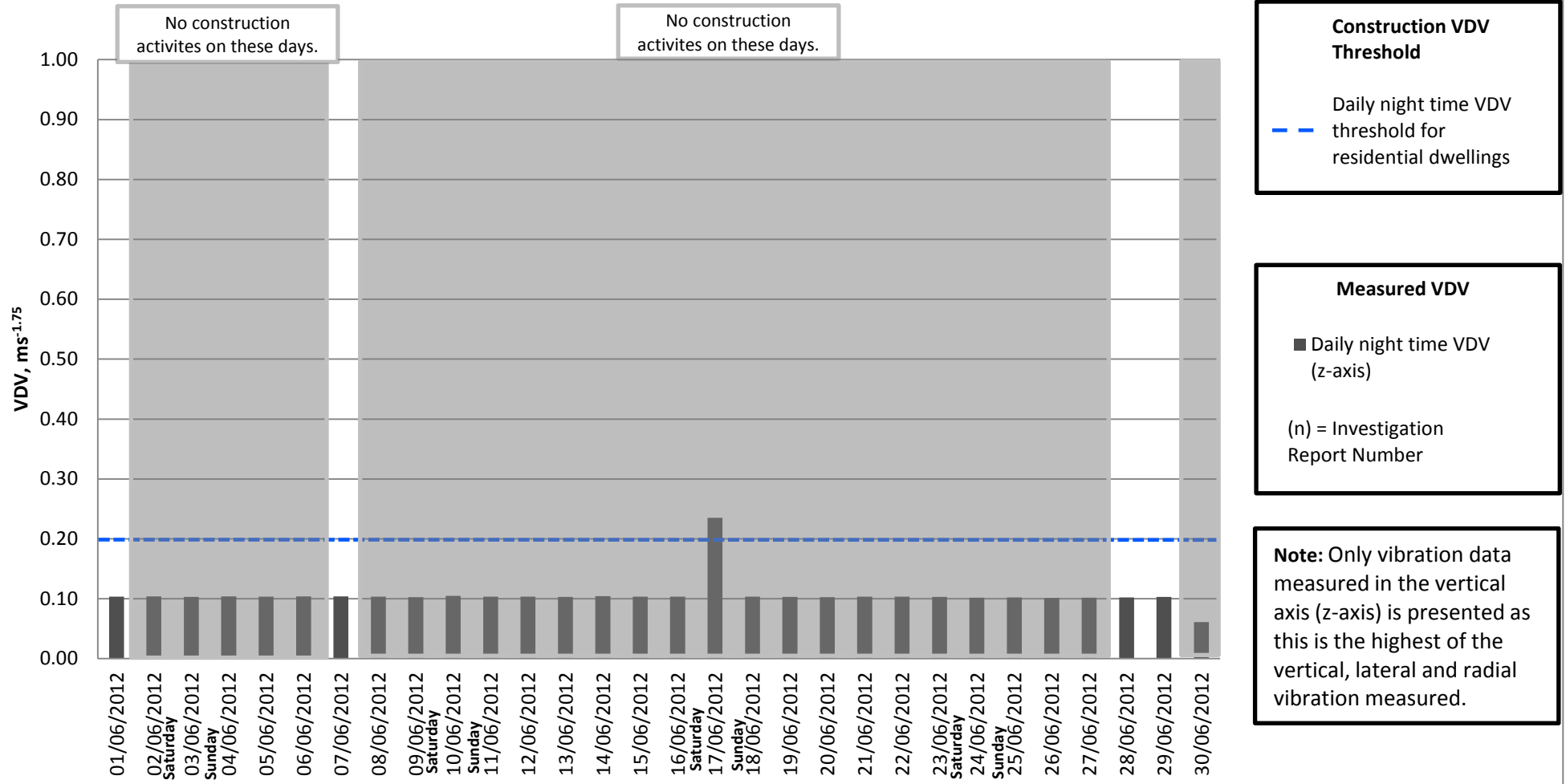
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