Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley

Monthly Report 4

22.10.2022 - 21.11.2022

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1 INTRODUCTION

Acoustic Logic has been engaged to carry out noise, dust and vibration monitoring for the impacts associated with the upgrade the existing road infrastructure of Tweed Coast Road/Cudgen Road intersection to service increased demand following the completion of the Tweed Valley Hospital.

This report provides the results of the following monitoring items:

- Vibration Monitoring: 22nd of October to 21st of November 2022
- Noise Monitoring: 22nd of October to 3rd of November 2022 (system malfunction between 4th to 21st of November), and
- Dust Monitoring: 22nd of October to 3rd of November 2022 (system malfunction between 4th to 21st of November).

Unattended noise, dust and vibration monitoring has been carried out with reference to the management levels identified in the *Construction Noise, Dust & Vibration Management Plan* (CNVMP) for Tweed Valley Hospital Carpark the site prepared by AL (ref: *20211491.1/2911A/R2/OB*, dated 29/11/2021). The criteria set up in the above management plan will be adopted to the proposed intersection upgrade site.

1.1 SITE DESCRIPTION AND SENSITIVE RECEIVERS

The subject site is located at Tweed Coast Road/Cudgen Road intersection, Kingscliff as indicated in Figure 1-1. The land uses surrounding the intersection are existing residential and agricultural receivers. The nearest potentially most affected receivers are:

- **Residential Receiver R1:** Residential receivers at 6-30 John Robb Way to the north of the proposed construction site
- **Industrial/Agricultural Receiver 1:** Catchment Area C to the south of the proposed construction site

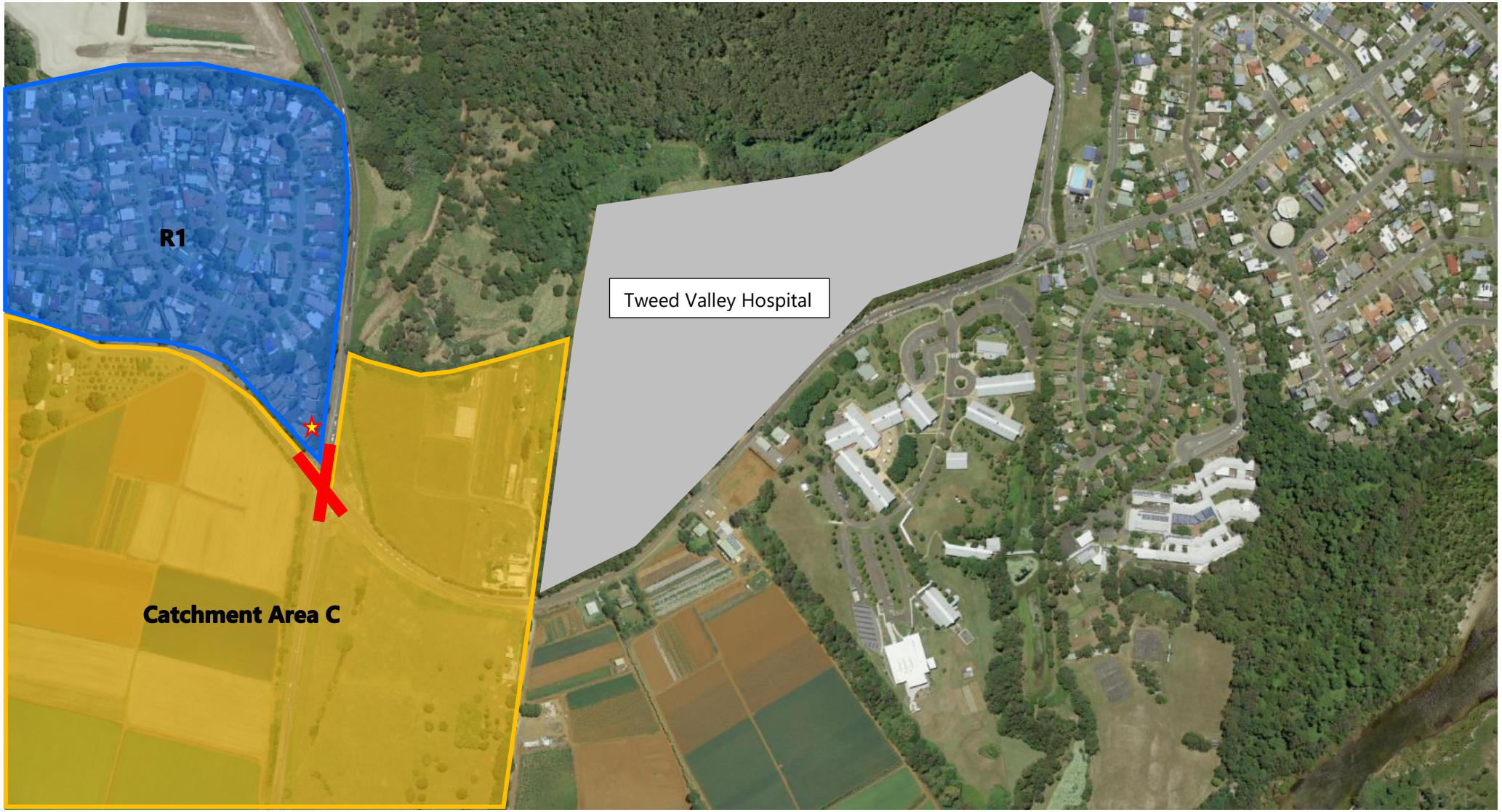


Figure 1-1 – Project Site and Sensitive Receiver Locations

2 CONSTRUCTION NOISE, DUST & VIBRATION MANAGEMENT LEVELS

Noise, dust and vibration management levels which are presented below have been adopted from the following documents:

- Tweed Valley Hospital Carpark *Construction Noise, Dust and Vibration Management Plan* (CNVMP), Acoustic Logic (ref: *20211491.1/2911A/R2/OB*, dated 29/11/2021)
- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*, and
- For human exposure to vibration, the NSW EPA document *Assessing Vibration: A Technical Guideline*.

2.1 VIBRATION MONITORING OBJECTIVES

German Standard DIN 4150-3 provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 are presented in Table 2-1.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 2-1 – DIN4150-3 Safe Limits for Building Vibration

TYPE OF STRUCTURE		PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use **Receivers R1**	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

The surrounding residential properties are considered type 2 structures and are the most sensitive receivers as such vibration will be assessed to the Type 2 criteria.

2.2 NOISE MONITORING OBJECTIVES

Project specific noise construction noise management levels are outlined in the approved CNVMP and summarised in Table 2-2 below:

Table 2-2 – Summarised Construction Noise Requirements During Proposed Hours

"Noise Affected" Level - dB(A)$L_{eq(15min)}$ Standard Hours	**"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$**
55 externally at façade	75

2.3 DUST MONITORING OBJECTIVES

Dust monitoring has been conducted to measure mechanically generated respirable $PM_{2.5}$ dust particles (< 2.5µm) and PM_{10} dust particles (< 10µm), which are generally understood to be the main health concern in airborne dust. The air quality limits are based on the standards outlined in Department of the Environment's *National Environment Protection (Ambient Air Quality) Measure* and NSW EPA's air quality categories.

It should be noted that the dust monitoring results can be influenced by events such as fires and dust storms, thus the PM_{10} limit has an allowance of 5 days per year to account for the effects of such events.

The $PM_{2.5}$ and PM_{10} goals are summarised below.

Table 3 – $PM_{2.5}$ and PM_{10} Goals (24-Hour Average)

Pollutant	**Averaging Time**	**Maximum Concentration**
$PM_{2.5}$	24 hours	25 µg/m^3
PM_{10}	24 hours	50 µg/m^3

The EPA has air quality categories based on particle concentration over a one hour average. As per the Construction Noise, Dust and Vibration management Plan, this project has targeted the 'Poor' category as a reference, **however, the assessment level is the 24-hour average**.

Table 4 – $PM_{2.5}$ and PM_{10} Goals (1-Hour Average)

Pollutant	**Air Quality Category**	**Maximum Concentration**
$PM_{2.5}$	Poor	62-97 µg/m^3
PM_{10}		80-120 µg/m^3

3 MONITOR/MEASUREMENT EQUIPMENT AND LOCATIONS

3.1 VIBRATION MONITOR

3.1.1 Measurement Equipment

Vibration monitoring was conducted using Texcel ETM vibration monitors with external Tri-axial Geophones. The monitors are programmed to store statistical vibration data every 5-minute intervals, along with any 'triggered' events that occur throughout the monitoring period.

3.1.2 Measurement Locations & Installation Dates

A vibration monitor (M7394) has been installed, representative of the potential impact for vibration transmission to surrounding residential houses, at the northern boundary of the construction site (at the ground level, also see Figure 3-1). The monitor was installed on Friday 22nd July 2022.

3.2 NOISE AND DUST MONITORR

3.2.1 Measurement Equipment

Unattended noise monitoring was conducted using a *SiteHive Hexanode 134* noise and dust monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the monitoring period. Measurements were taken on A-frequency weighting and fast time weighting.

3.2.2 Measurement Locations & Installation Dates

A noise monitor has been installed, representative of the potential impact for noise transmission to surrounding residential houses, at the northern boundary of the construction site (at the ground level, also see Figure below). The monitor was installed on Friday 22nd July 2022.

Figure 3-1 Noise, dust and vibration monitor installation locations

4 NOISE, DUST & VIBRATION MEASURMENTS

4.1 MONITORING PERIOD

This report provides the available results of noise, dust and vibration monitoring between the 22nd of October to 21st of November 2022. Note that noise and dust data is not available between 4th to 21st of November due to system malfunction.

4.2 VIBRATION MONITORING RESULTS

The highest axial (transverse / radial / vertical) vibration level, Peak Particle Velocity (PPV), during the monitoring period have been presented below. Graphs of the results are presented in Appendix A.

Table 5 – Vibration Monitoring Results-M7394

Date	Maximum Measured Vibration Level mm/s	Structural Damage Criteria for Type 2 (DIN4150-3)	Comments
Saturday 2022-10-22	<3mm/s	5 mm/s (<10Hz) 5-15 mm/s (10-50Hz) 15-20mm/s (50-100Hz)	Vibration levels satisfy DIN4150-3 Type 2 criteria
Sunday 2022-10-23	No work		
Monday 2022-10-24	<3mm/s		
Tuesday 2022-10-25	<3mm/s		
Wednesday 2022-10-26	<3mm/s		
Thursday 2022-10-27	14mm/s @ 7Hz		Event @ 12:30 pm due to monitor service
Friday 2022-10-28	<3mm/s		Vibration levels satisfy DIN4150-3 Type 2 criteria
Saturday 2022-10-29	<3mm/s		
Sunday 2022-10-30	No work		
Monday 2022-10-31	<3mm/s		
Tuesday 2022-11-01	<3mm/s		
Wednesday 2022-11-02	<3mm/s		
Thursday 2022-11-03	<3mm/s		

Date	Maximum Measured Vibration Level mm/s	Structural Damage Criteria for Type 2 (DIN4150-3)	Comments
Friday 2022-11-04	<3mm/s	5 mm/s (<10Hz) 5-15 mm/s (10-50Hz) 15-20mm/s (50-100Hz)	Vibration levels satisfy DIN4150-3 Type 2 criteria
Saturday 2022-11-05	<3mm/s		
Sunday 2022-11-06	No work		
Monday 2022-11-07	<3mm/s		
Tuesday 2022-11-08	<3mm/s		
Wednesday 2022-11-09	<3mm/s		
Thursday 2022-11-10	<3mm/s		
Friday 2022-11-11	<3mm/s		
Saturday 2022-11-12	<3mm/s		
Sunday 2022-11-13	No work		
Monday 2022-11-14	<3mm/s		
Tuesday 2022-11-15	<3mm/s		
Wednesday 2022-11-16	<3mm/s		
Thursday 2022-11-17	3mm/s		
Friday 2022-11-18	<3mm/s		
Saturday 2022-11-19	<3mm/s		
Sunday 2022-11-20	No work		
Monday 2022-11-21	11mm/s@13Hz		Event @ 3:30 pm due to monitor service

Vibration levels for monitor M7394 to the north of the construction site were within the nominated criteria for the whole monitoring period between 22nd October to 21st November 2022 except two exceedances on Thursday 27th October and 21st November which are caused by monitor service (i.e., battery change).

4.3 NOISE MONITORING RESULTS

The available measured noise levels have been analysed by this office and the graphed noise data presented in Appendix 1. Summarised results are also in Table 6 below.

Table 6 – Measured Construction Noise Levels @ R1

Date	Time Period	Percentage of Time that Measured Noise Level dB(A)$L_{eq(15min)}$ Exceeds			
		0-5 above Noise affected level 55 dB(A)$L_{eq(15min)}$	5-10 above Noise affected level 55 dB(A)$L_{eq(15min)}$	10-15 above Noise affected level 55 dB(A)$L_{eq(15min)}$	Above Highly Noise affected level 75 dB(A)$L_{eq(15min)}$
Saturday 2022-10-22	8am – 1pm	72.73%	22.73%	0.00%	0.00%
Sunday 2022-10-23	No Works				
Monday 2022-10-24	7am – 6pm	70.45%	29.55%	0.00%	0.00%
Tuesday 2022-10-25		43.18%	56.82%	0.00%	0.00%
Wednesday 2022-10-26		72.73%	27.27%	0.00%	0.00%
Thursday 2022-10-27		59.09%	40.91%	0.00%	0.00%
Friday 2022-10-28		59.09%	40.91%	0.00%	0.00%
Saturday 2022-10-29	8am – 1pm	100.00%	0.00%	0.00%	0.00%
Sunday 2022-10-30	No Works				
Monday 2022-10-31	7am – 6pm	43.18%	54.55%	2.27%	0.00%
Tuesday 2022-11-01		47.73%	52.27%	0.00%	0.00%
Wednesday 2022-11-02		81.82%	18.18%	0.00%	0.00%
Thursday 2022-11-03		35.14%	32.43%	0.00%	0.00%

Noise levels were below the highly noise affected level (75dB(A)) during the whole monitoring period. Noise levels were normally between 5-10 dB higher than the noise affected level. This is expected to lower at the residential façade due to distance attenuation.

AL notes that data between 4th November and 21st November is not available due to equipment malfunction.

4.4 DUST MONITORING RESULTS

The daily average $PM_{2.5}$ and PM_{10} concentration levels are presented below.

Table 7 – 24hr Average $PM_{2.5}$ and PM_{10} Concentration

Date	24hr Average $PM_{2.5}$ and PM_{10} Concentration					
	$PM_{2.5}$ Level ($\mu g/m^3$)	**$PM_{2.5}$ Limit ($\mu g/m^3$)**	**Complies**	**PM_{10} Level ($\mu g/m^3$)**	**PM_{10} Limit ($\mu g/m^3$)**	**Complies**
Saturday 2022-10-22	19	25	Yes	44	50	Yes
Sunday 2022-10-23	No Works					
Monday 2022-10-24	31	25	See comment below	219	50	Non construction works related: Exceedances occurred outside construction hours
Tuesday 2022-10-25	14		Yes	73		
Wednesday 2022-10-26	11		Yes	40		Yes
Thursday 2022-10-27	6		Yes	26		Yes
Friday 2022-10-28	7		Yes	27		Yes
Saturday 2022-10-29	3		Yes	13		Yes
Sunday 2022-10-30	No Works					
Monday 2022-10-31	8	25	Yes	30	50	Yes
Tuesday 2022-11-01	5		Yes	15		Yes
Wednesday 2022-11-02	2		Yes	12		Yes
Thursday 2022-11-03	8		Yes	N/A		System malfunction

Exceedances on 24th and 25th October were occurred outside construction hours and are not related to construction activities.

AL notes that data between 4th November and 21st November is not available due to equipment malfunction

The **daily maximum 1hour** $PM_{2.5}$ and PM_{10} concentration levels are presented below.

Table 8 – 1Hr Maximum $PM_{2.5}$ and PM_{10} Concentration

Date	Maximum 1hr Average $PM_{2.5}$ and PM_{10} Concentration					
	$PM_{2.5}$ Level ($\mu g/m^3$)	**$PM_{2.5}$ Limit ($\mu g/m^3$)**	**Complies**	**PM_{10} Level ($\mu g/m^3$)**	**PM_{10} Limit ($\mu g/m^3$)**	**Complies**
Saturday 2022-10-22	29	62-97	Yes	77	80-120	Yes
Sunday 2022-10-23	No Works					
Monday 2022-10-24	63	62-97	See comment below	214	80-120	Non construction works related: Exceedances occurred outside construction hours
Tuesday 2022-10-25	286		See comment below	2657		
Wednesday 2022-10-26	56		Yes	555		
Thursday 2022-10-27	54		Yes	30		Yes
Friday 2022-10-28	14		Yes	72		Yes
Saturday 2022-10-29	26		Yes	135		Non construction works related: Exceedances occurred outside construction hours
Sunday 2022-10-30	No Works					
Monday 2022-10-31	14	62-97	Yes	71	80-120	Yes
Tuesday 2022-11-01	14		Yes	46		Yes
Wednesday 2022-11-02	8		Yes	71		Yes
Thursday 2022-11-03	16		Yes	N/A		System malfunction

Maximum hourly averaged PM_{10} exceedances on 18th October were resulted from severe weather conditions. Exceedances on 24th, 25th, 26th and 29th October were recorded outside construction hours and unrelated to construction activities.

It is also noted that the sensor in the dust monitor overloads when significantly above criteria, there the 1-hour maximum PM2.5 and PM10 levels for 24th, 25th and 26th October is not numerically accurate due to limitations of the equipment.

5 CONCLUSION

Acoustic Logic Consultancy has carried out noise, dust and vibration monitoring for the proposed intersection upgrade at Tweed Coast Road/Cudgen Road intersection, Tweed Valley.

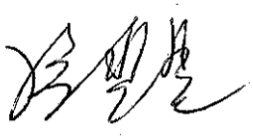
This monitoring report presents the noise and vibration monitoring for the periods as follows:

- Vibration Monitoring: 22nd of October to 21st of November 2022
- Noise Monitoring: 22nd of October to 3rd of November 2022 (system malfunction between 4th to 21st of November), and
- Dust Monitoring: 22nd of October to 3rd of November 2022 (system malfunction between 4th to 21st of November).

Vibration levels were below the criteria during the whole monitoring period. Noise levels were normally below 10dB(A) exceedance of noise affected level (55dB(A)). This is believed to be lower at the closet residential receiver due to distance attenuation. Several dust measurements exceedances were recorded during the above monitoring period and as found unrelated to the construction works as per the results notes in this report.

Please contact us should you have any further queries.

Yours faithfully,



Acoustic Logic Pty Ltd

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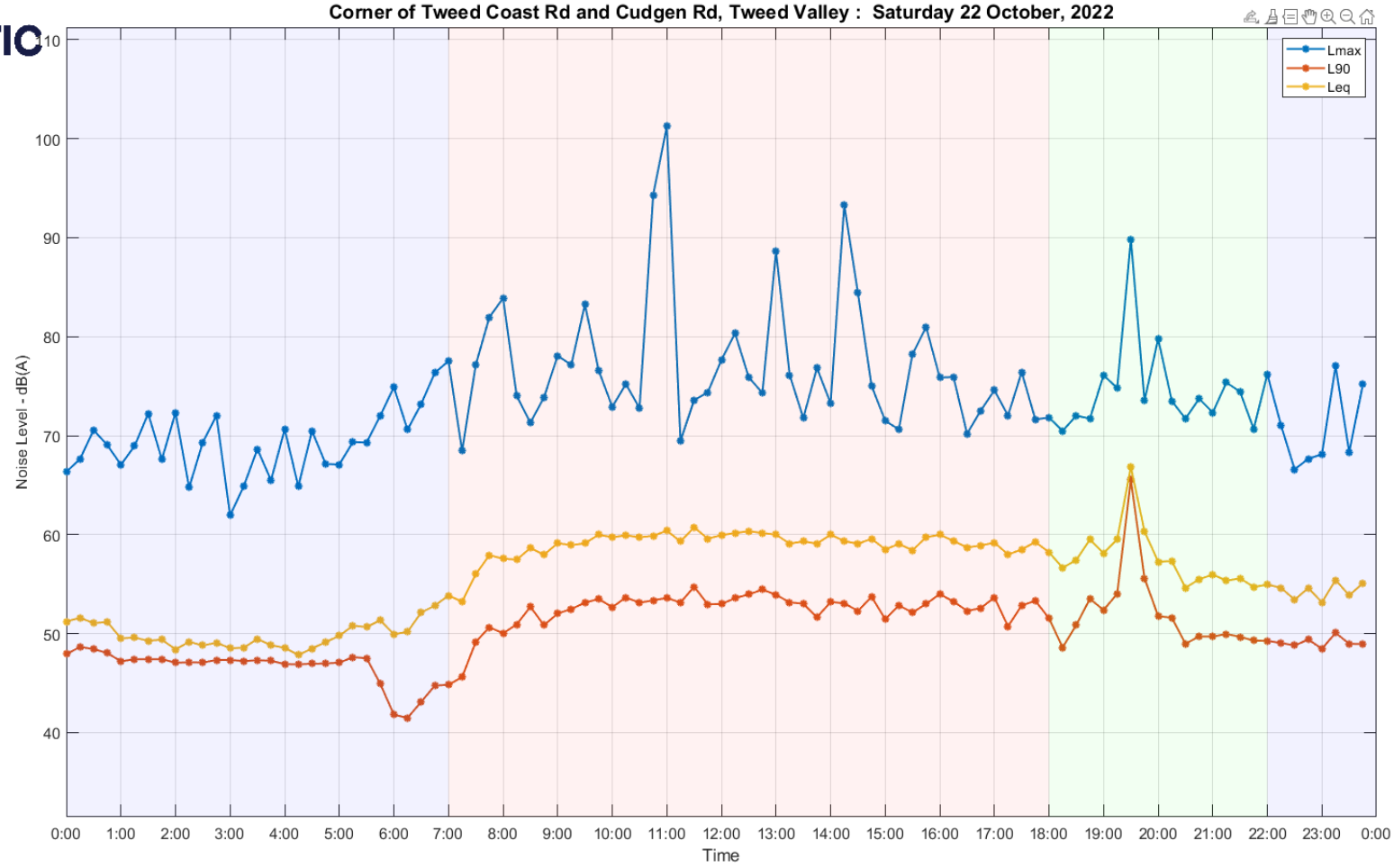
APPENDIX 1 – NOISE MONITORING RESULTS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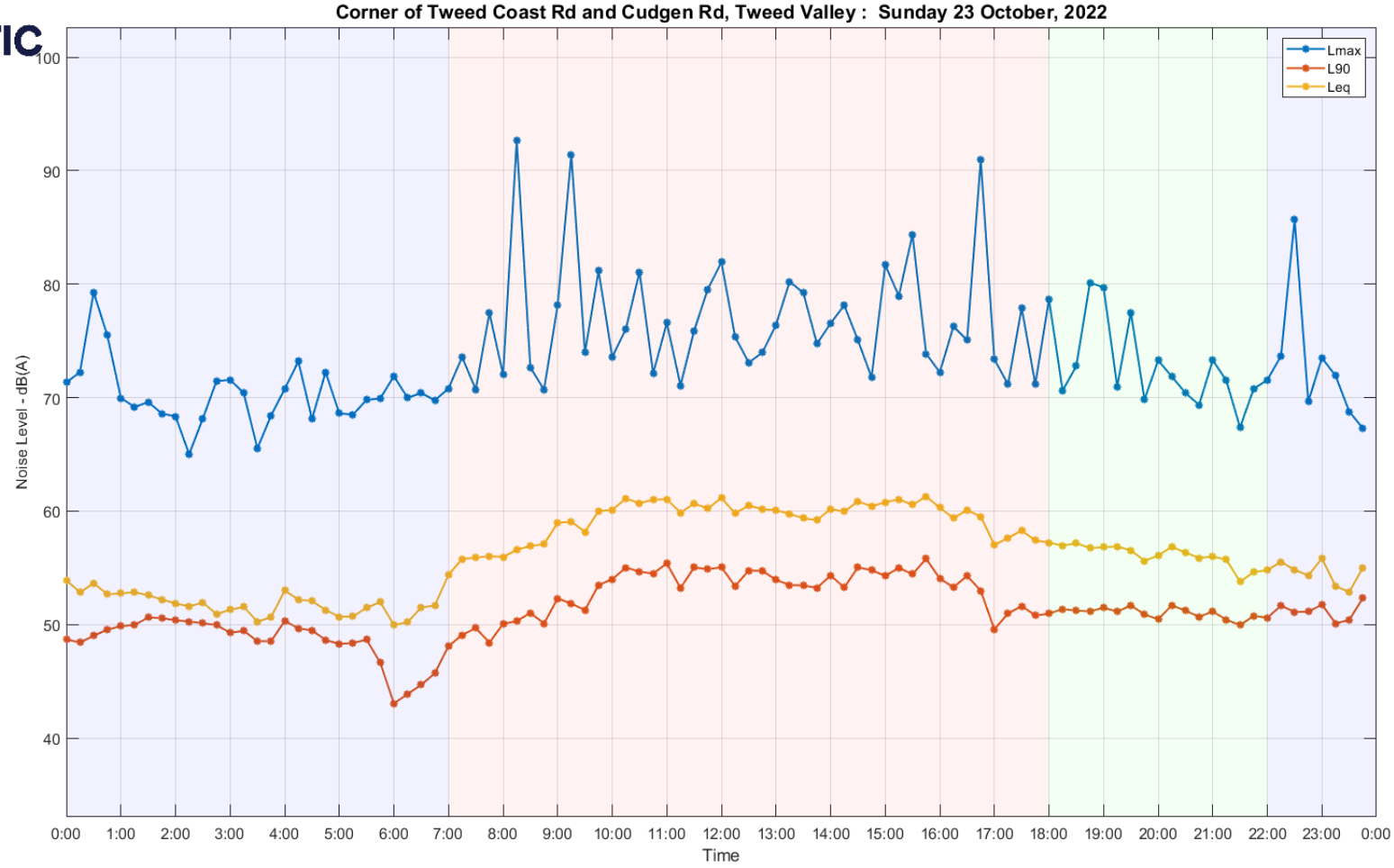
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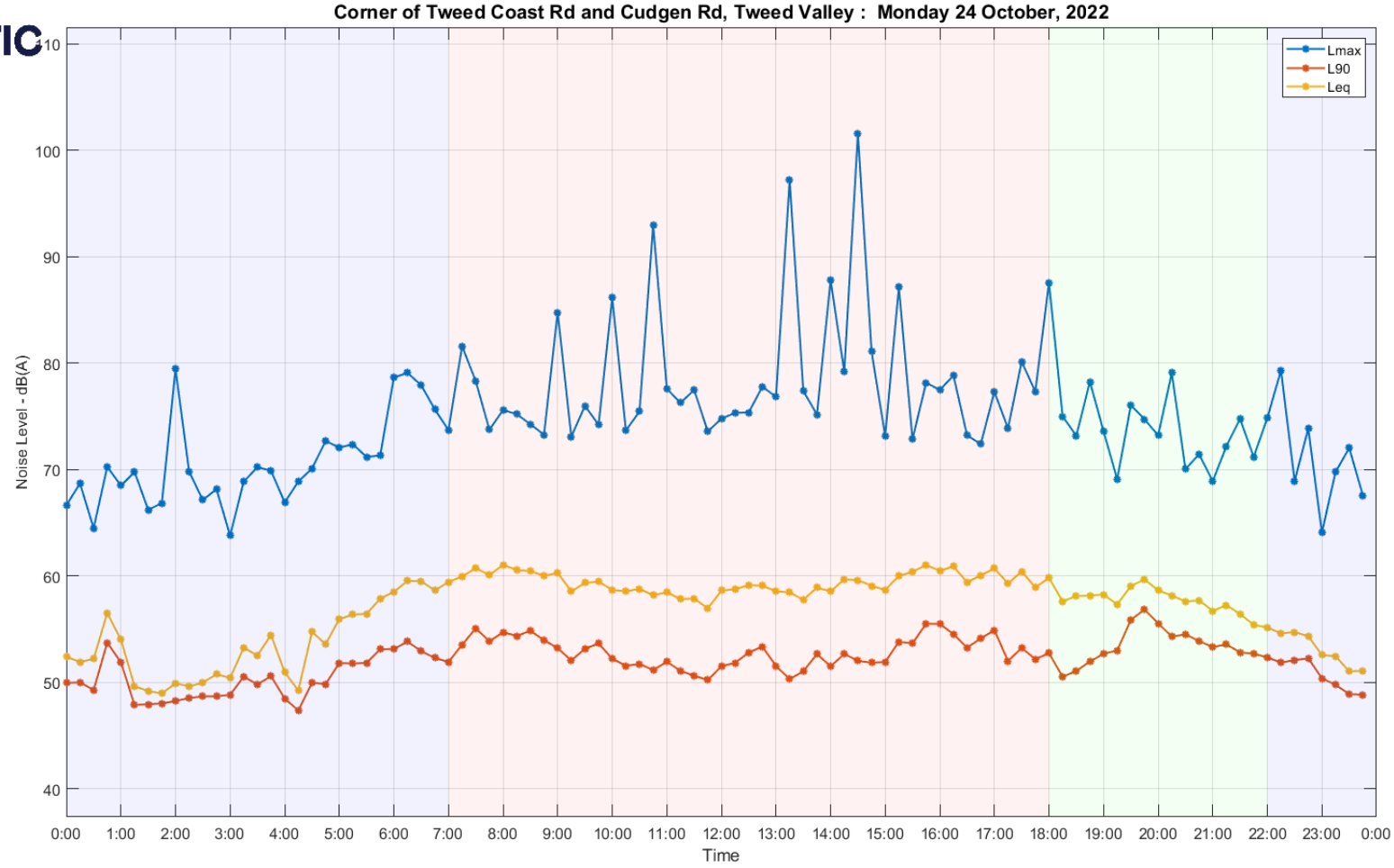
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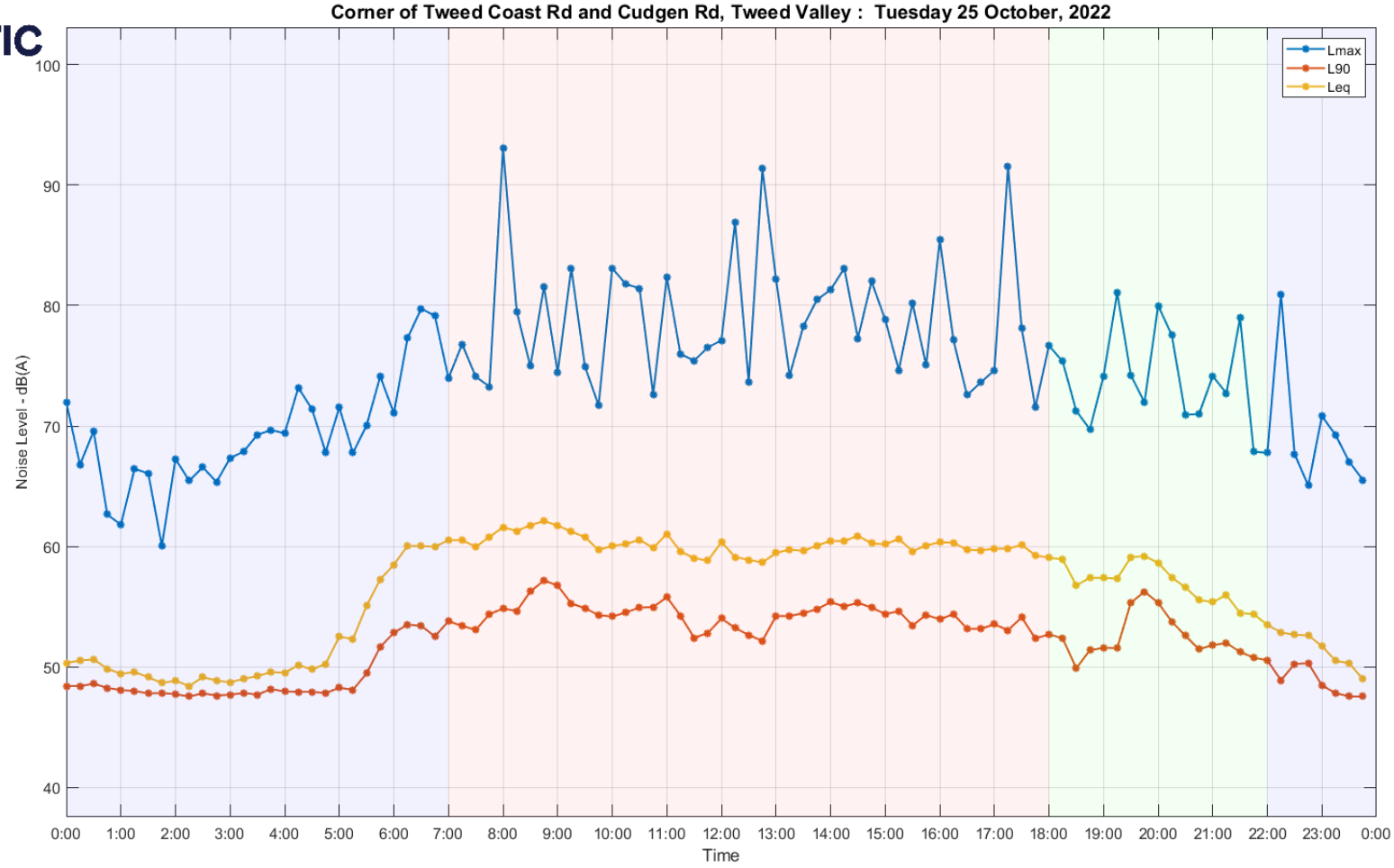
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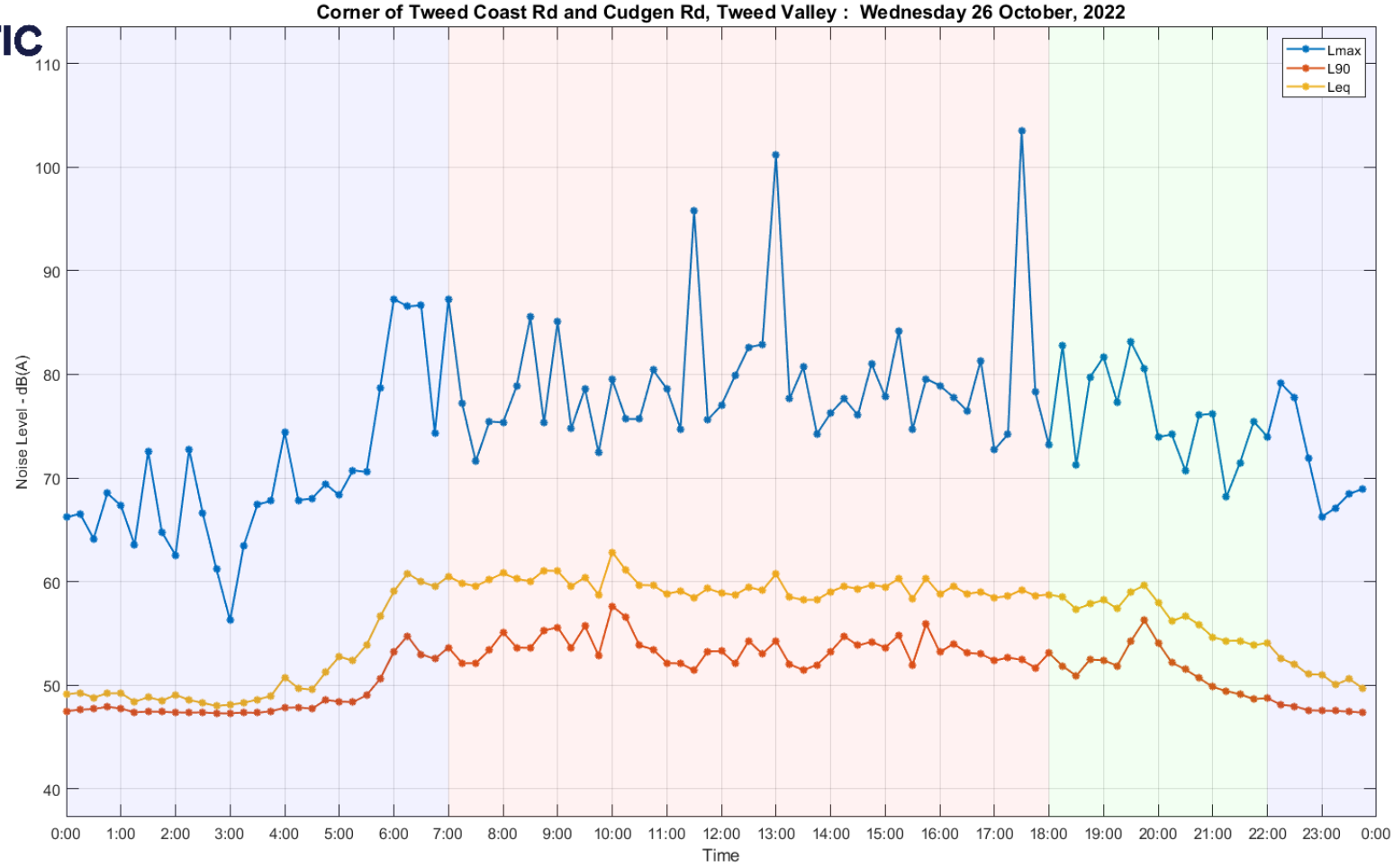
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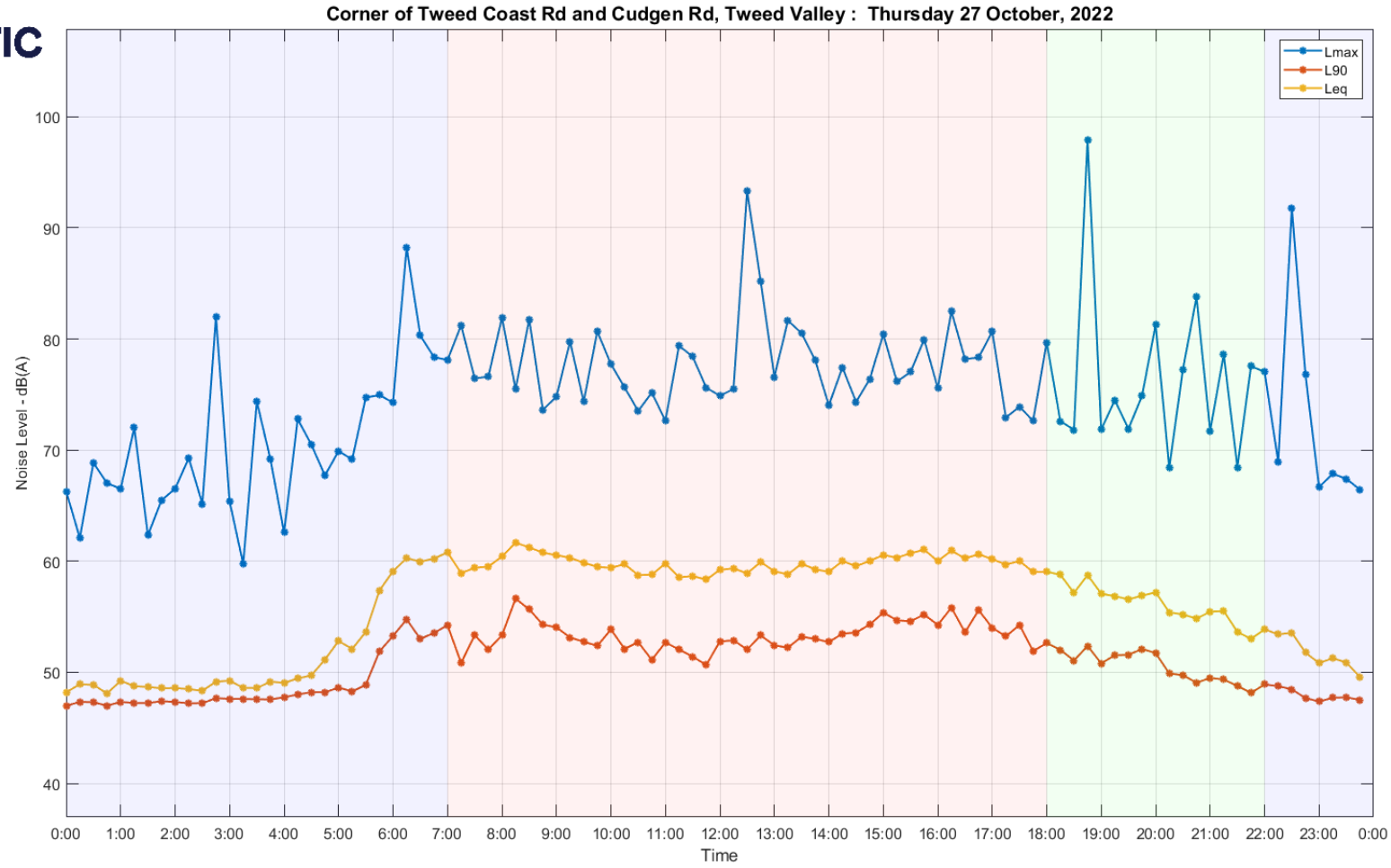
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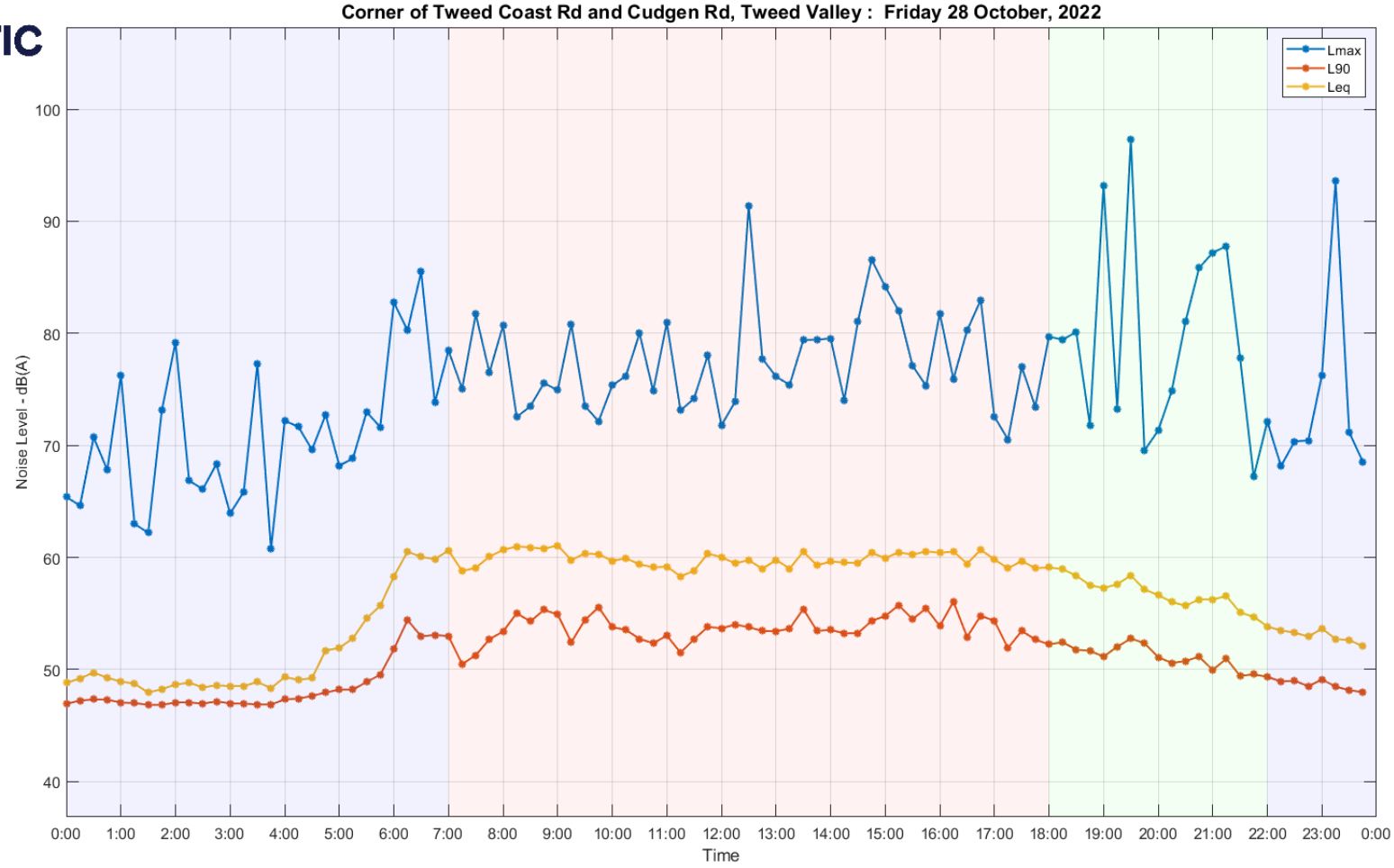
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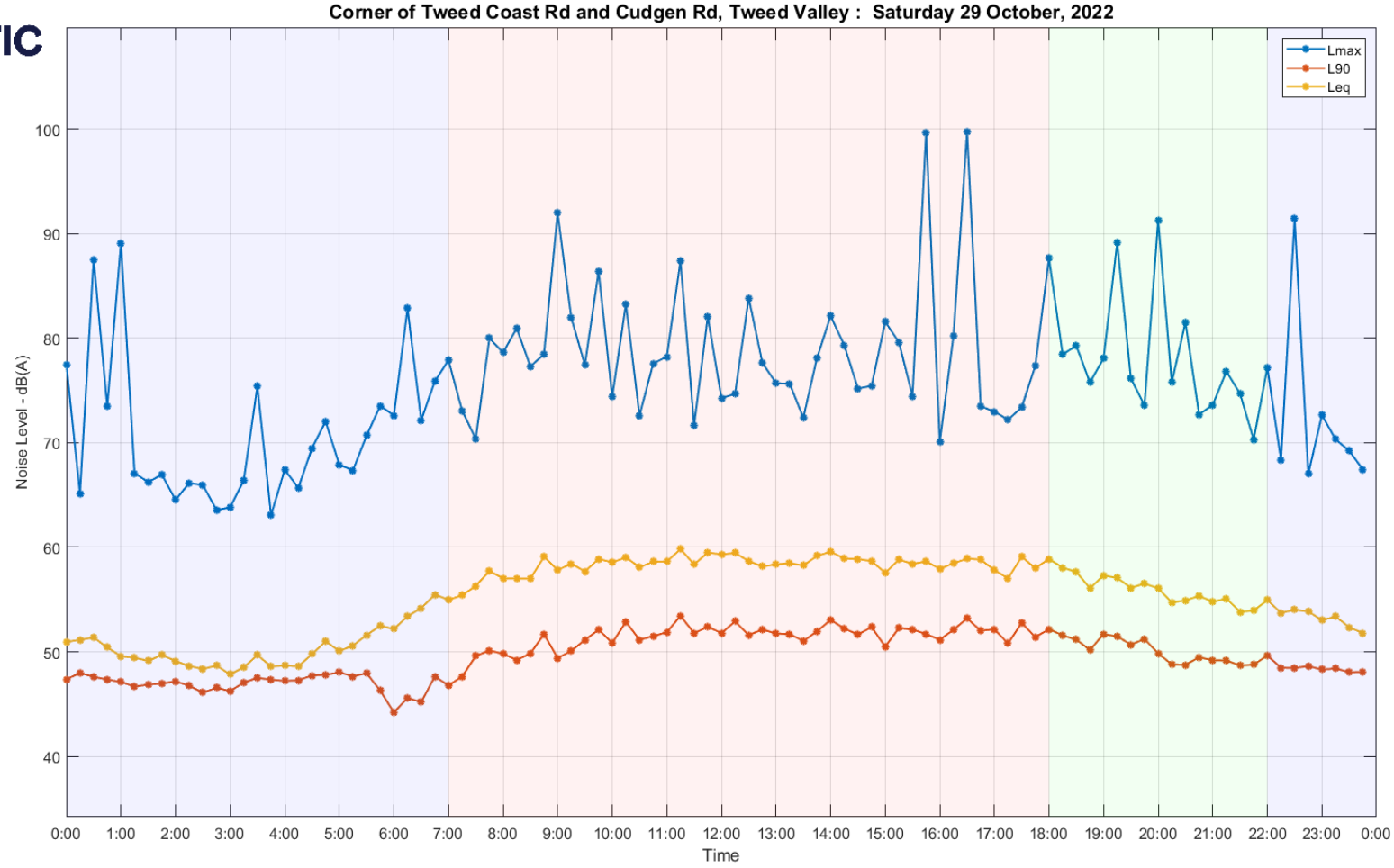
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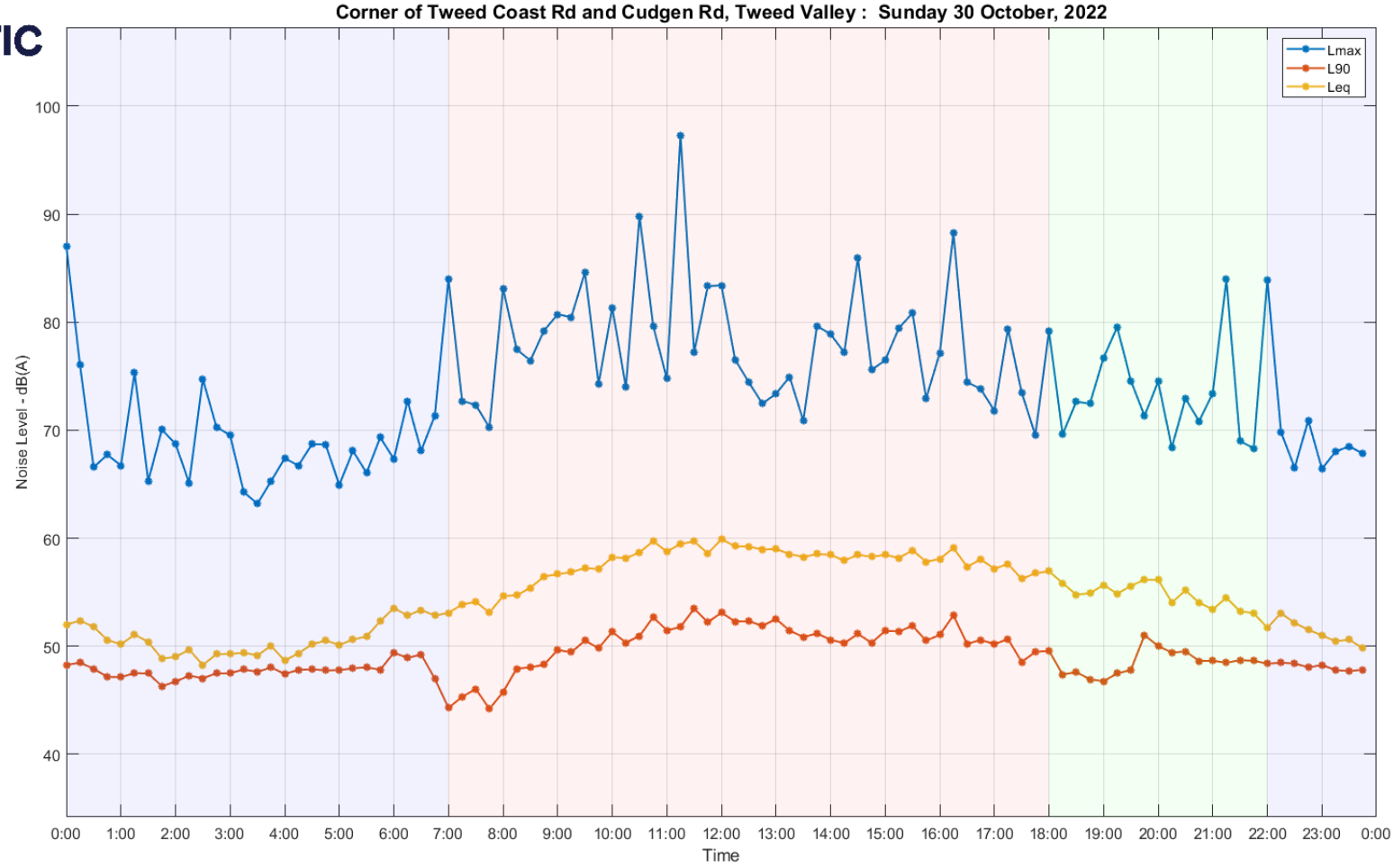
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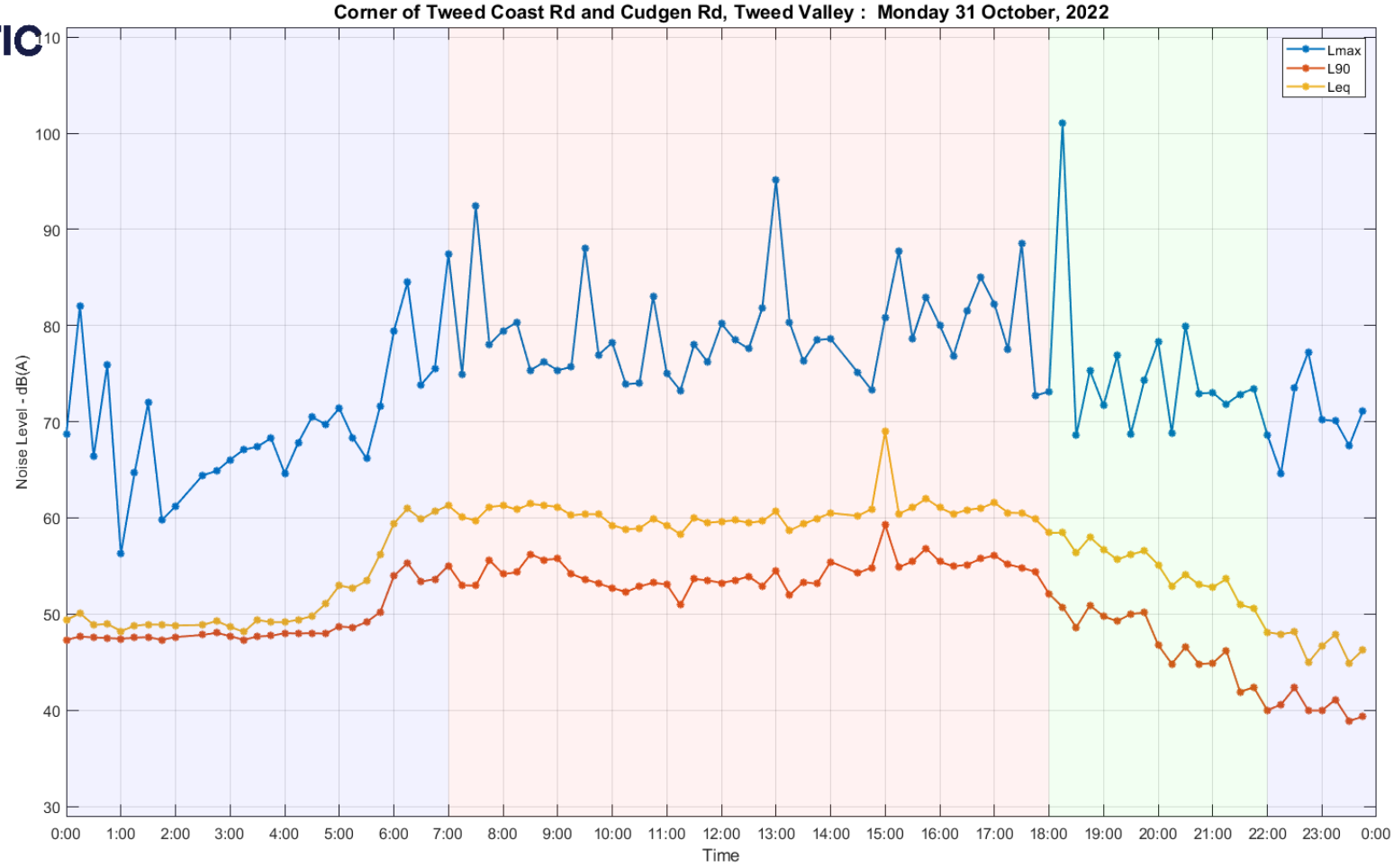
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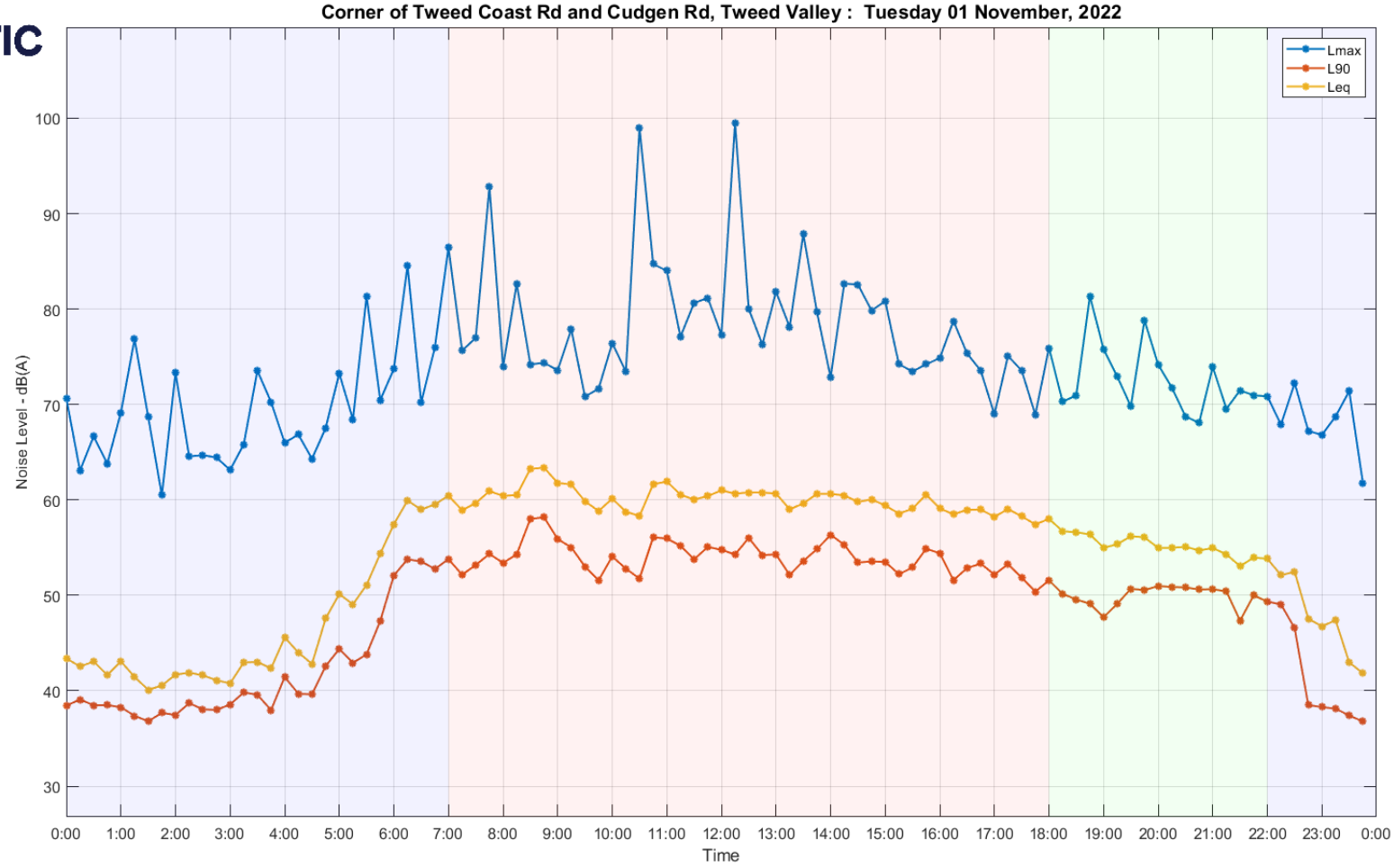
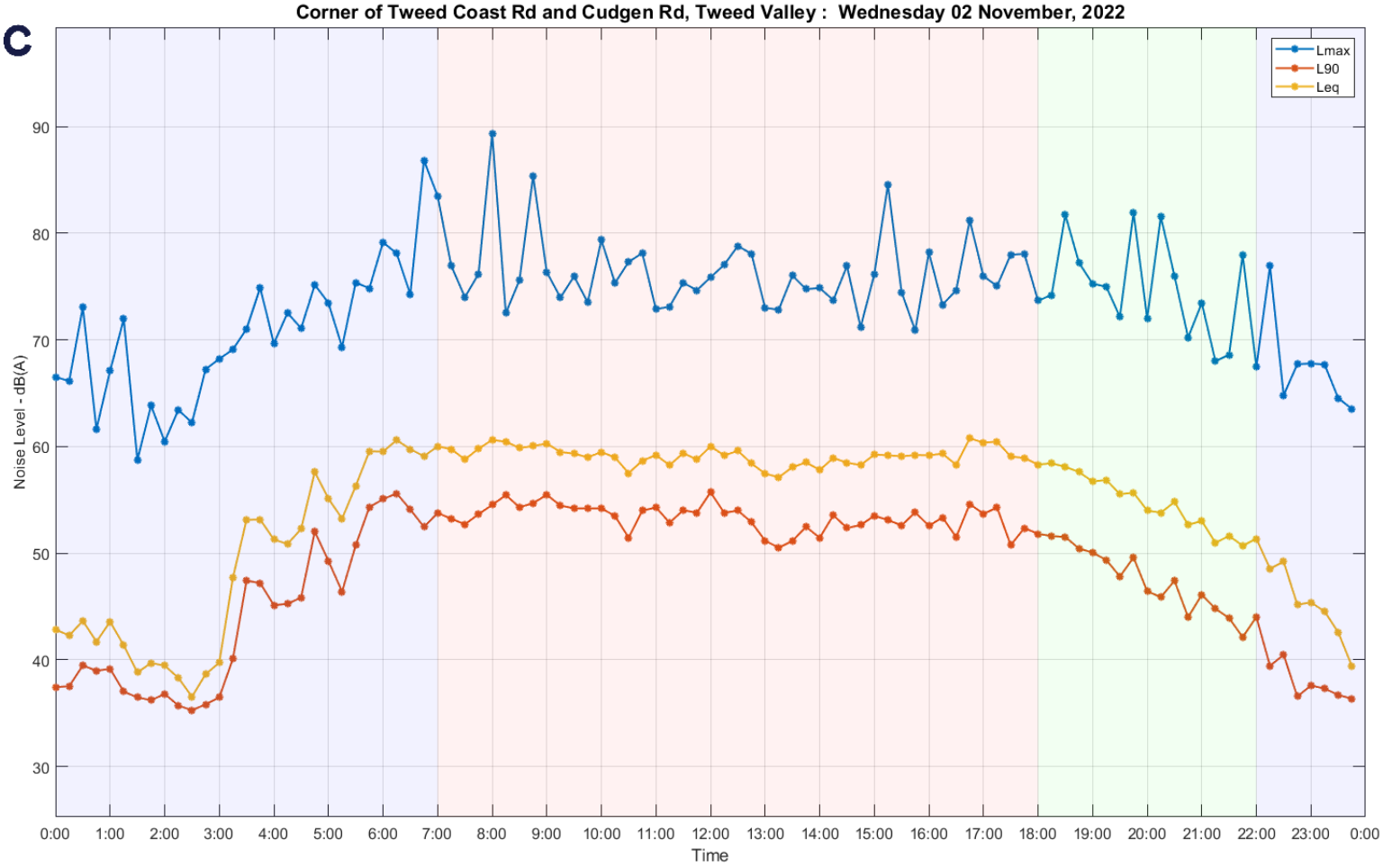
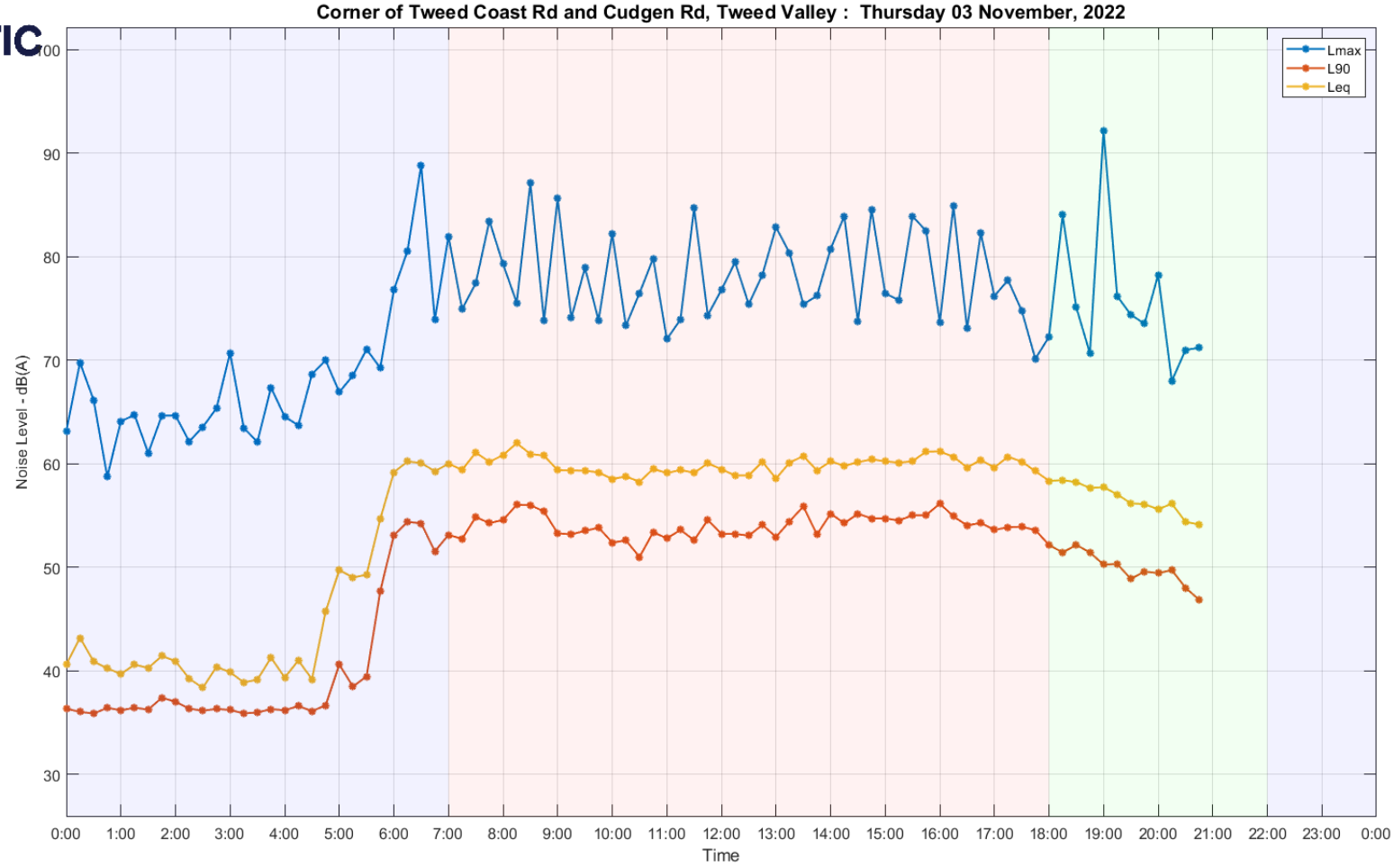
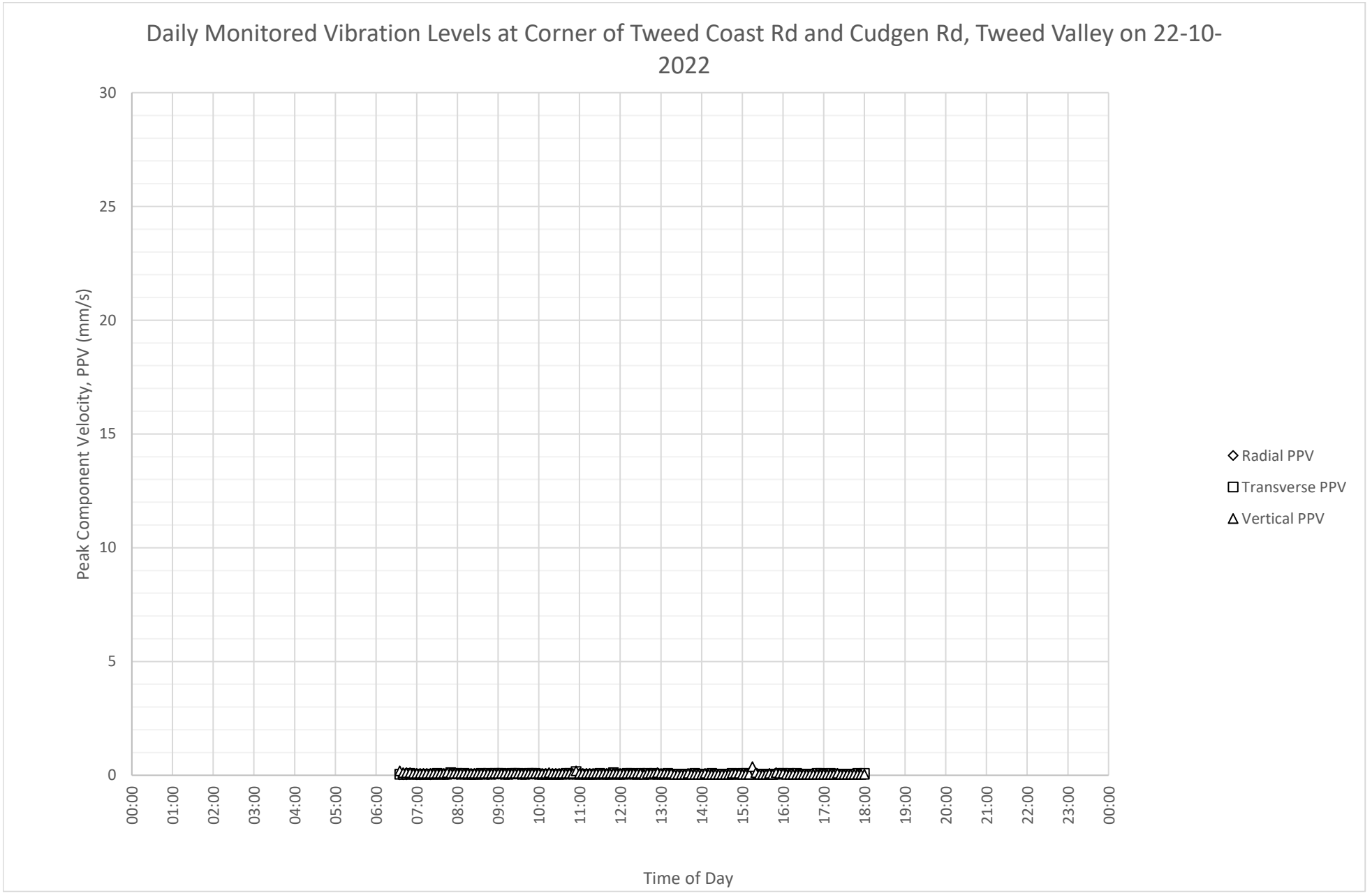
19:00
20:00
21:00
22:00
23:00
0:00
Time

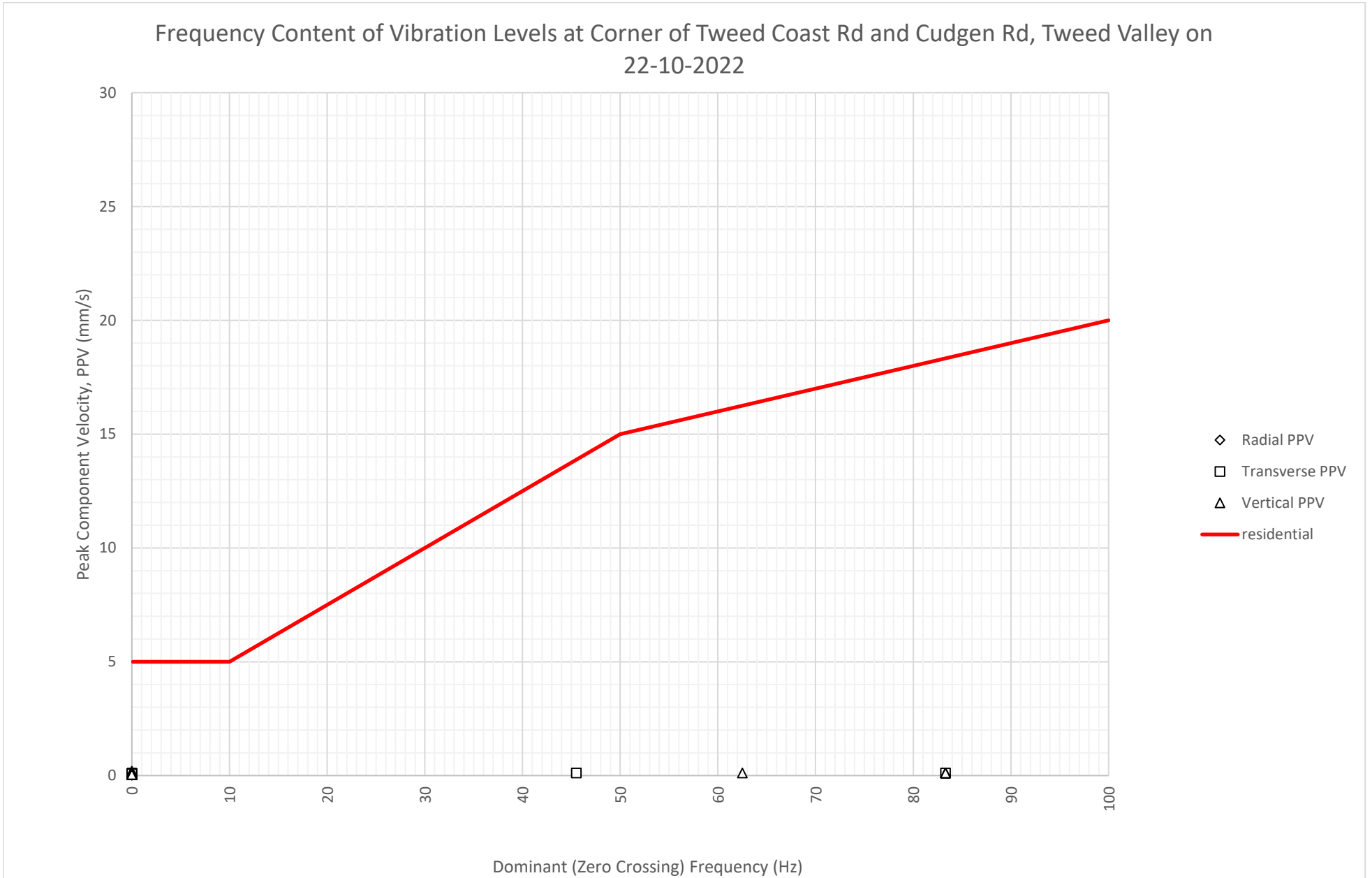

Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley : Tuesday 01 November, 2022
Lmax
L90
Leq
Noise Level - dB(A)
100
90
80
70
60
50
40
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time

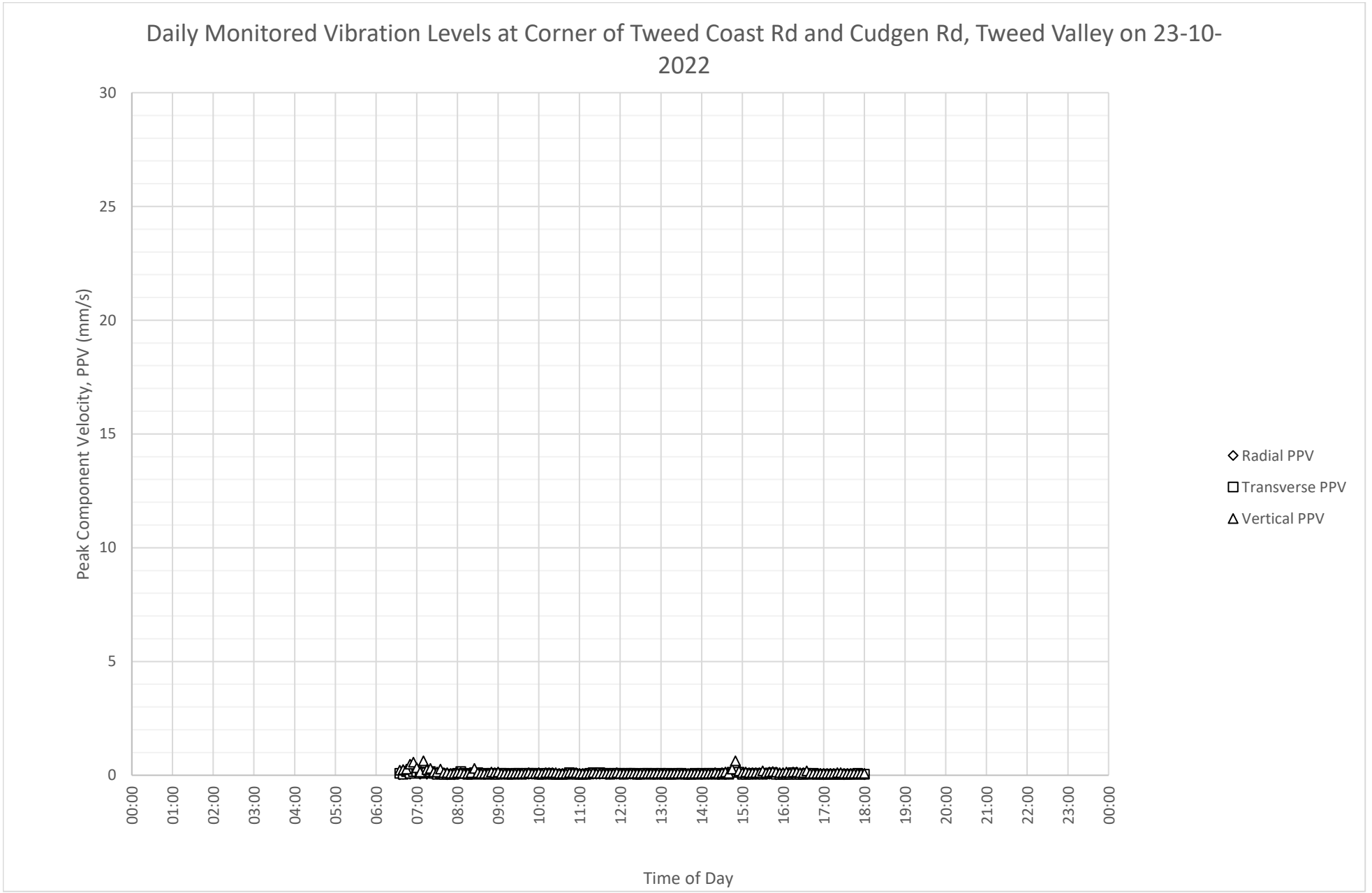

Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley : Wednesday 02 November, 2022
Lmax
L90
Leq
Noise Level - dB(A)
90
80
70
60
50
40
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time

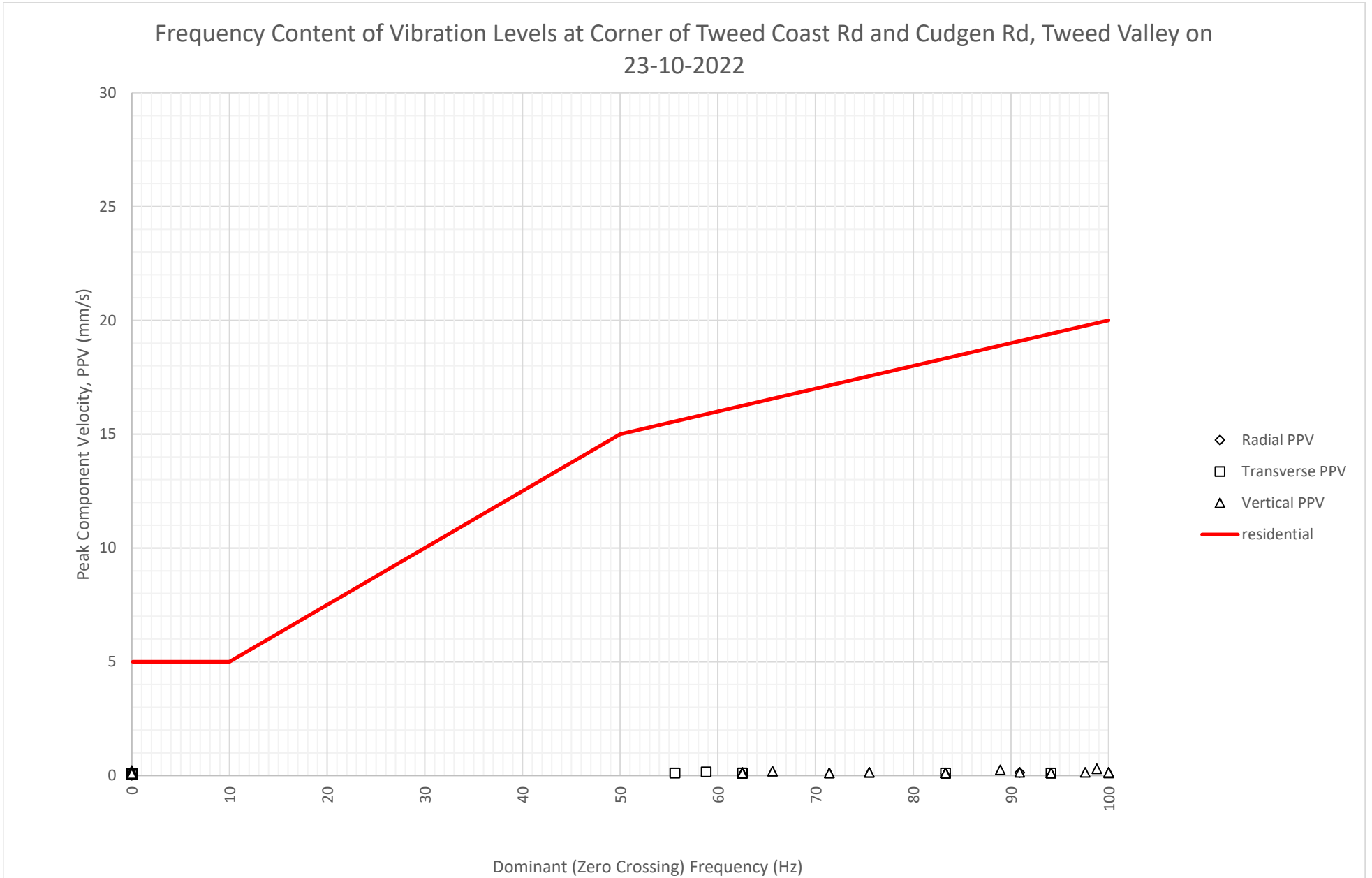

Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley : Thursday 03 November, 2022
Lmax
L90
Leq
Noise Level - dB(A)
100
90
80
70
60
50
40
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time

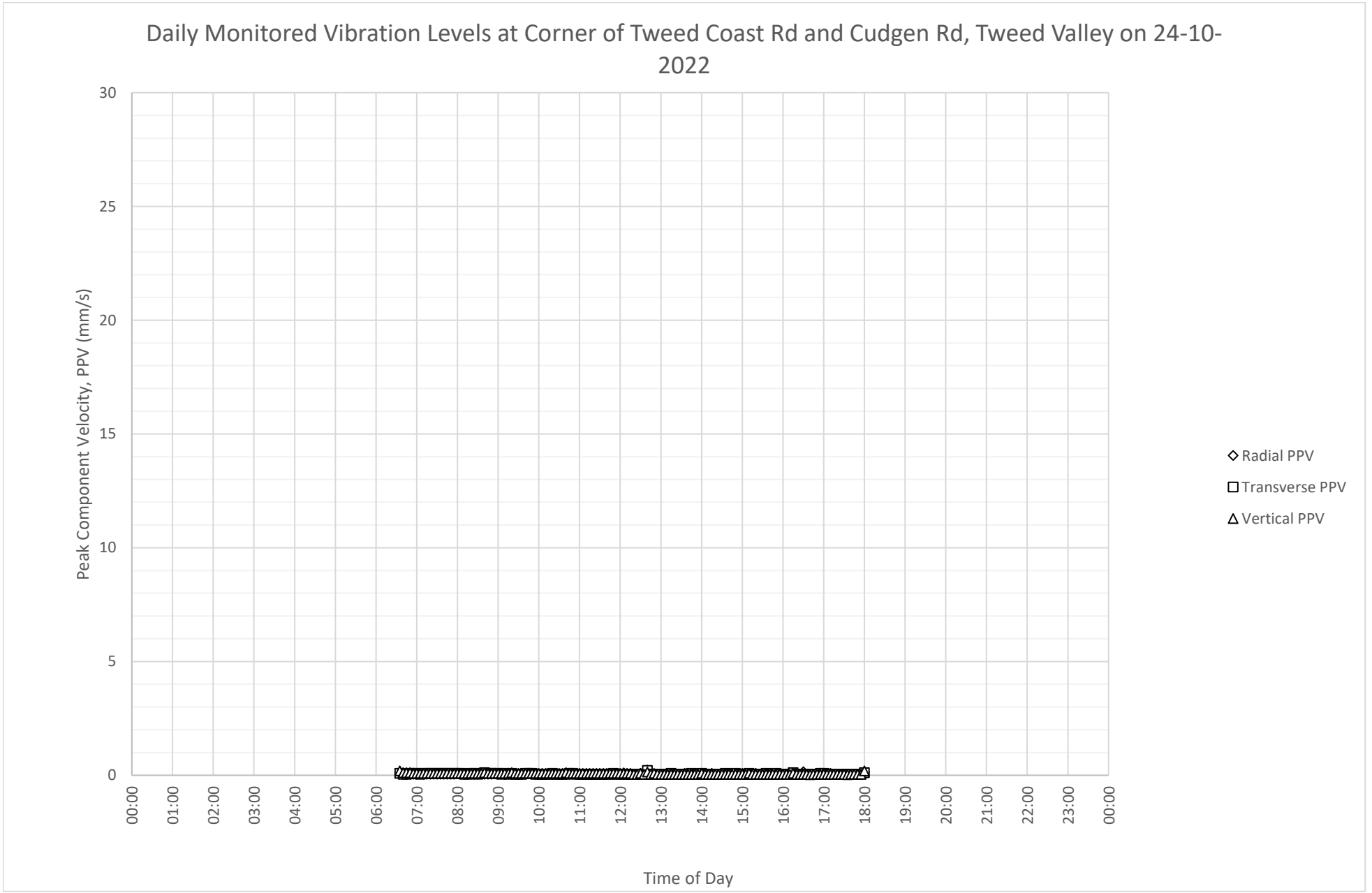
APPENDIX 2 – VIBRATION MONITORING RESULTS

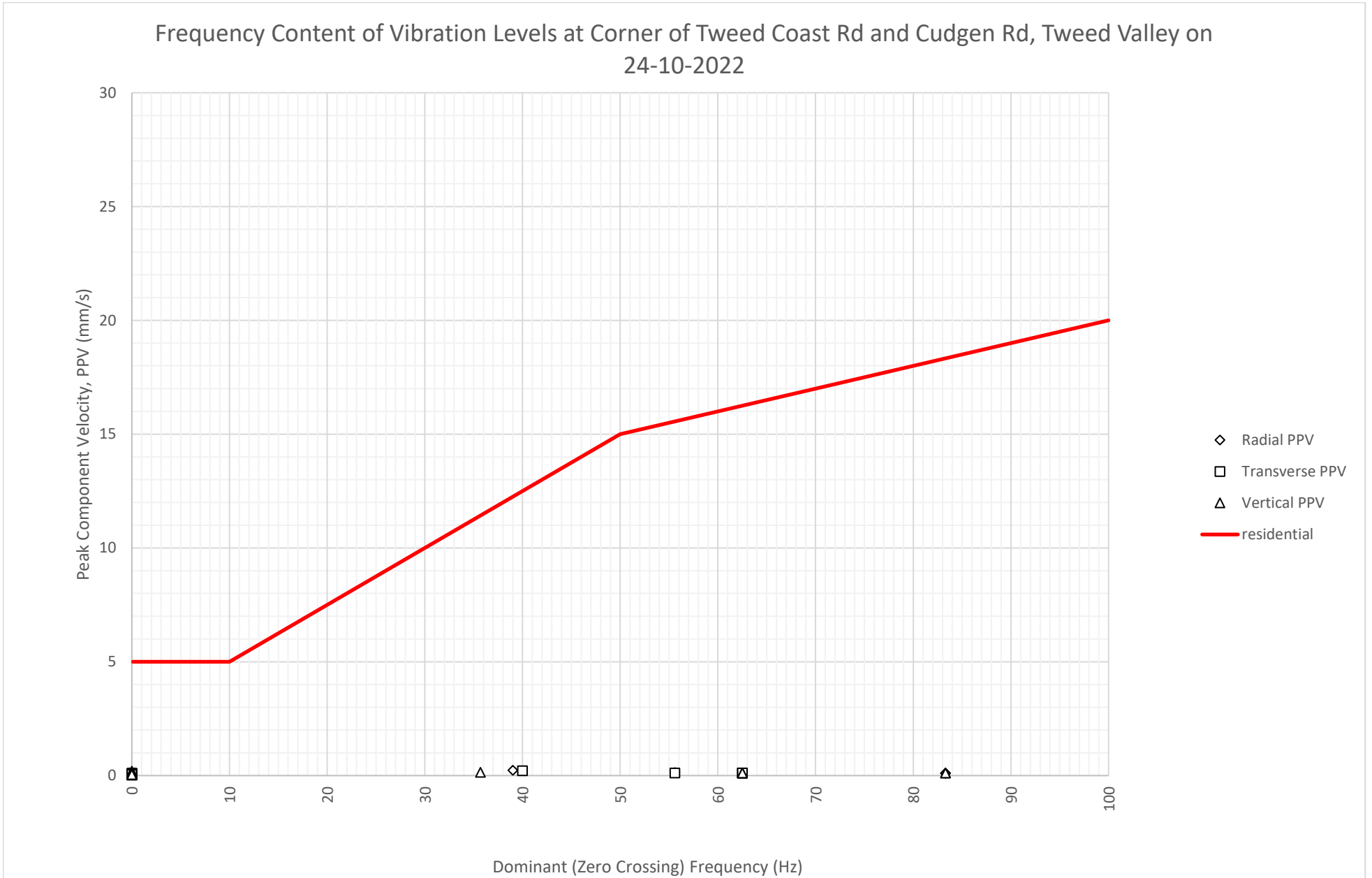

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 22-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

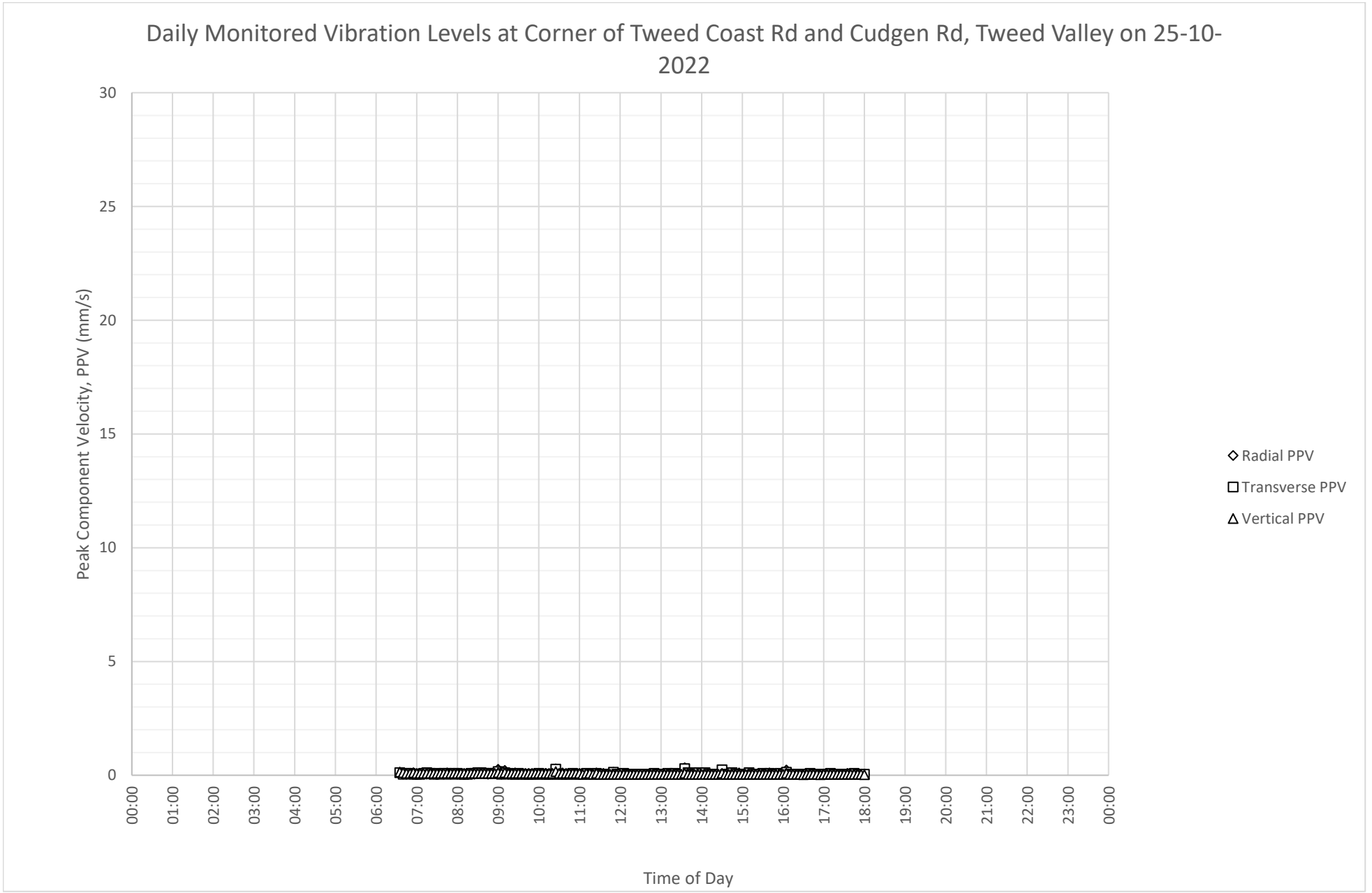

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 22-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

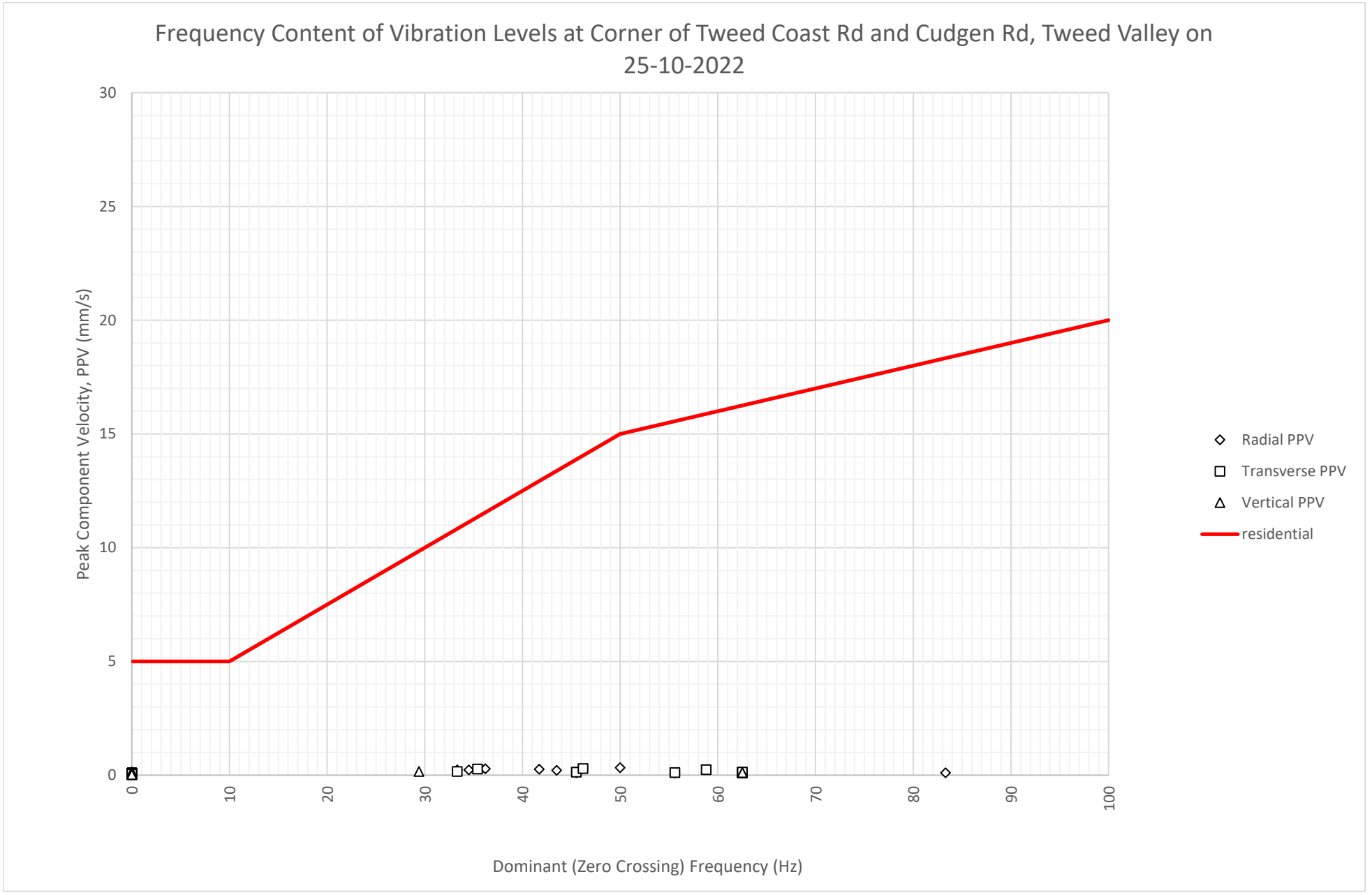

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 23-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

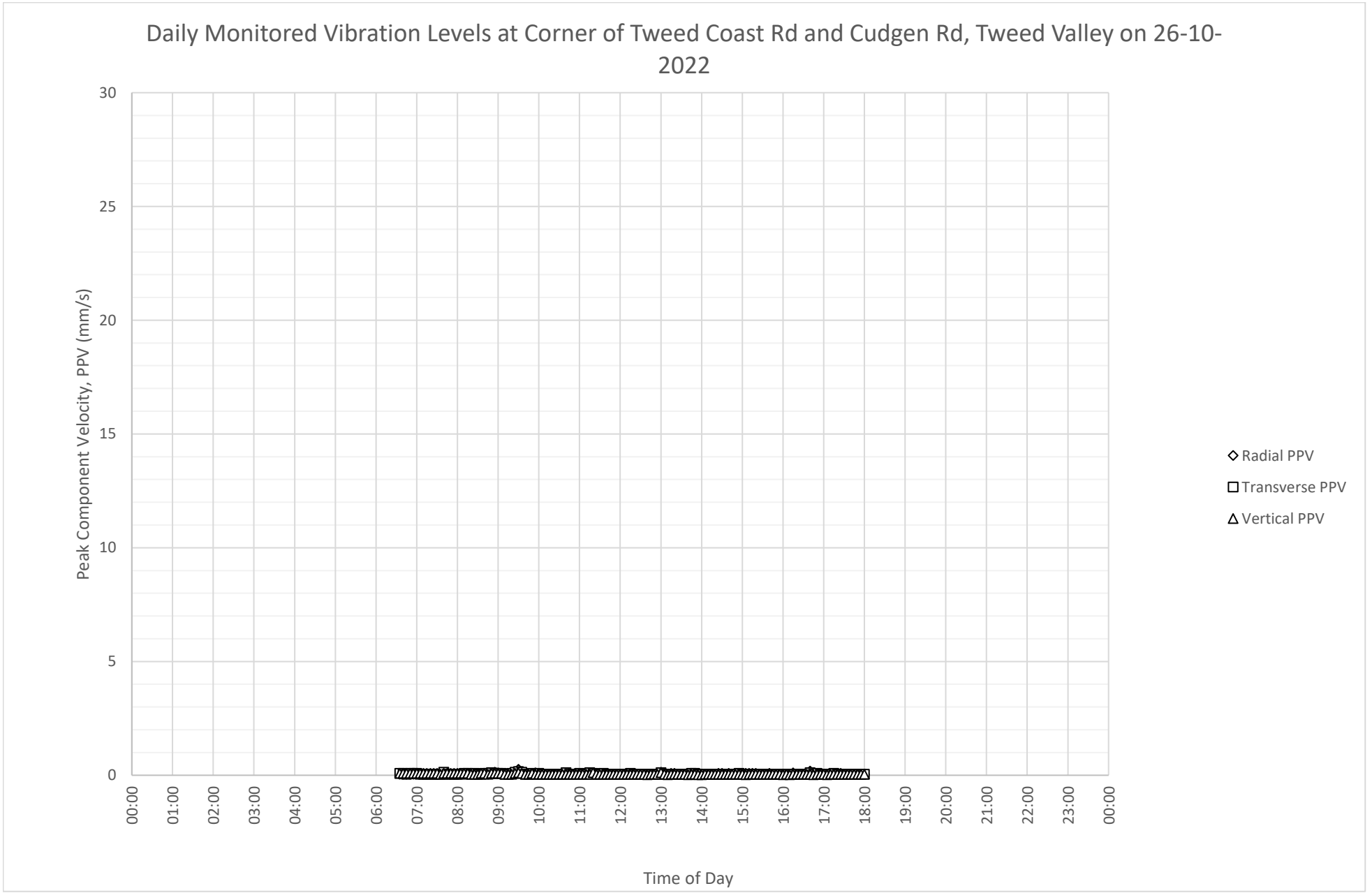

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 23-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

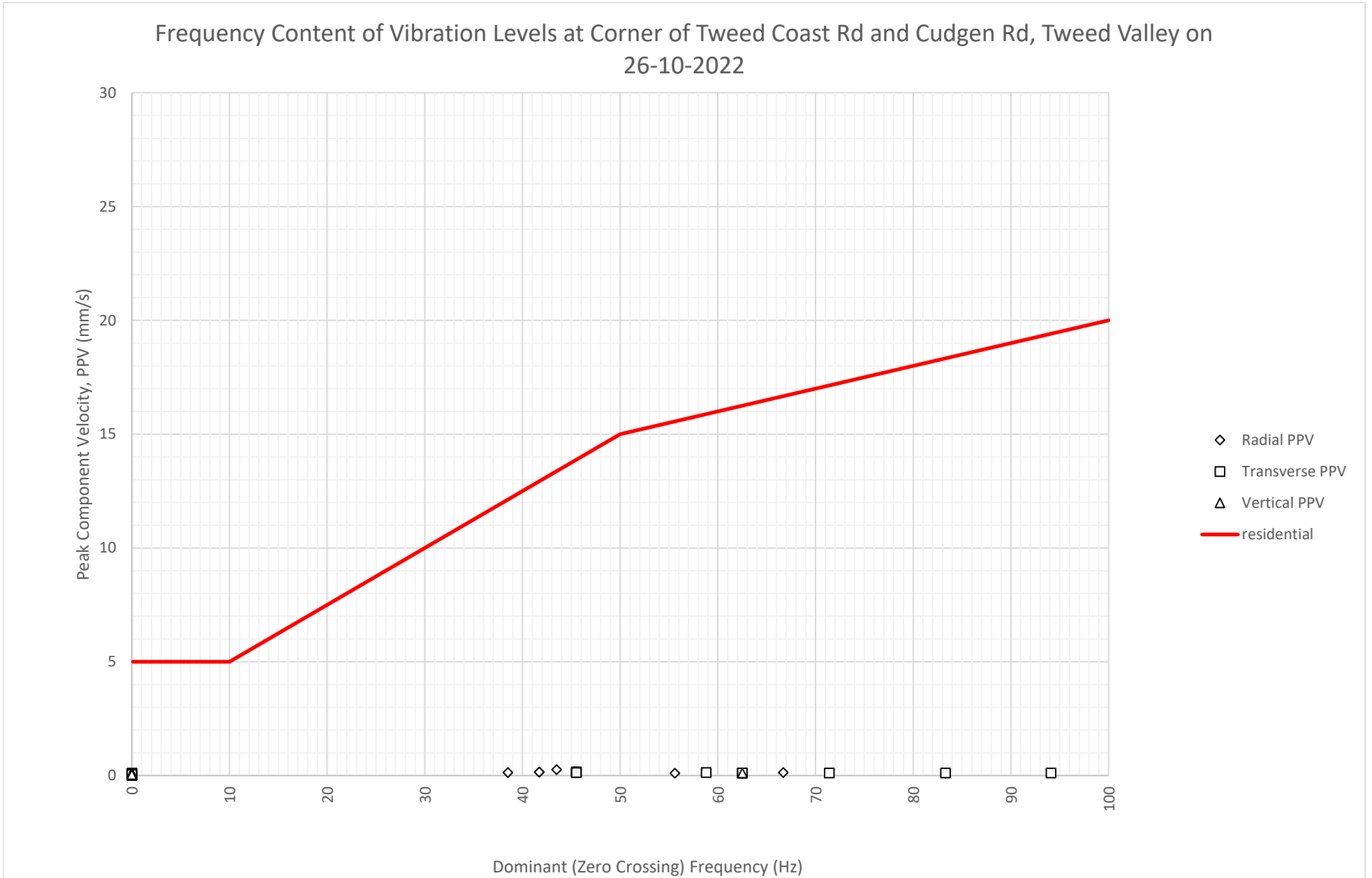

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 24-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

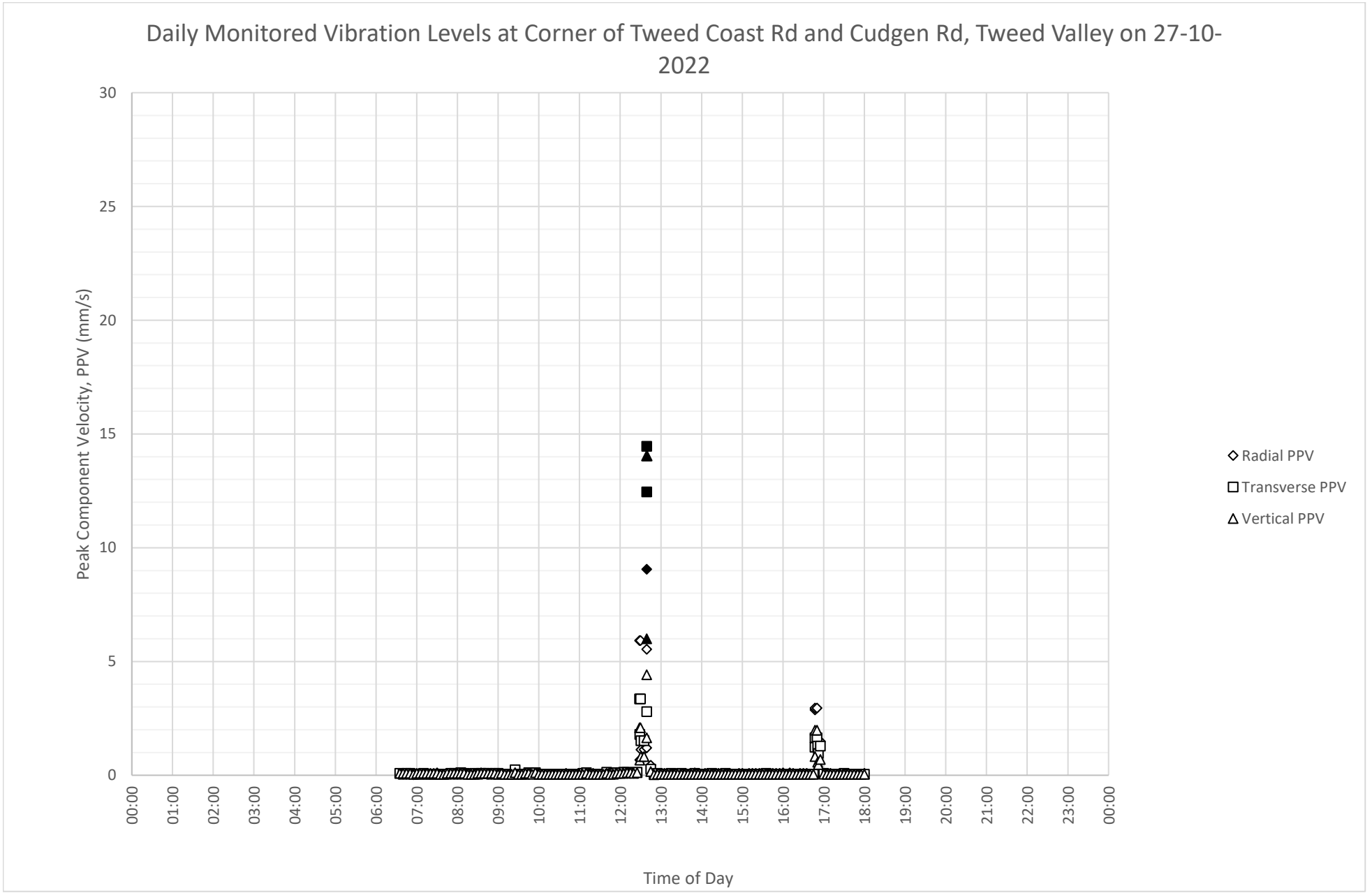

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 24-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

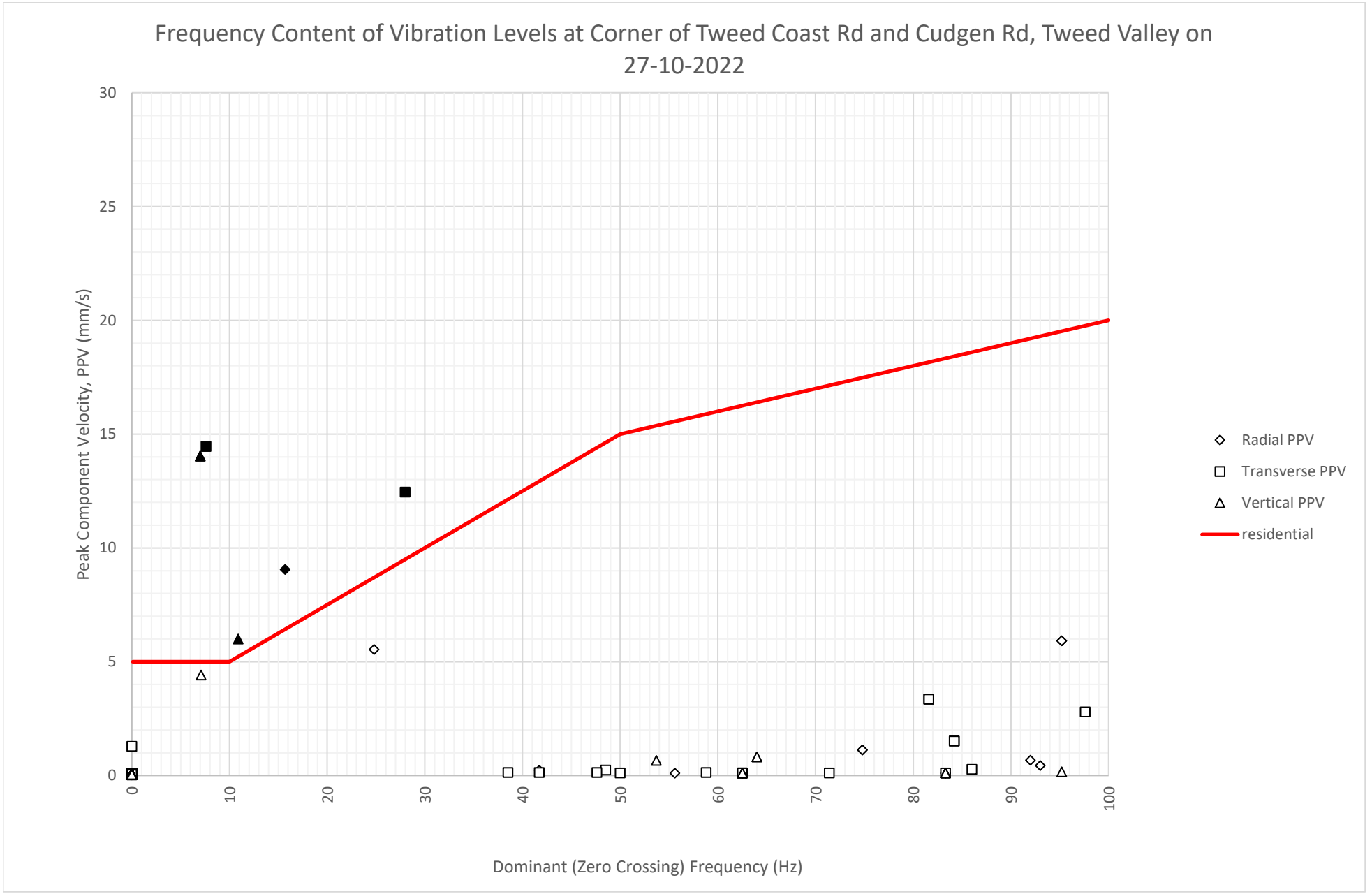

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 25-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

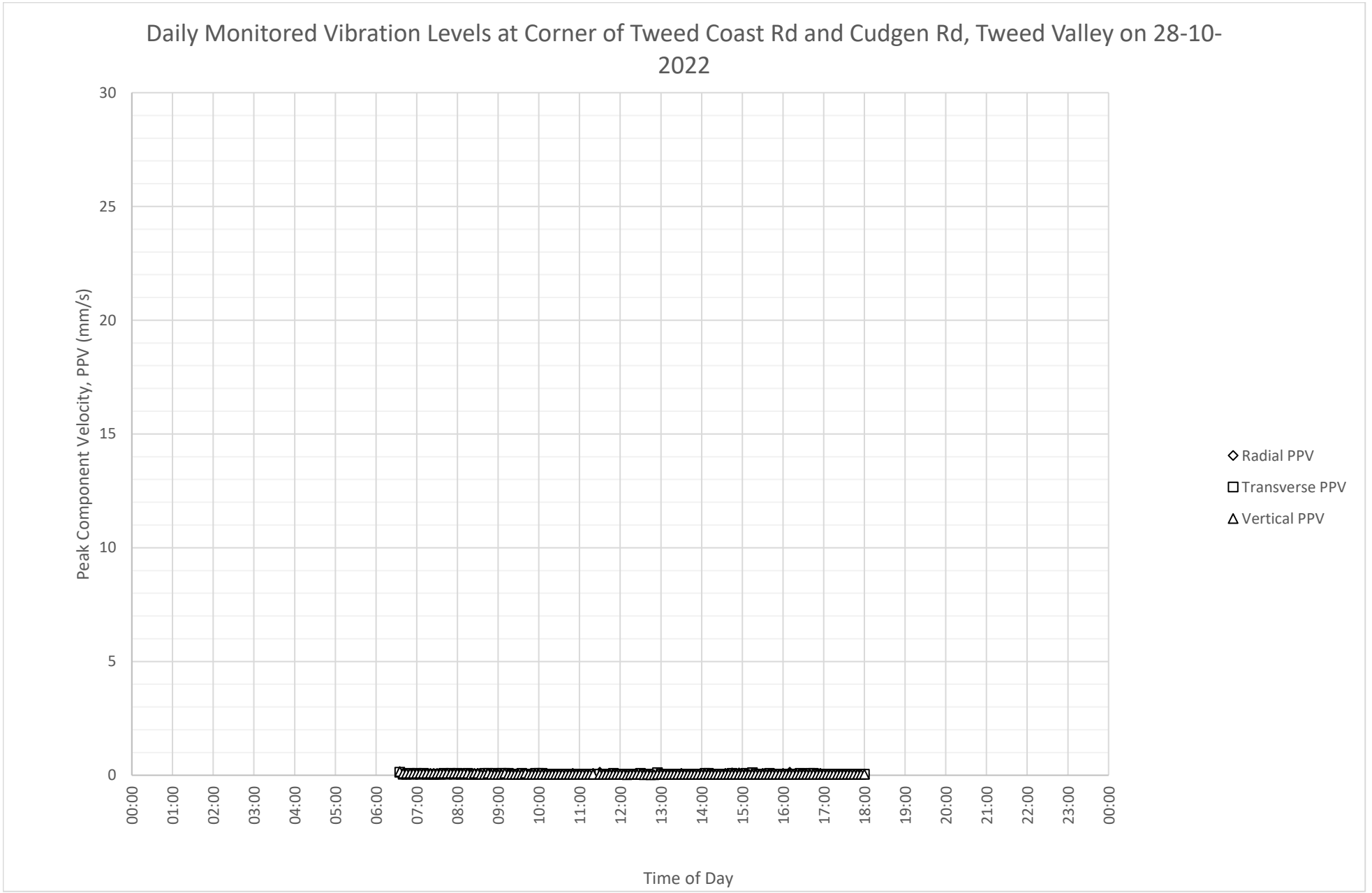

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 25-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

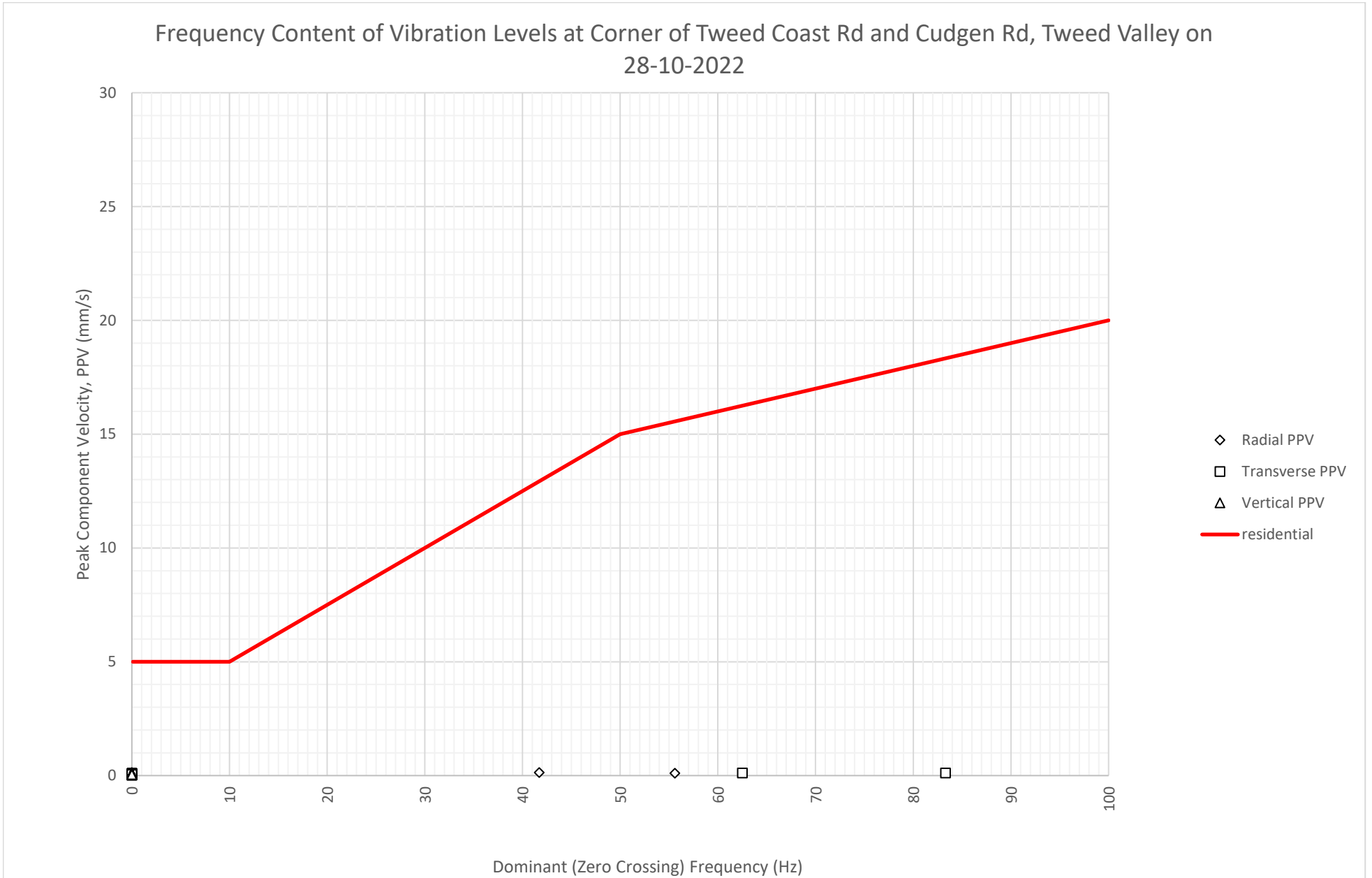

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 26-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

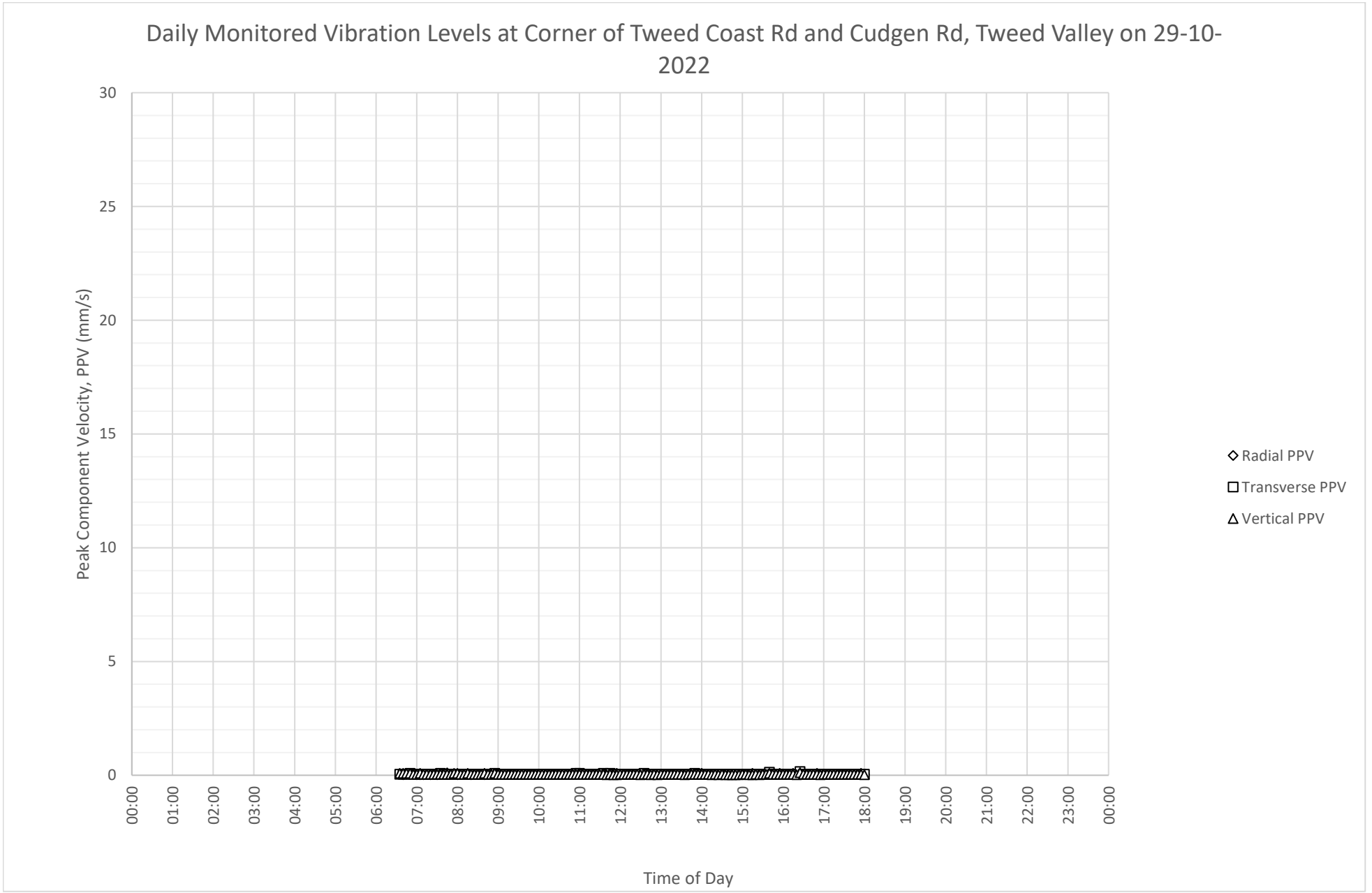

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 26-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

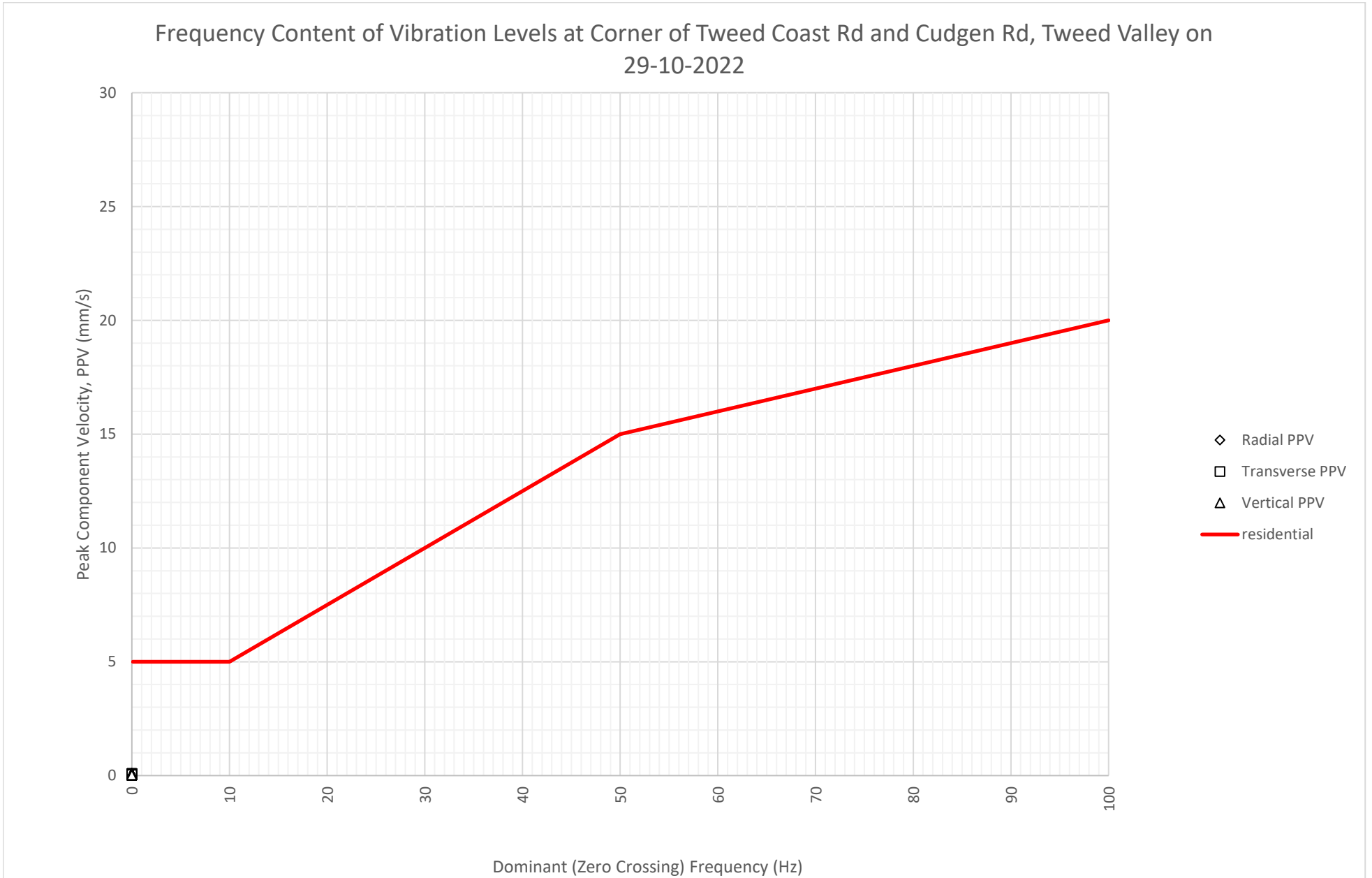

Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 27-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

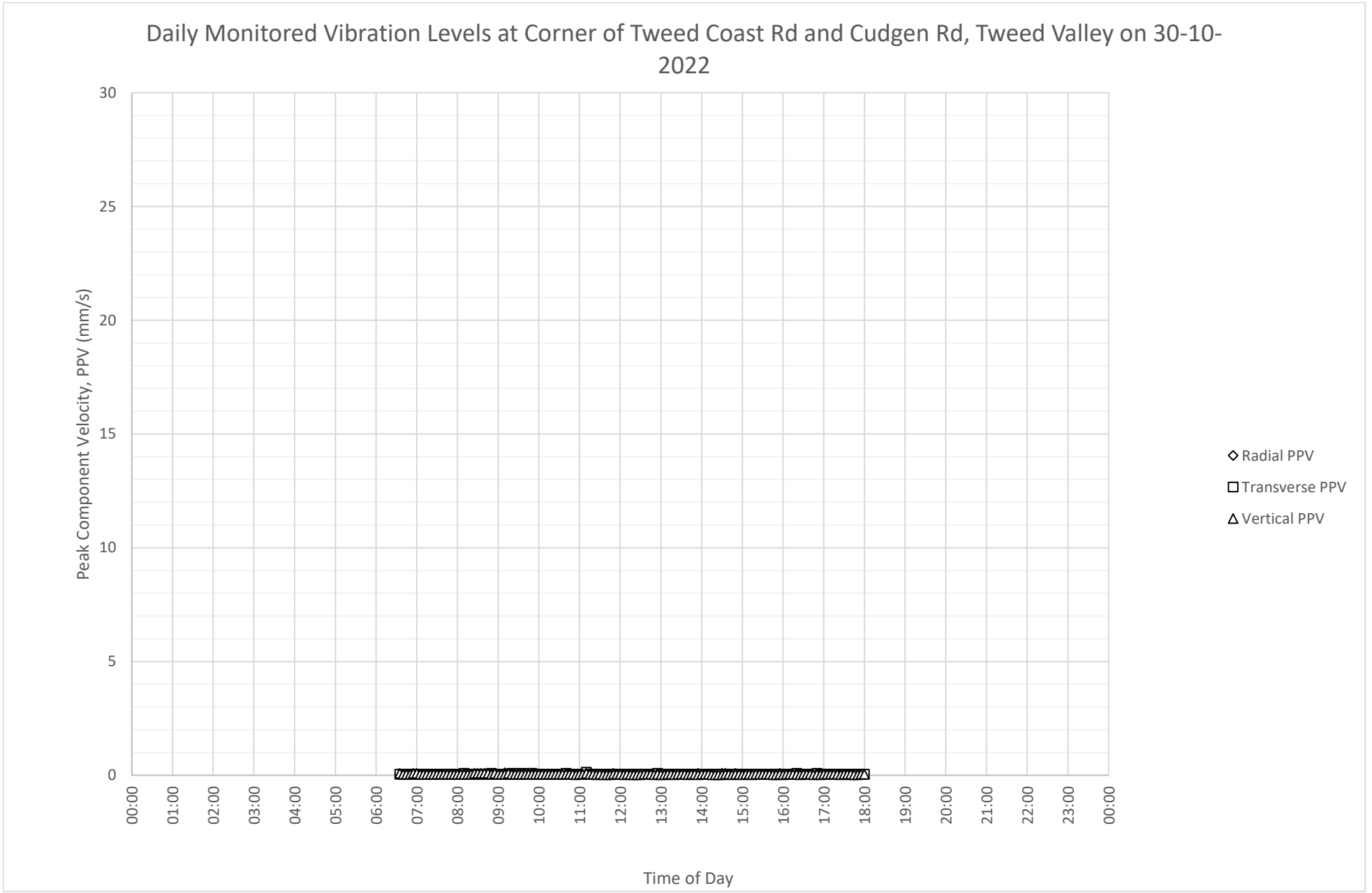

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 27-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 28-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 28-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 29-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 29-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 30-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
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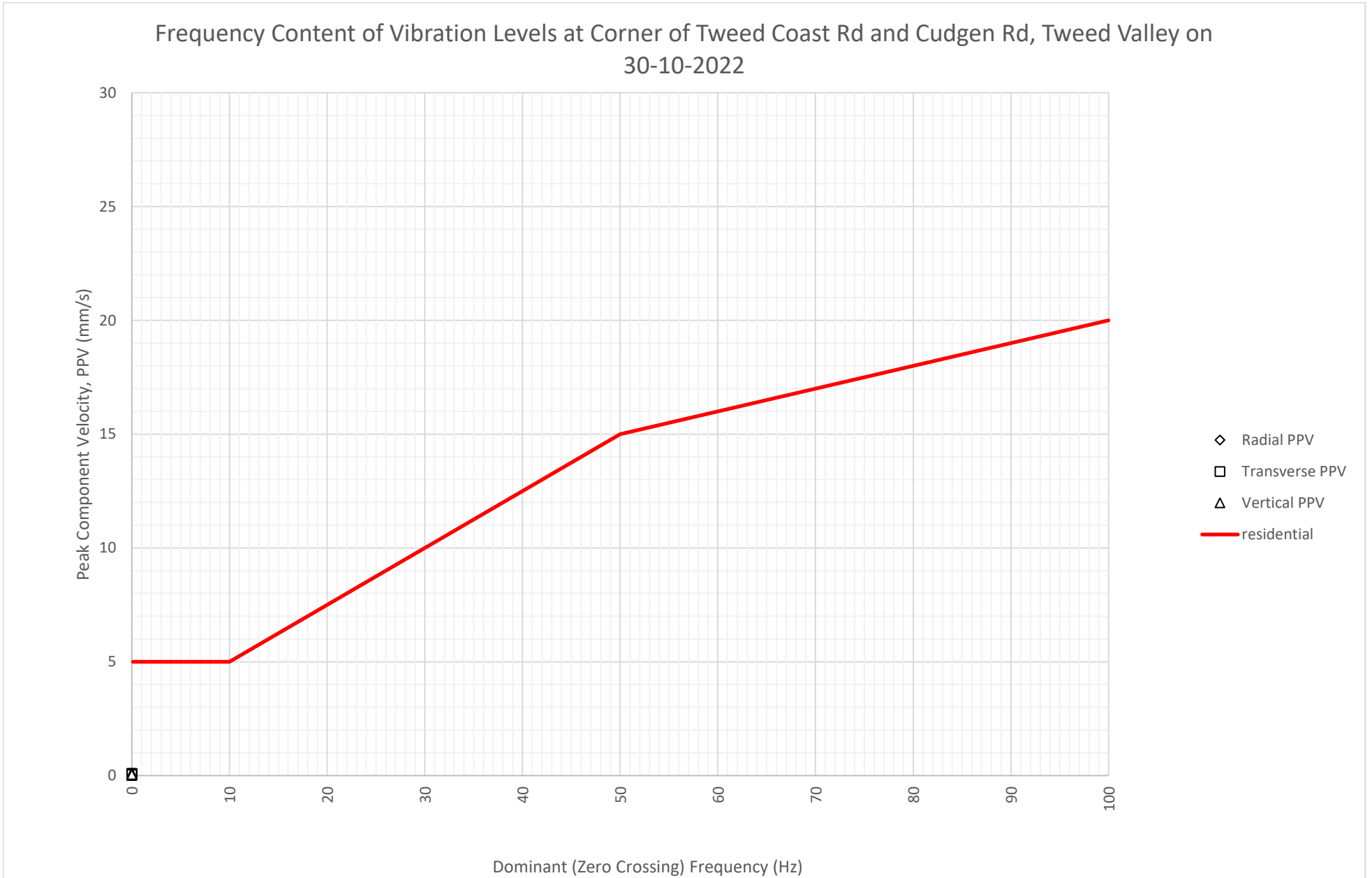
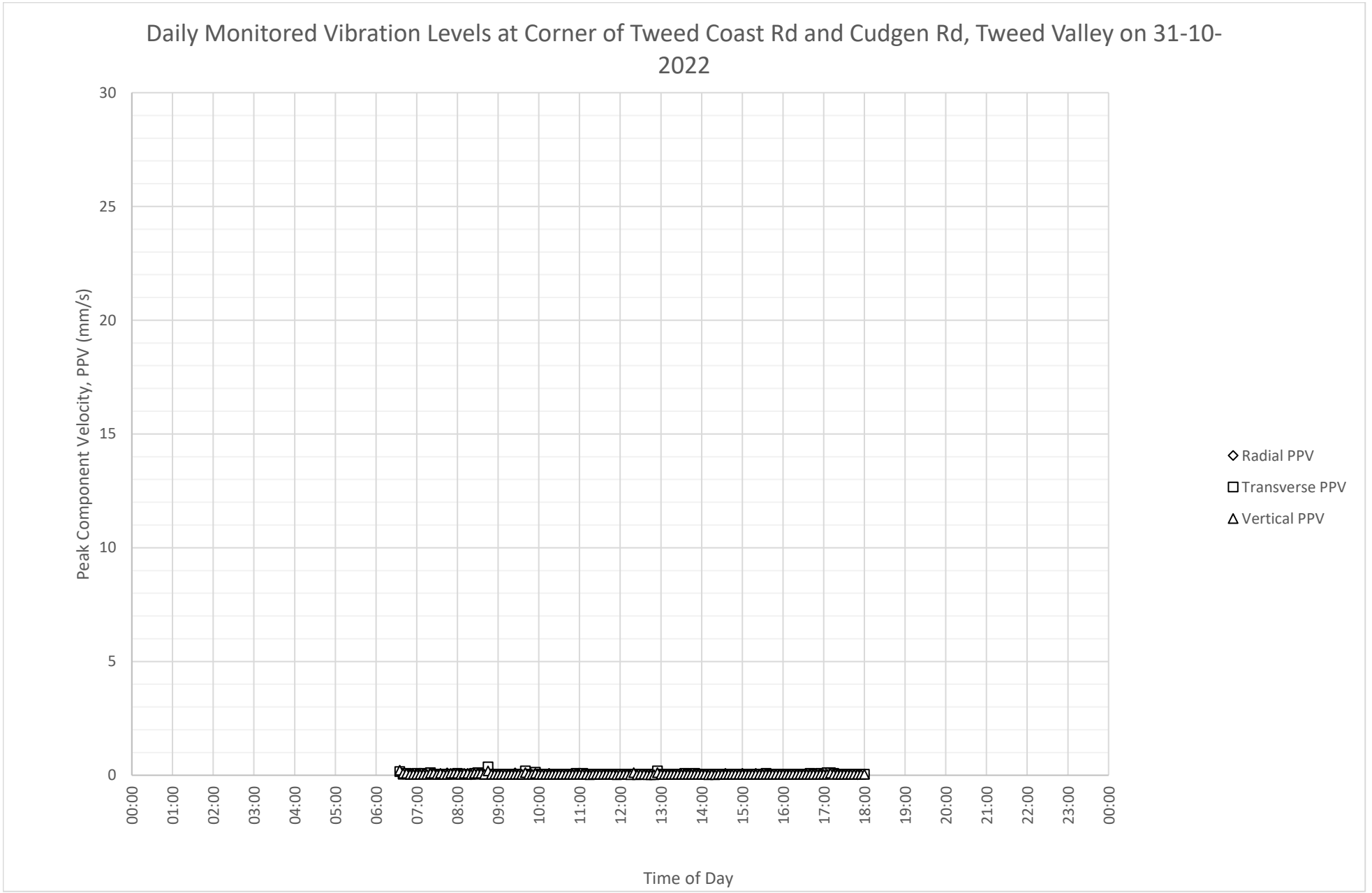
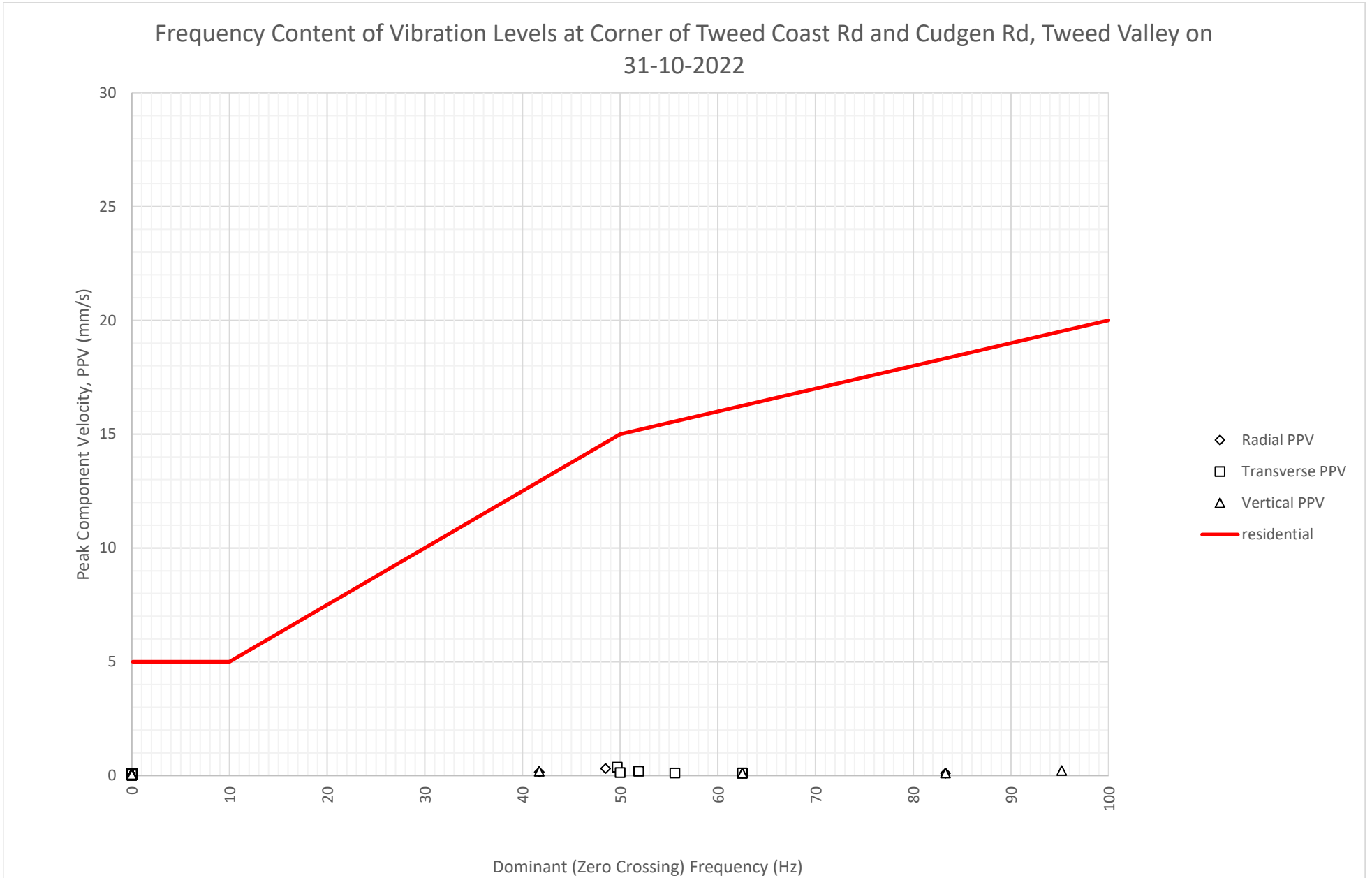
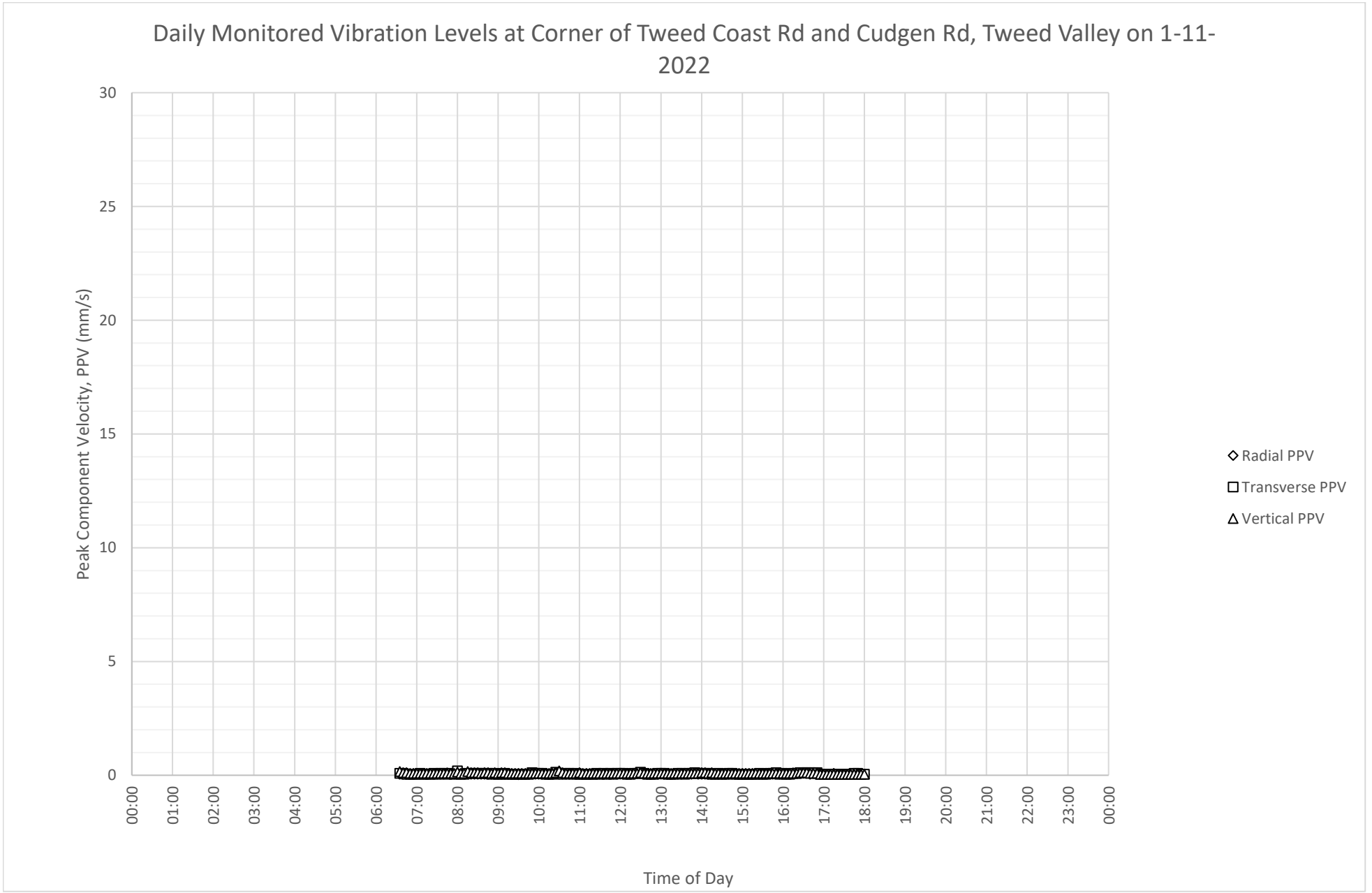
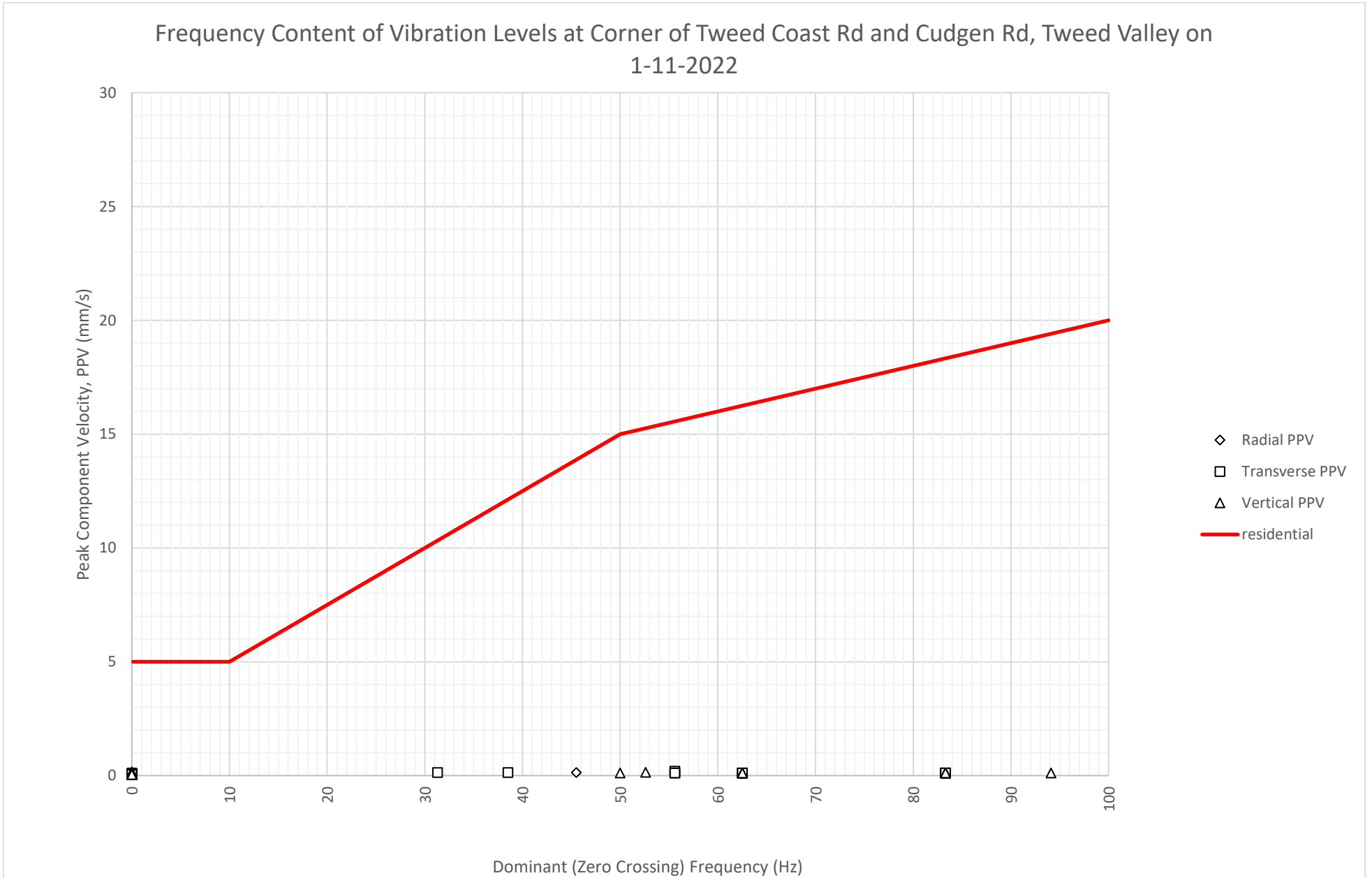
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV

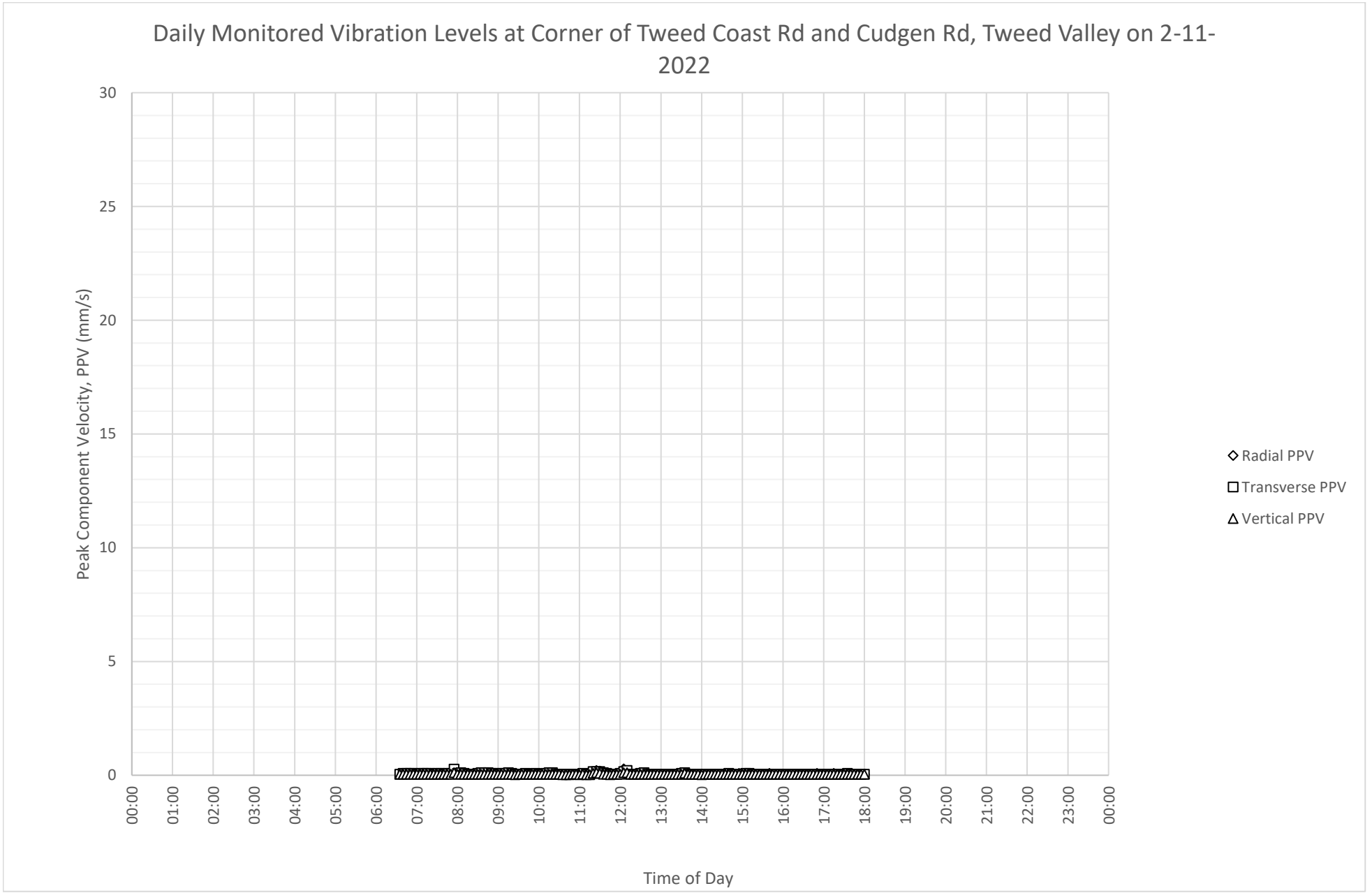

Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 30-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 31-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 31-10-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 1-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 1-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 2-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
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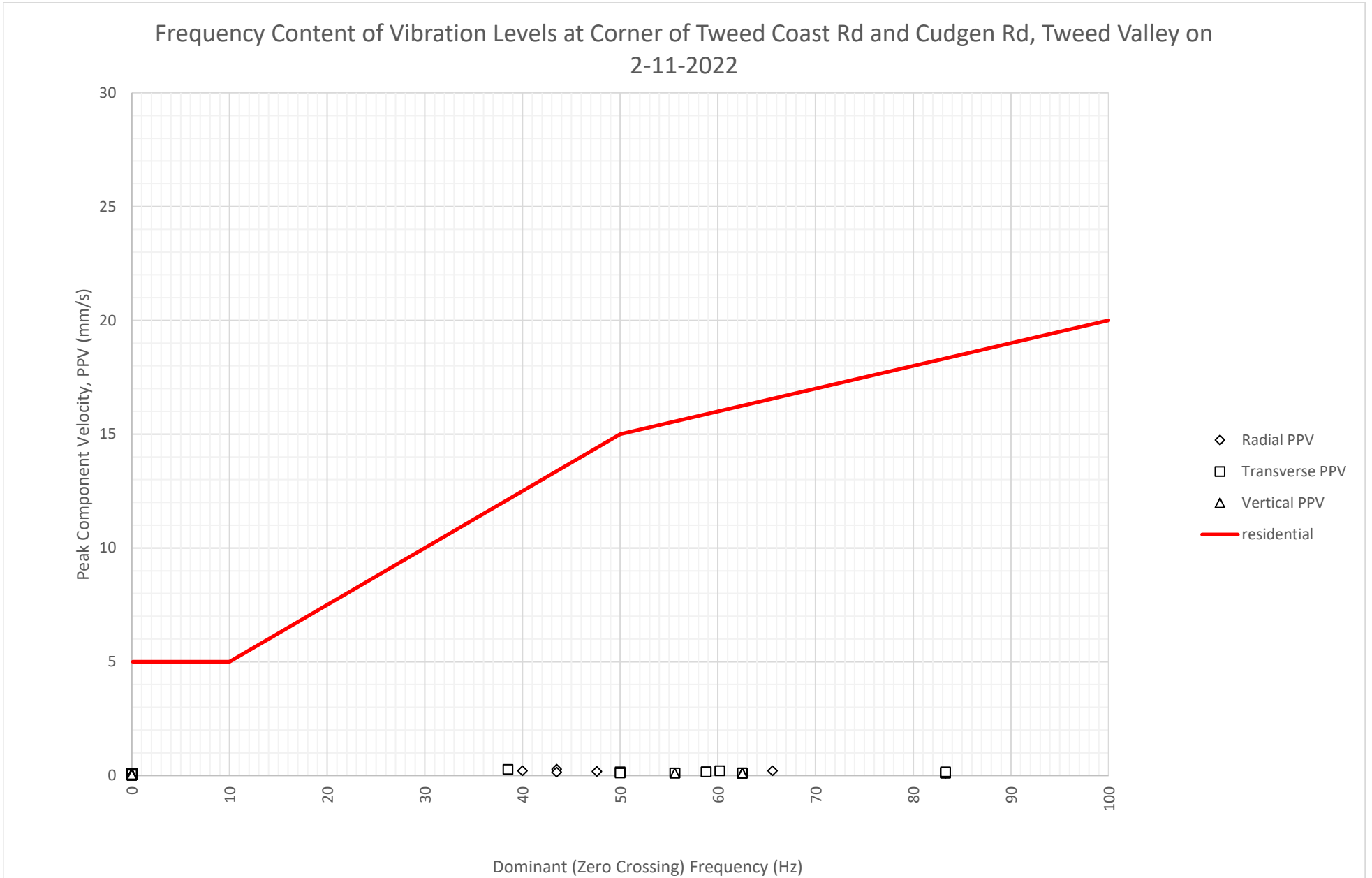
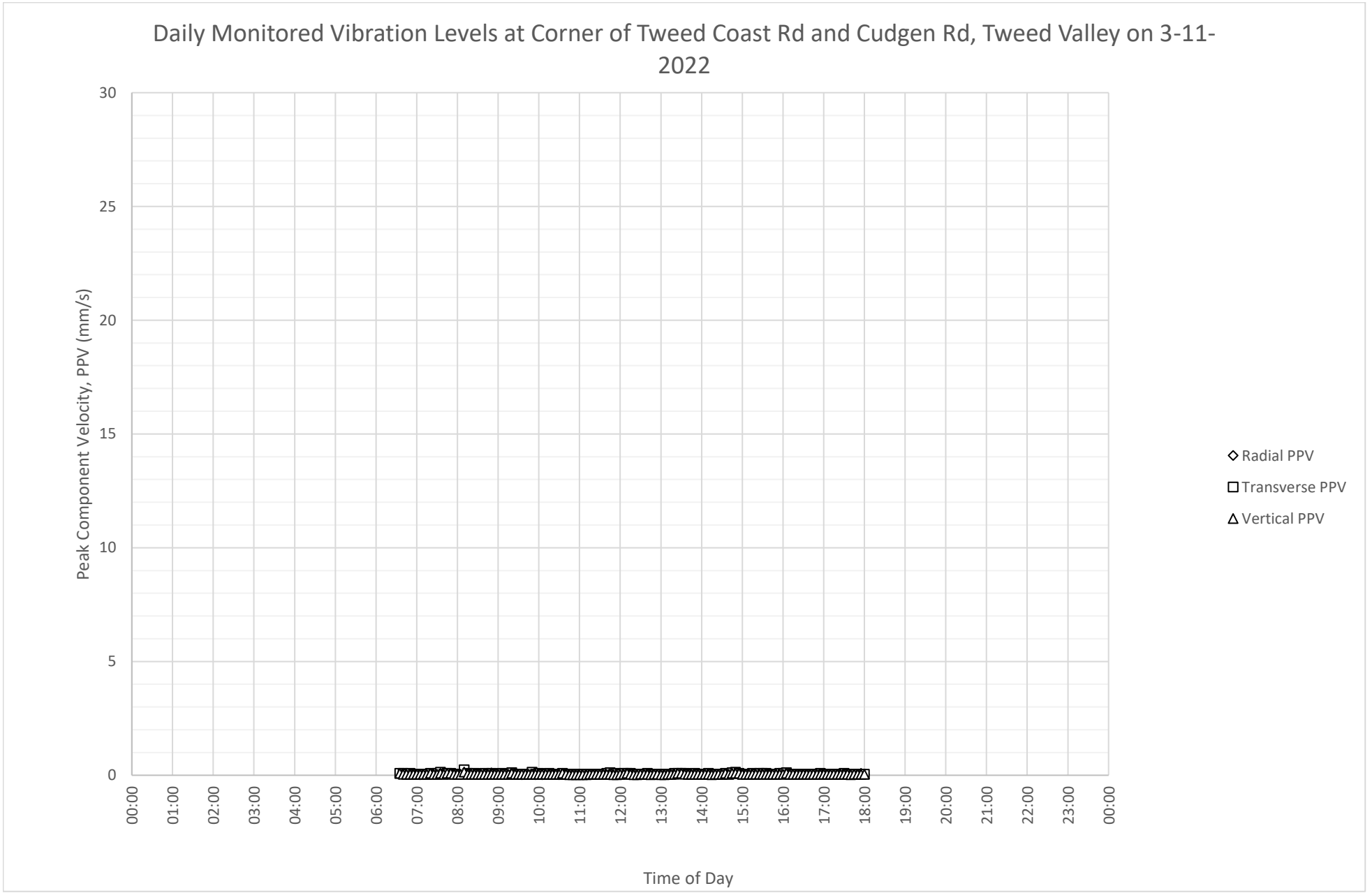
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 2-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 3-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
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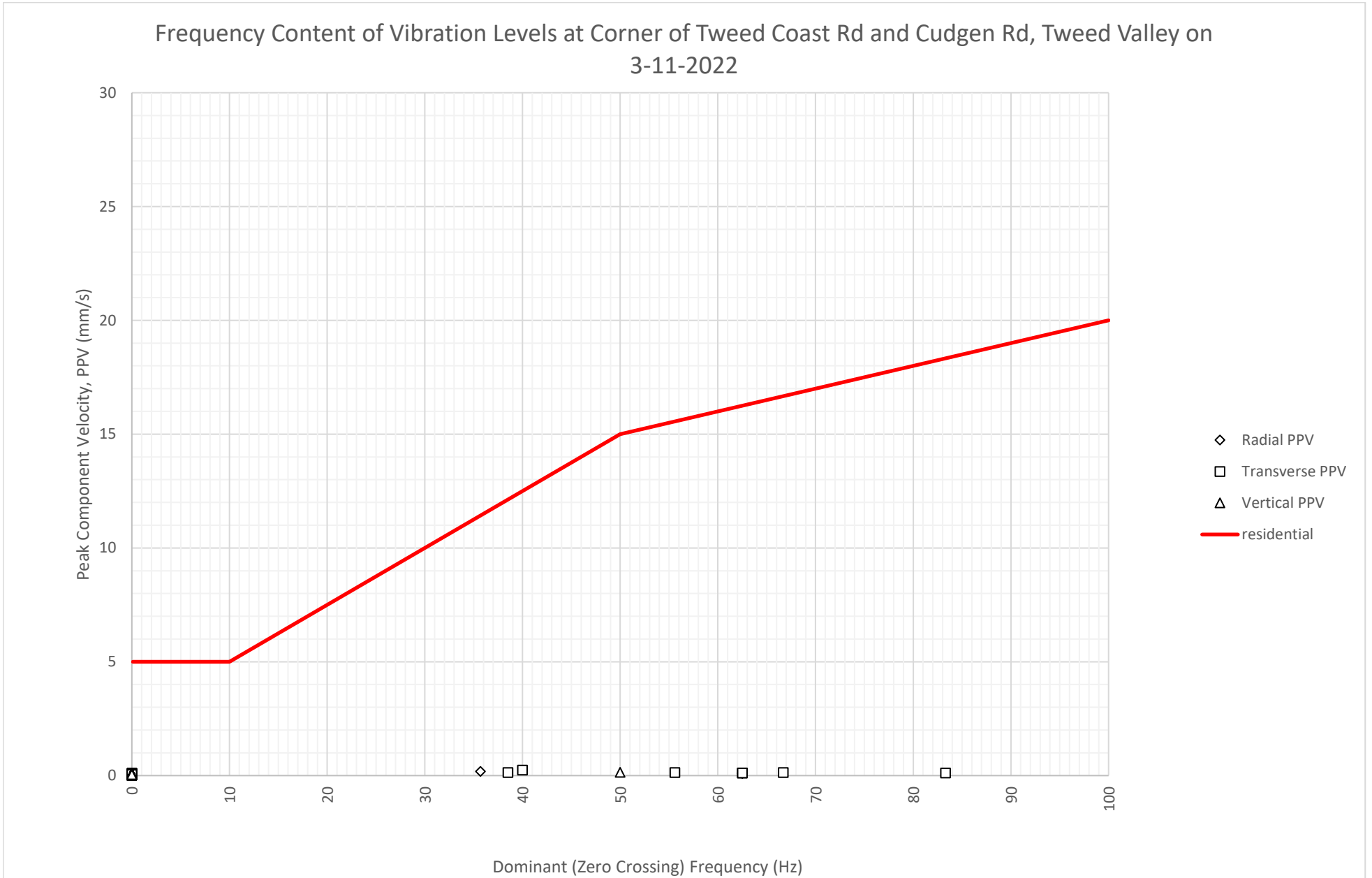
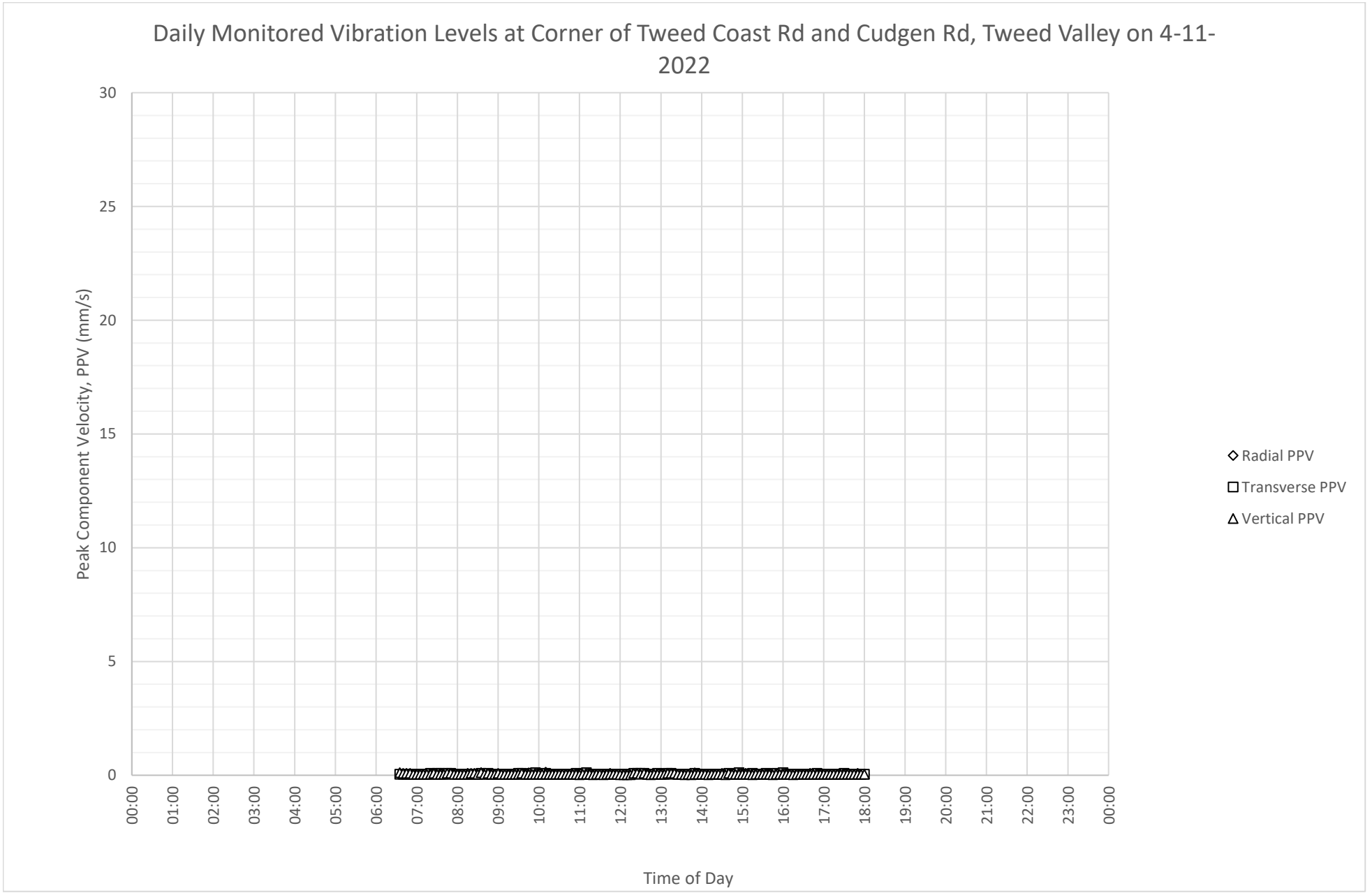
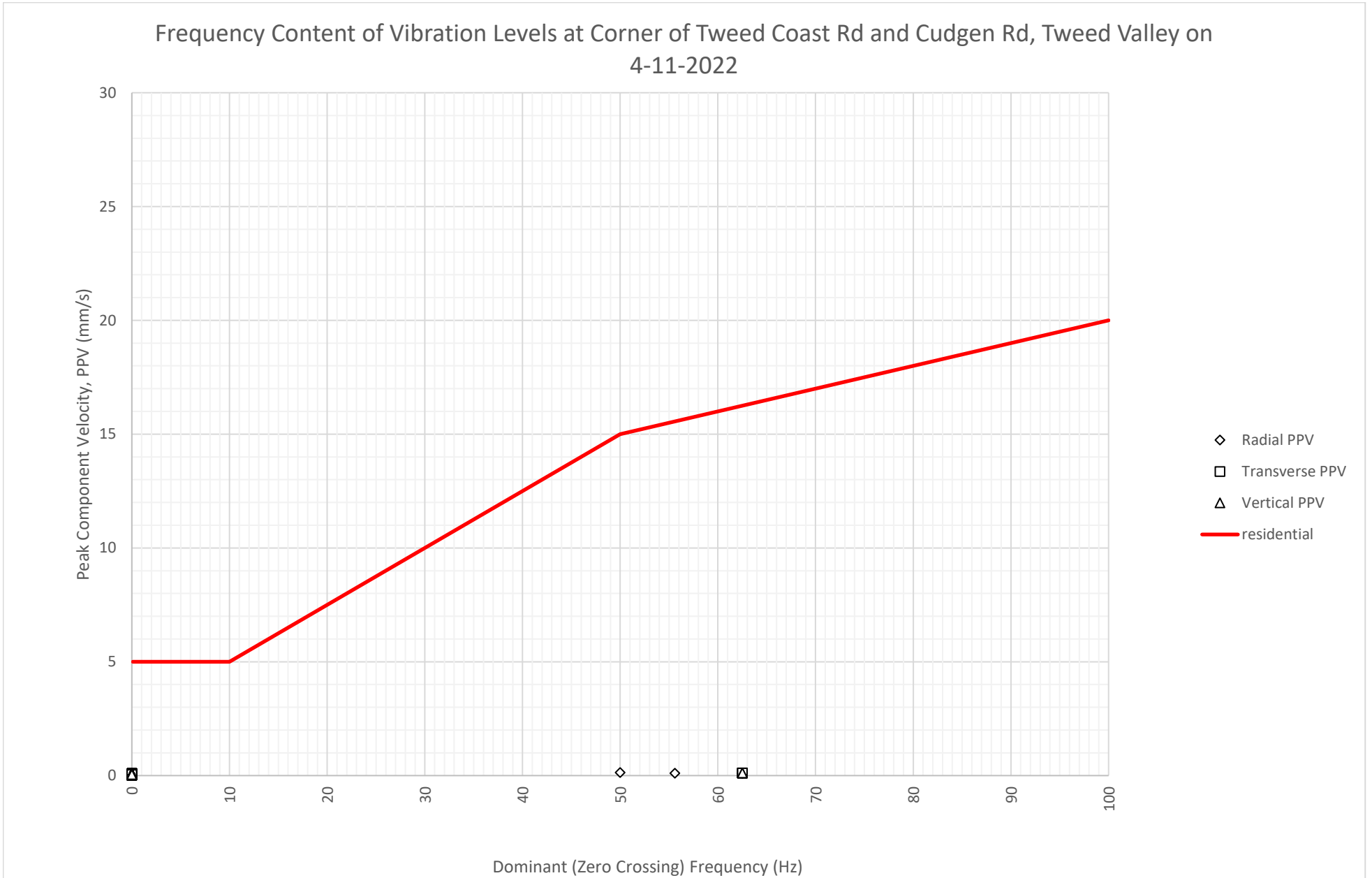
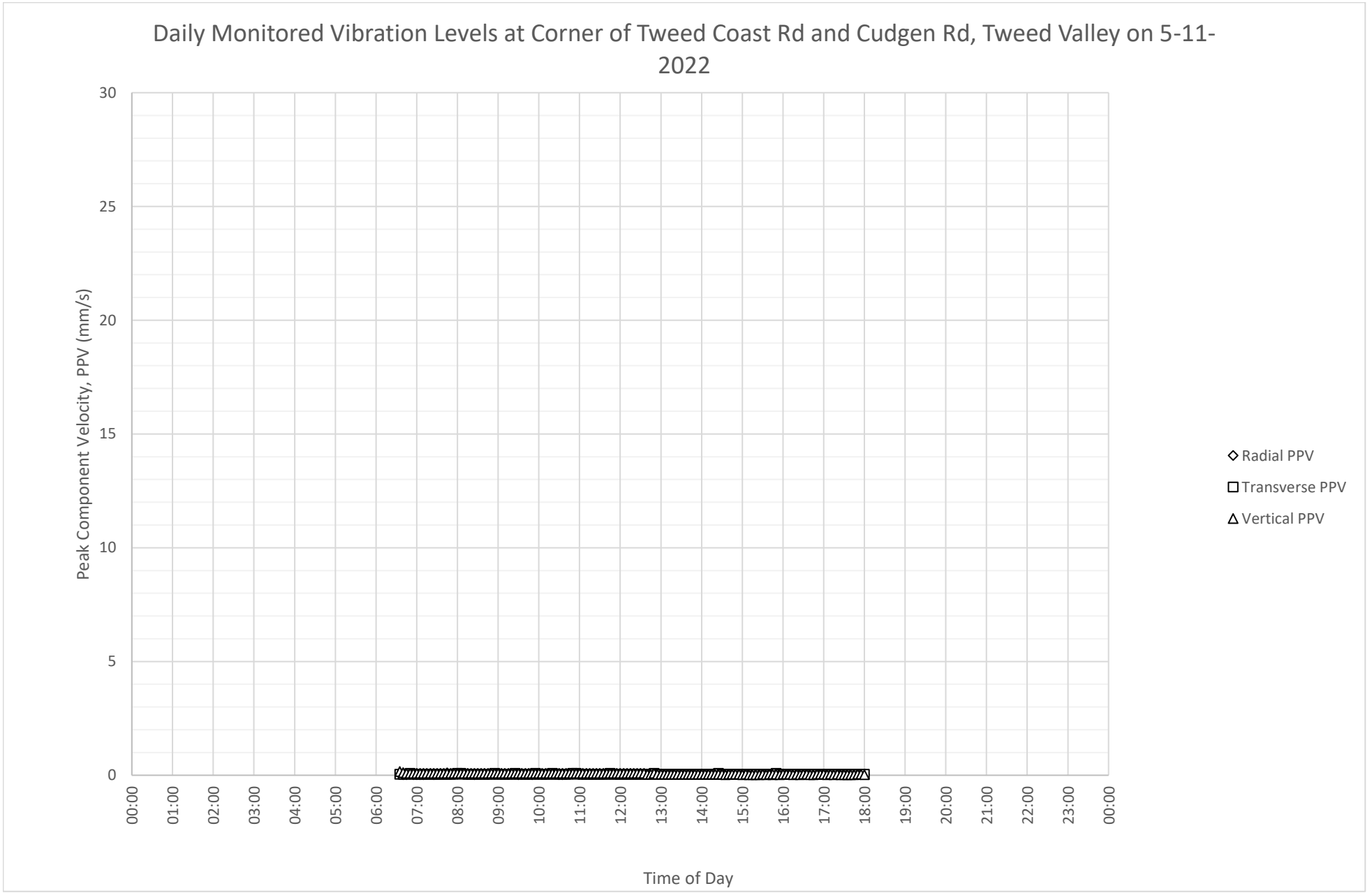
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 3-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 4-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 4-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 5-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
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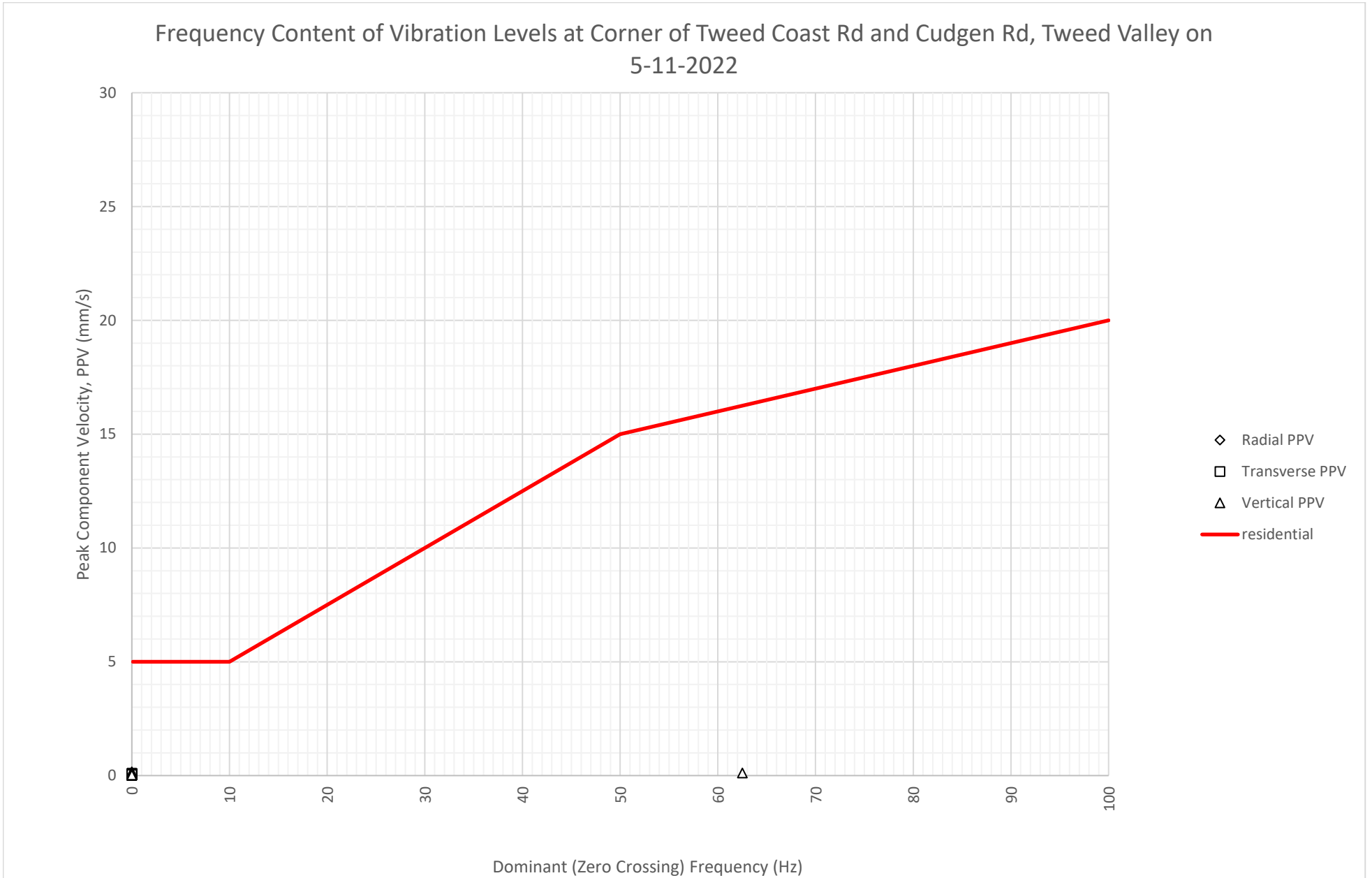
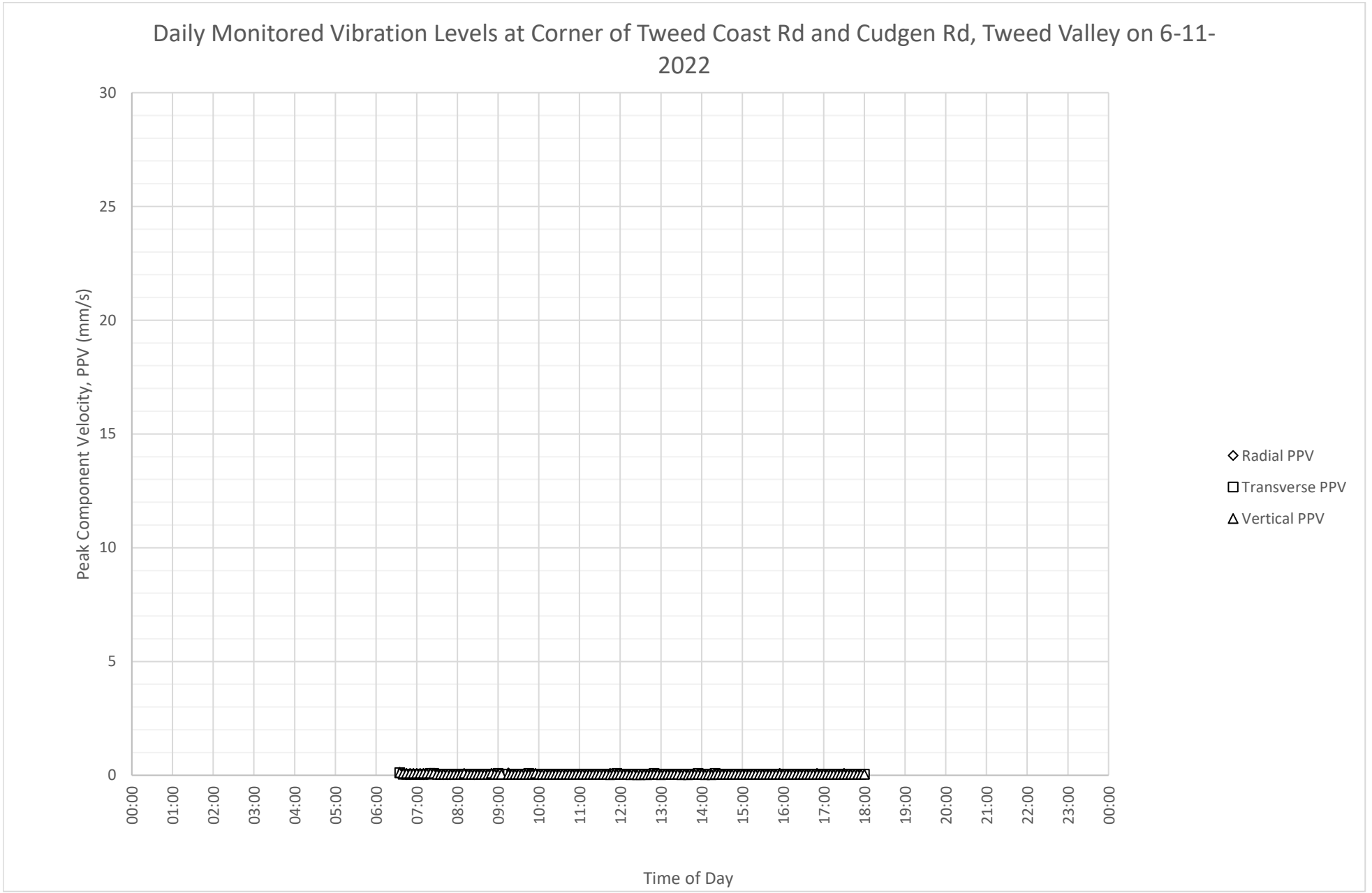
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 5-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 6-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
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13:00
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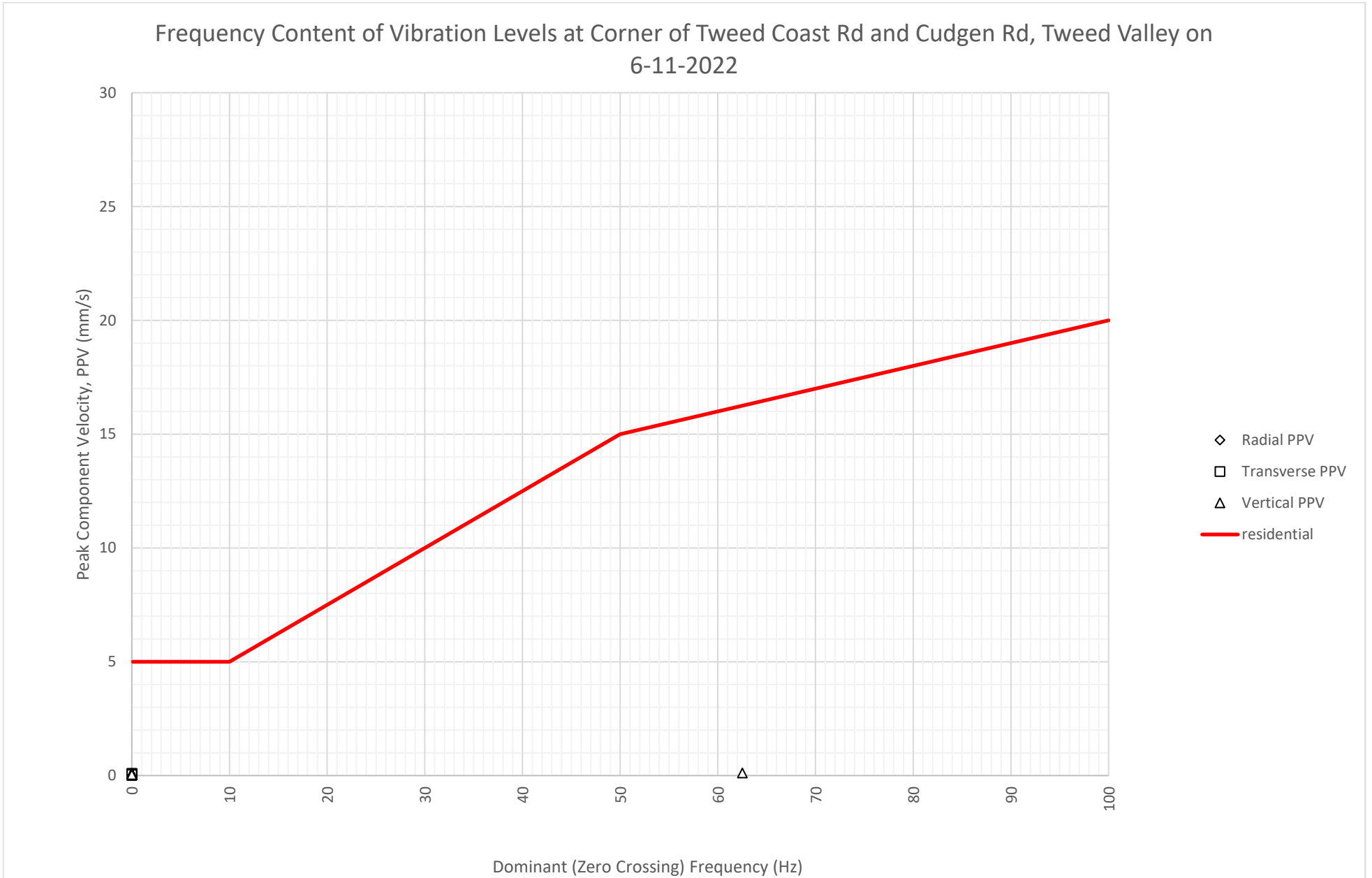
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 6-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
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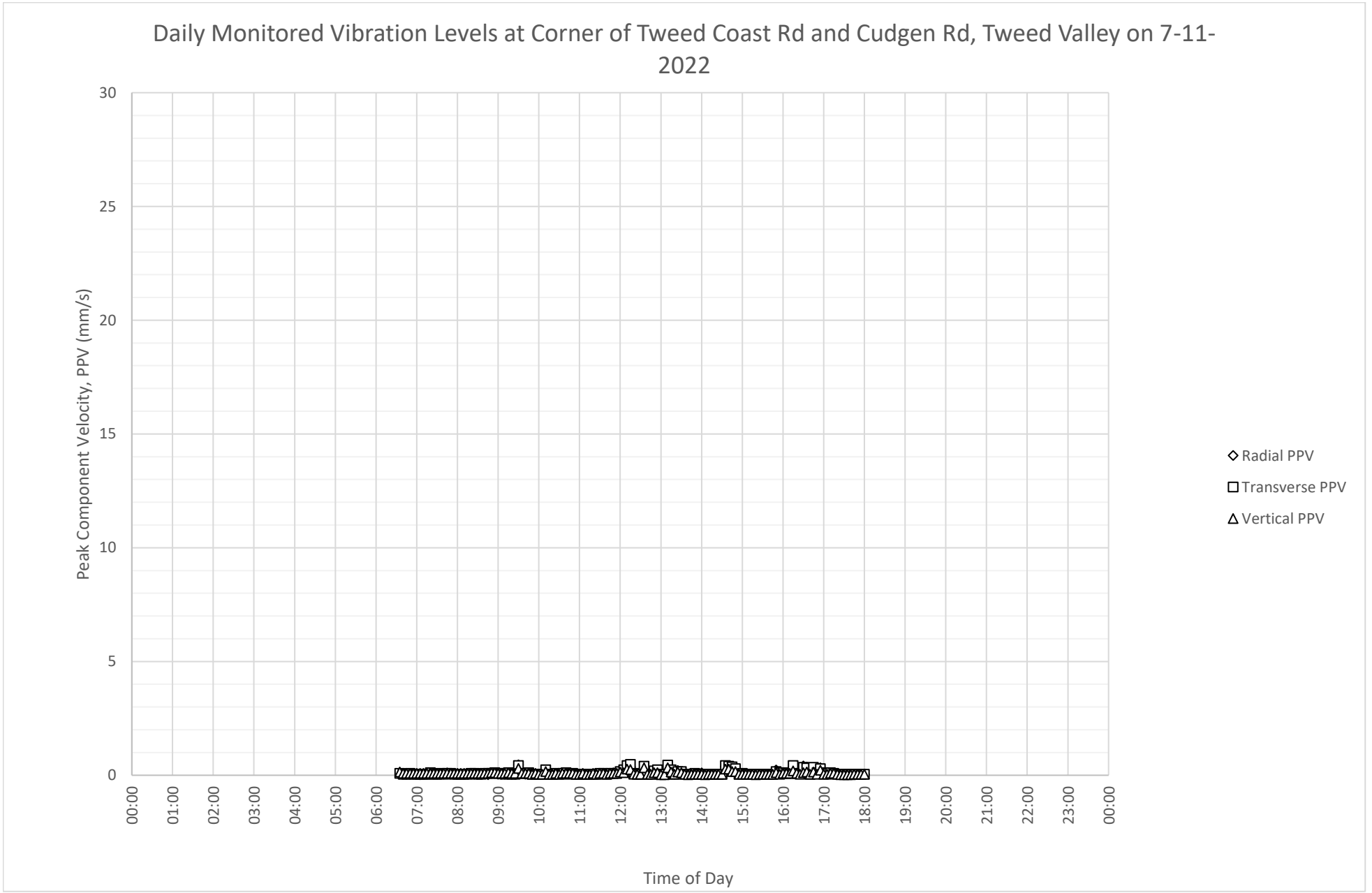
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 7-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
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01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
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20:00
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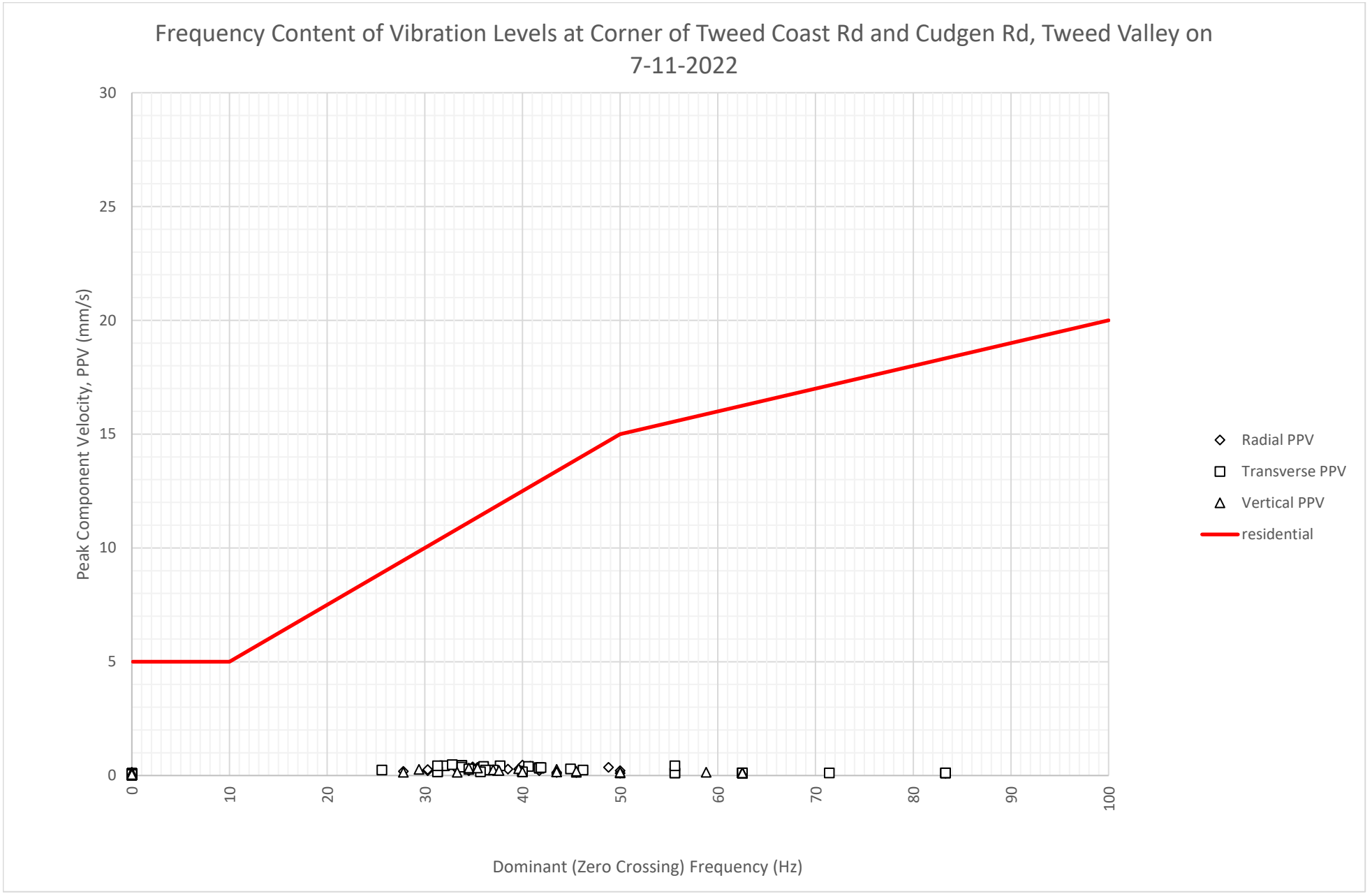
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 7-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
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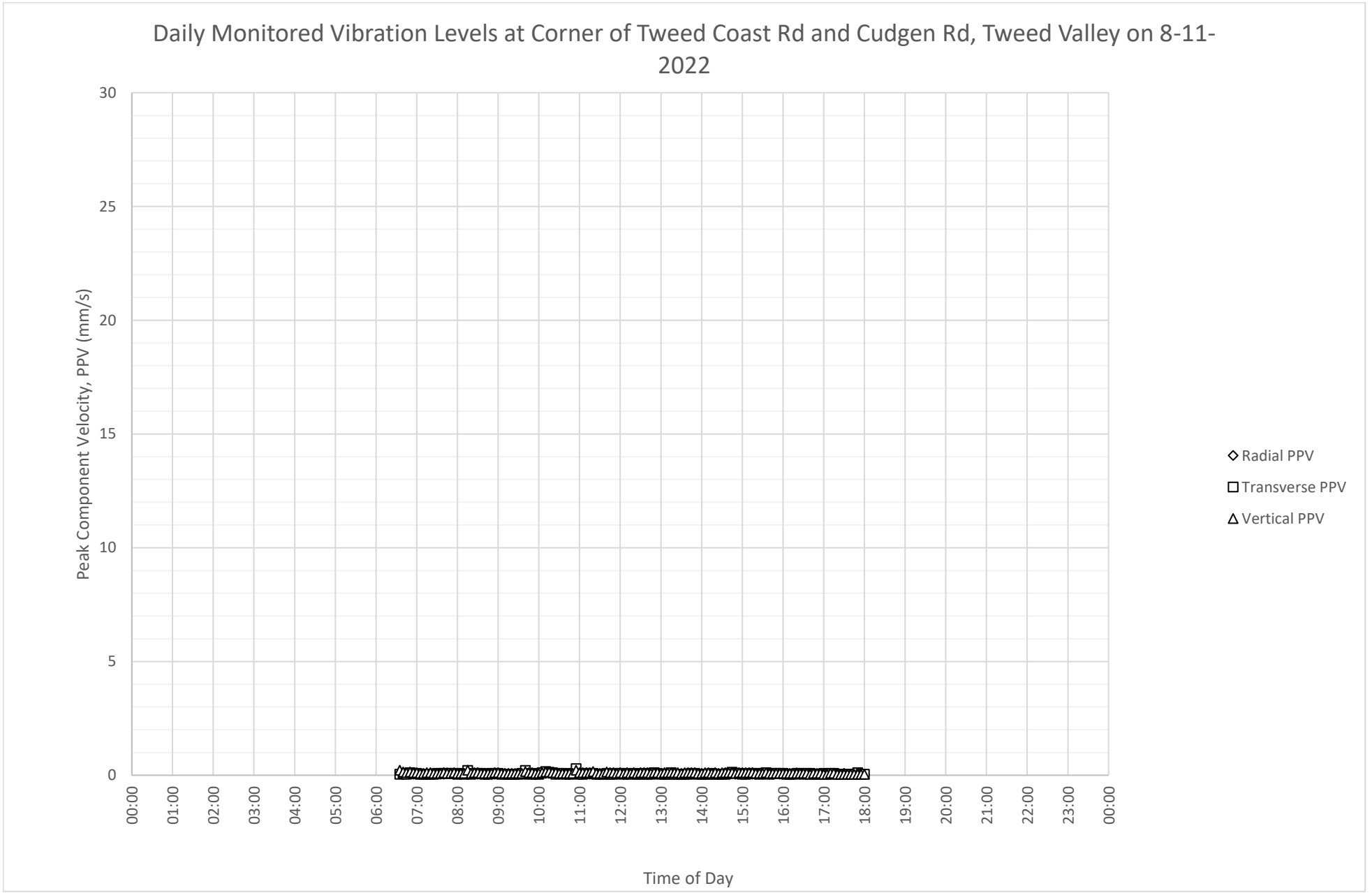
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 8-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
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01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
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13:00
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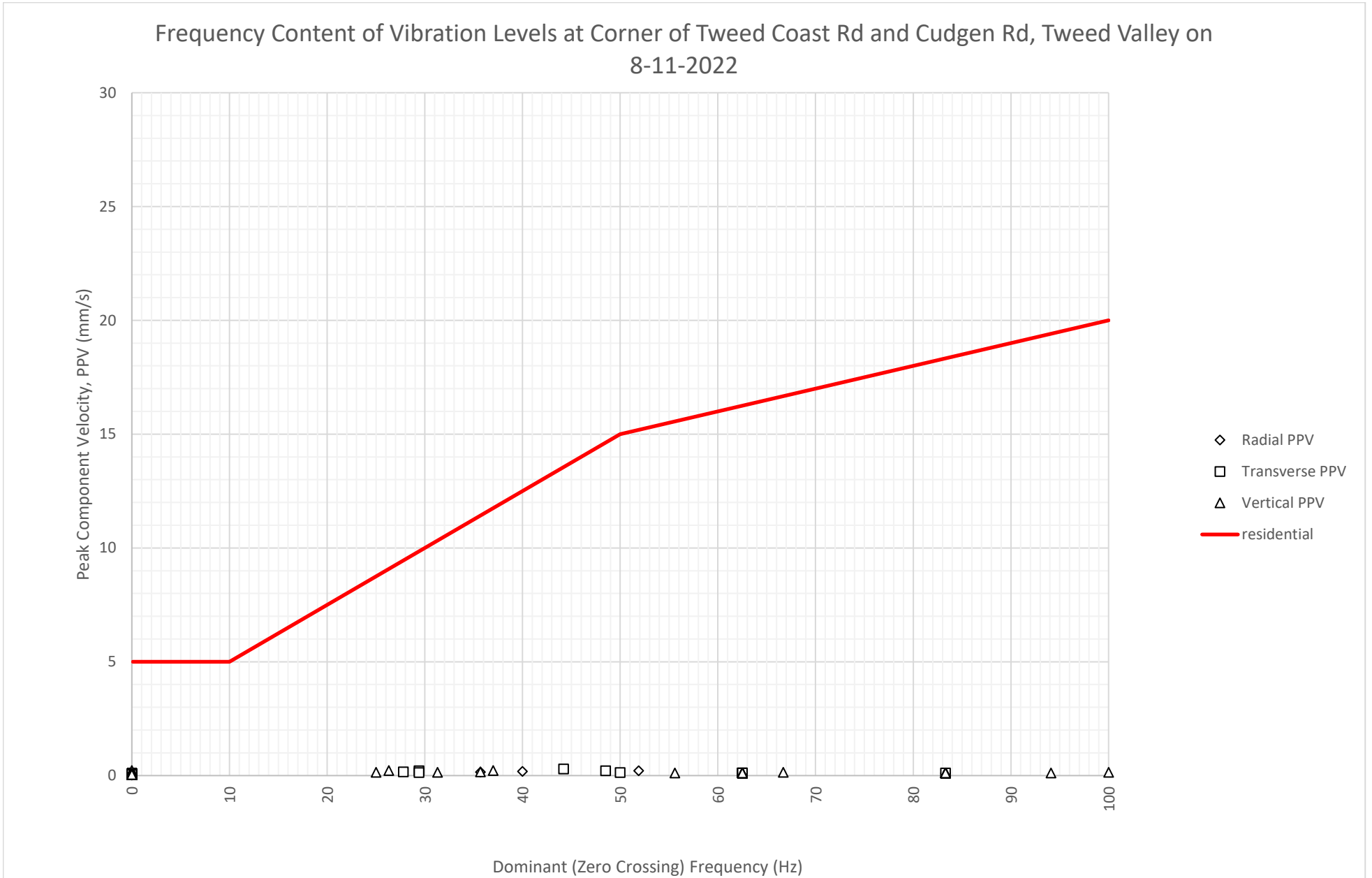
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 8-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
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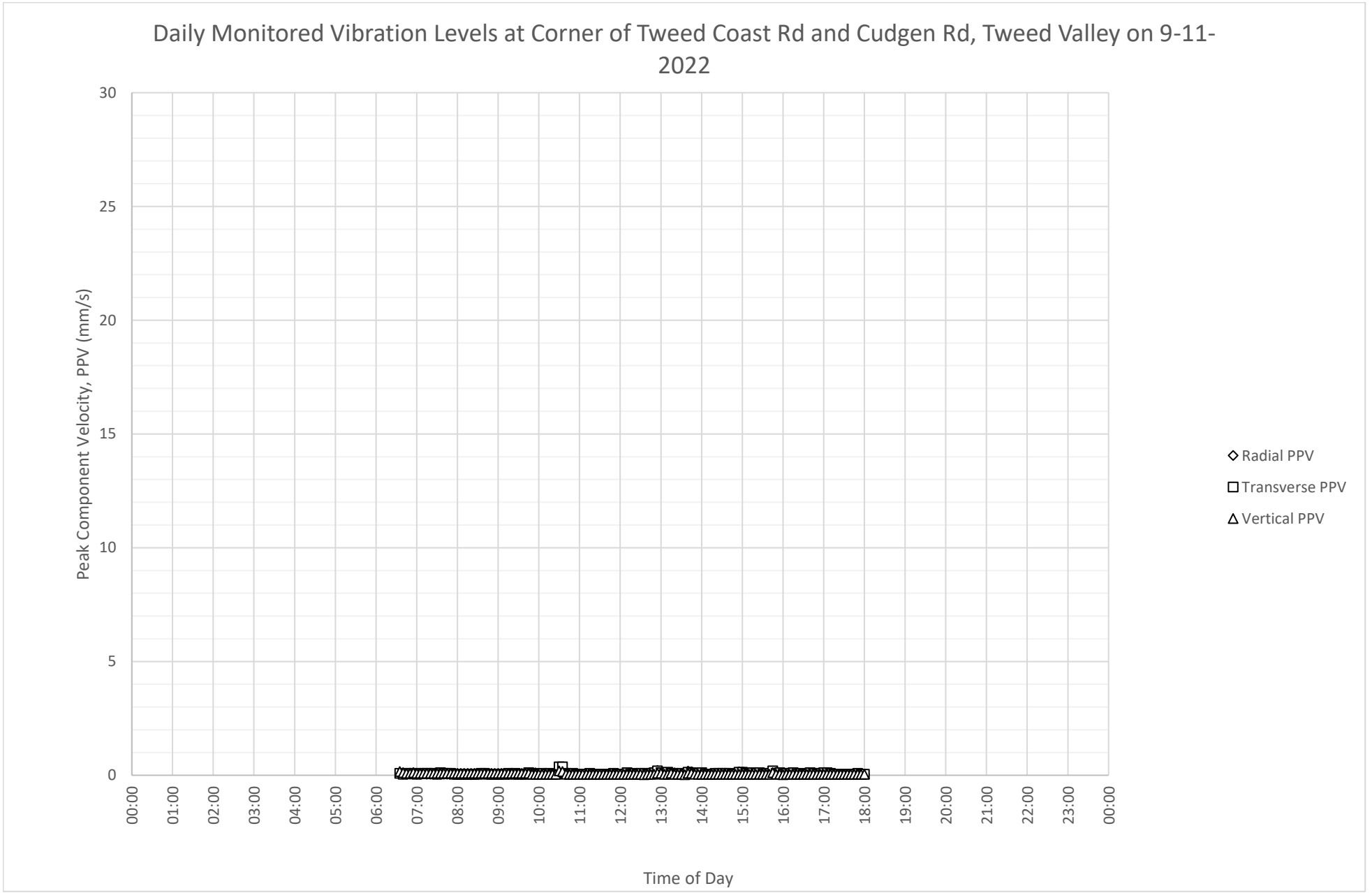
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 9-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
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01:00
02:00
03:00
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05:00
06:00
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08:00
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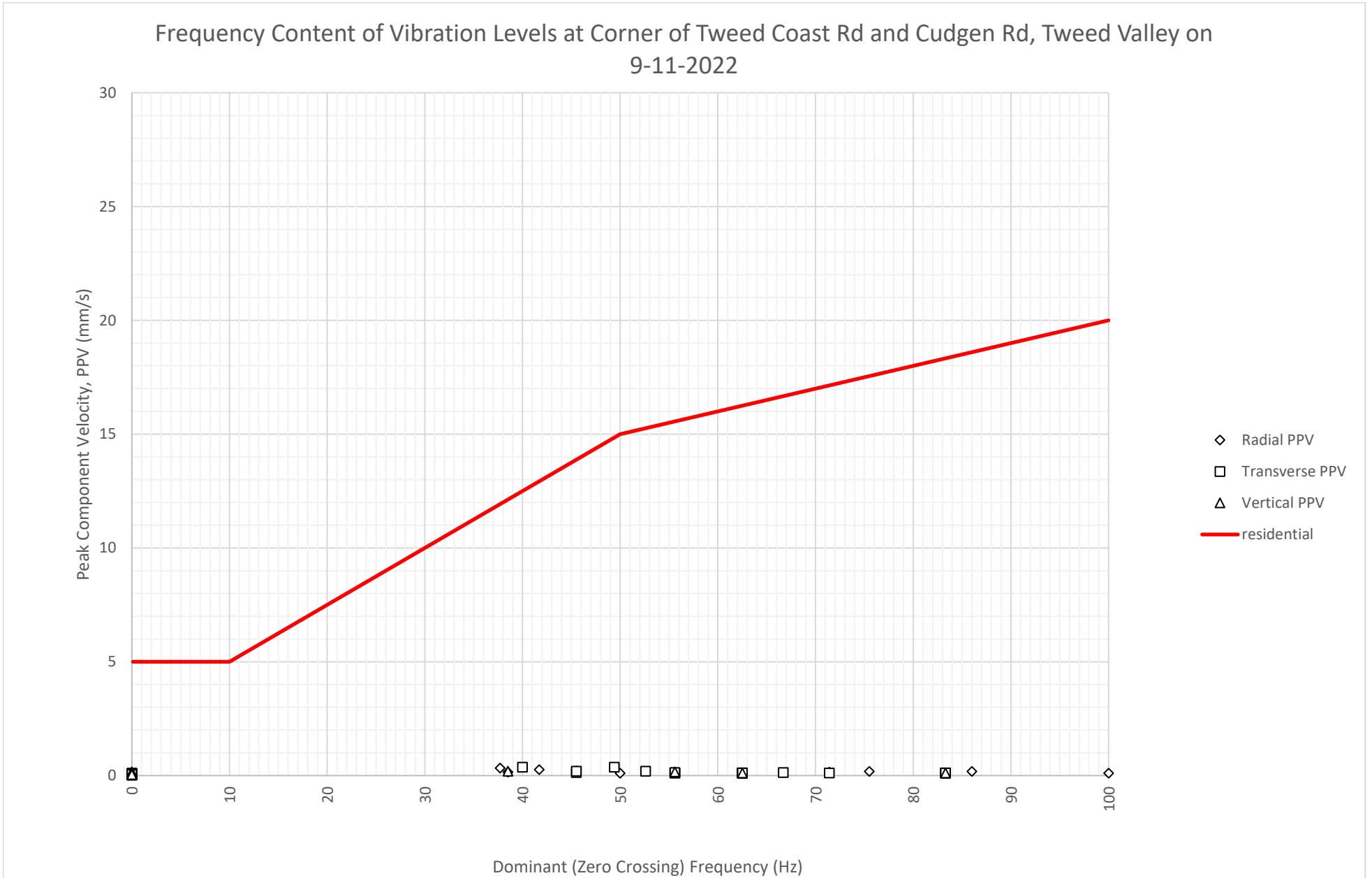
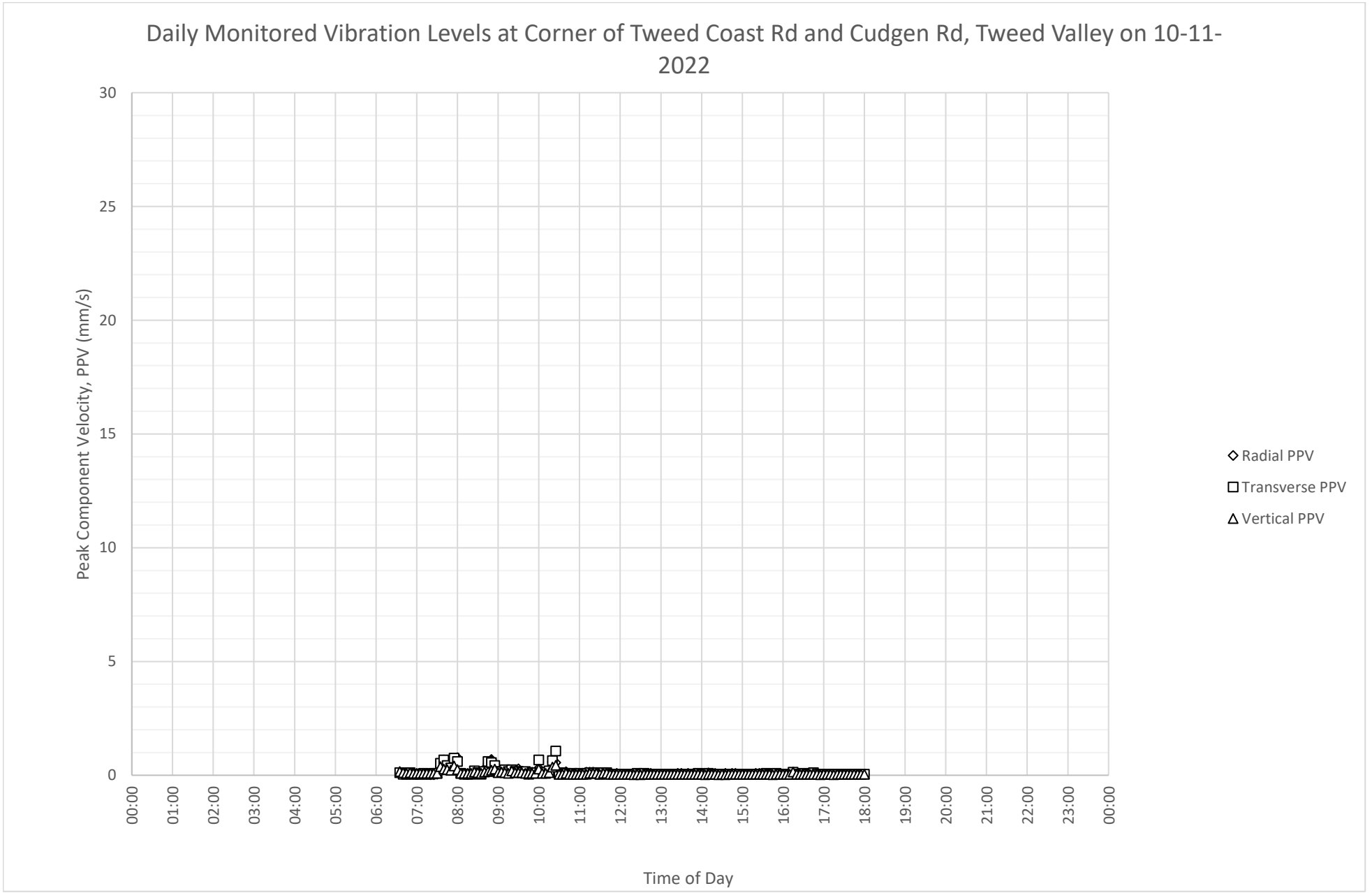
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 9-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 10-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
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01:00
02:00
03:00
04:00
05:00
06:00
07:00
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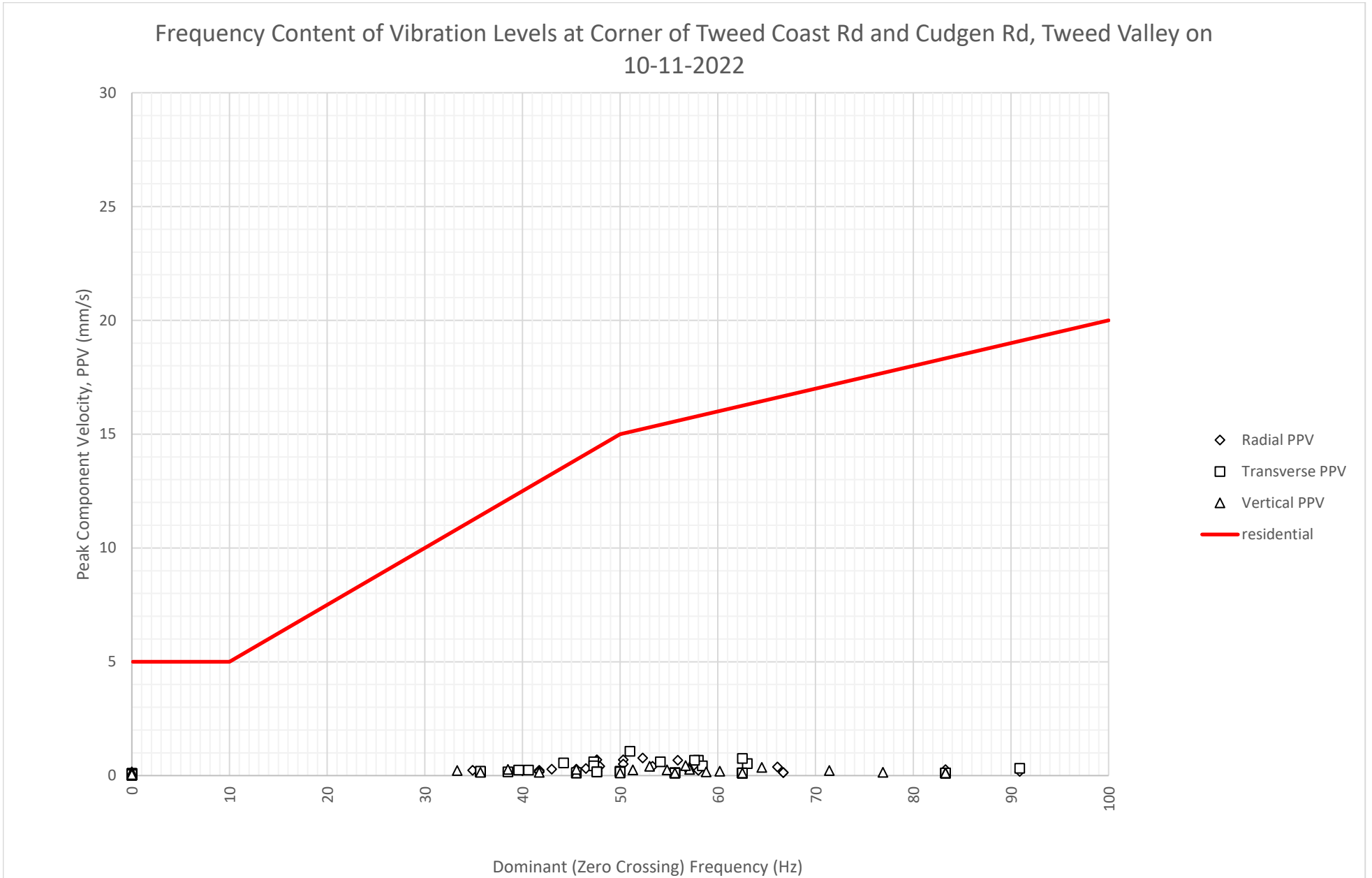
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 10-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
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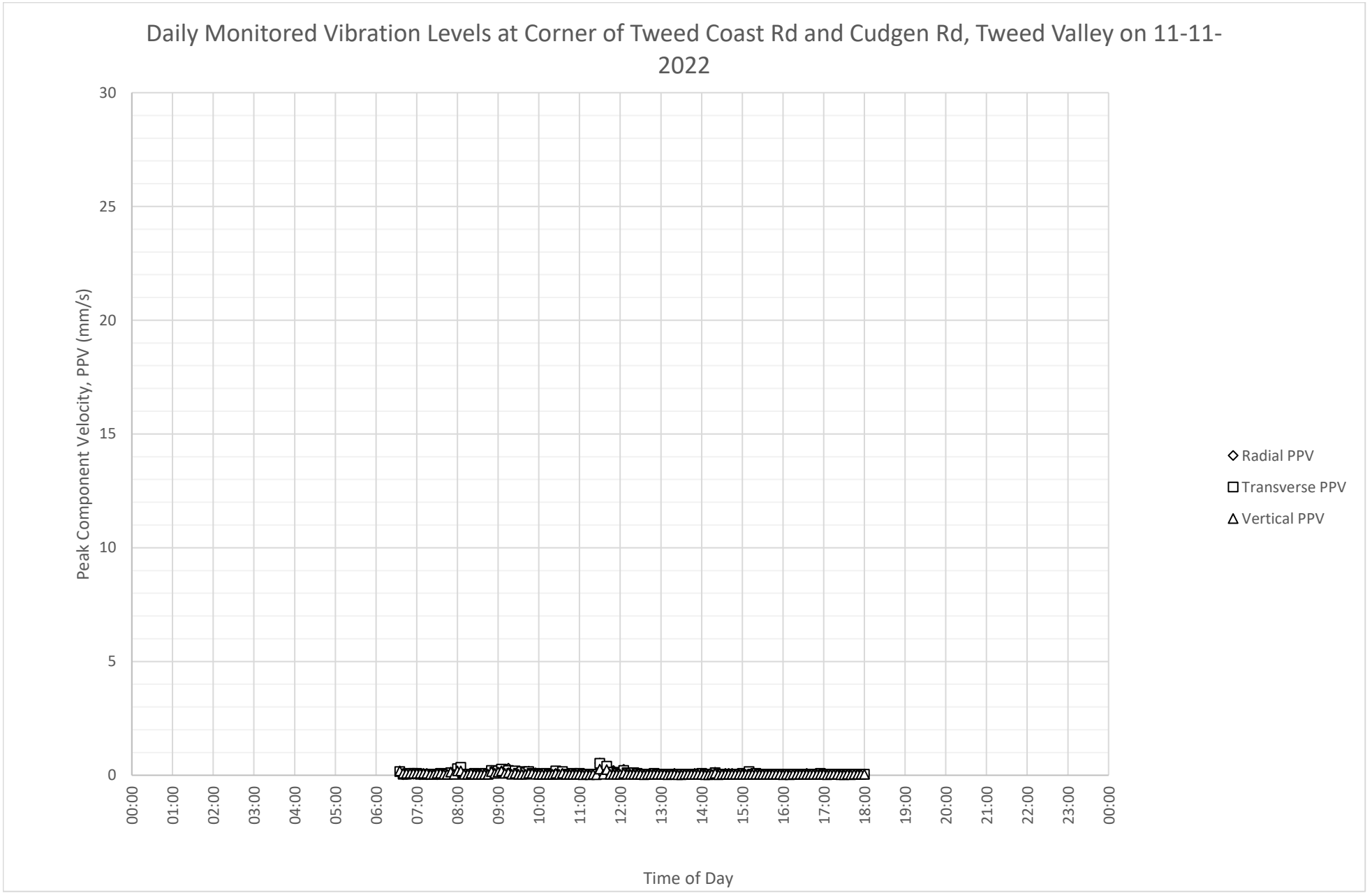
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 11-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
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01:00
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03:00
04:00
05:00
06:00
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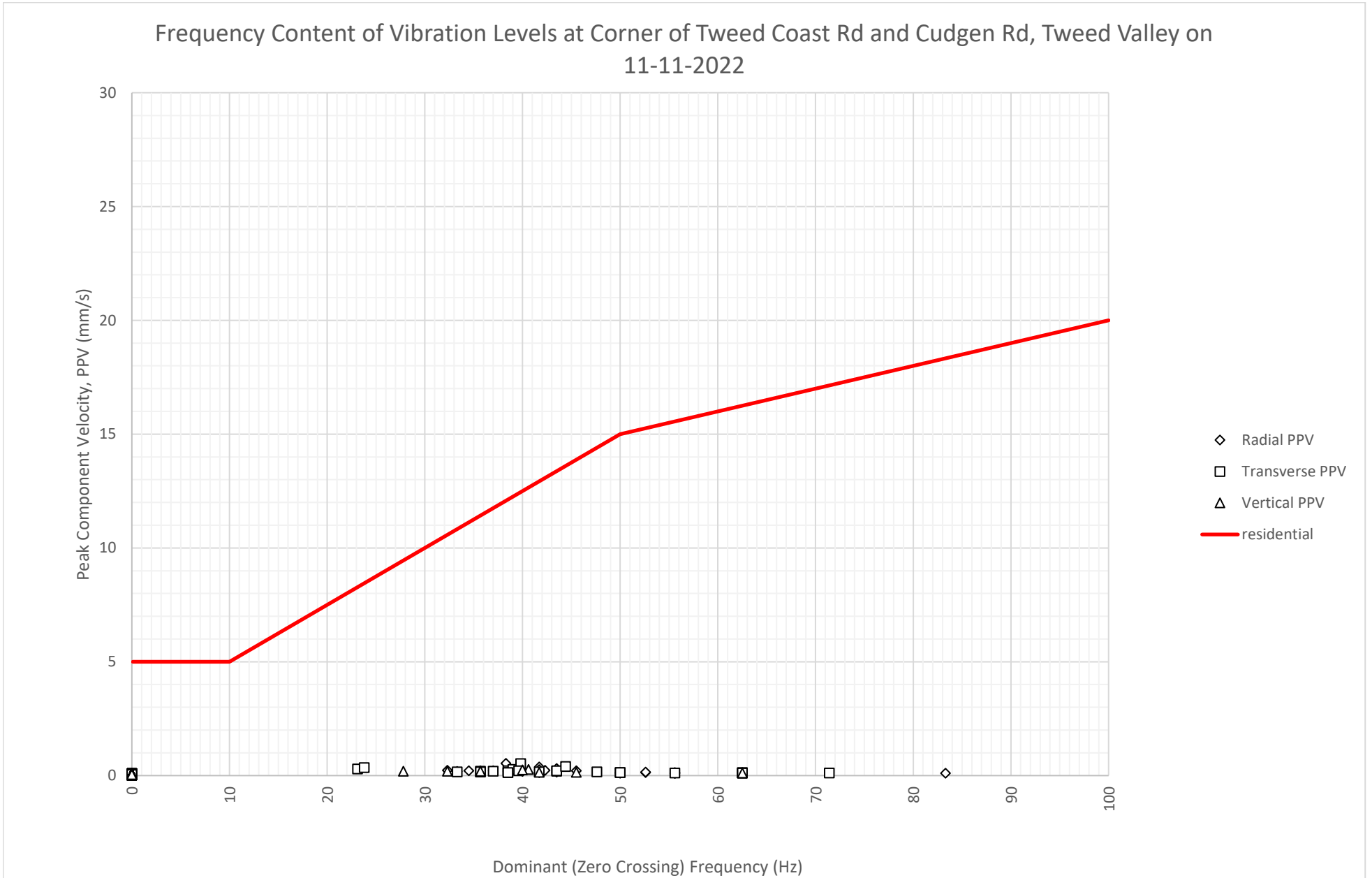
21:00
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 11-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
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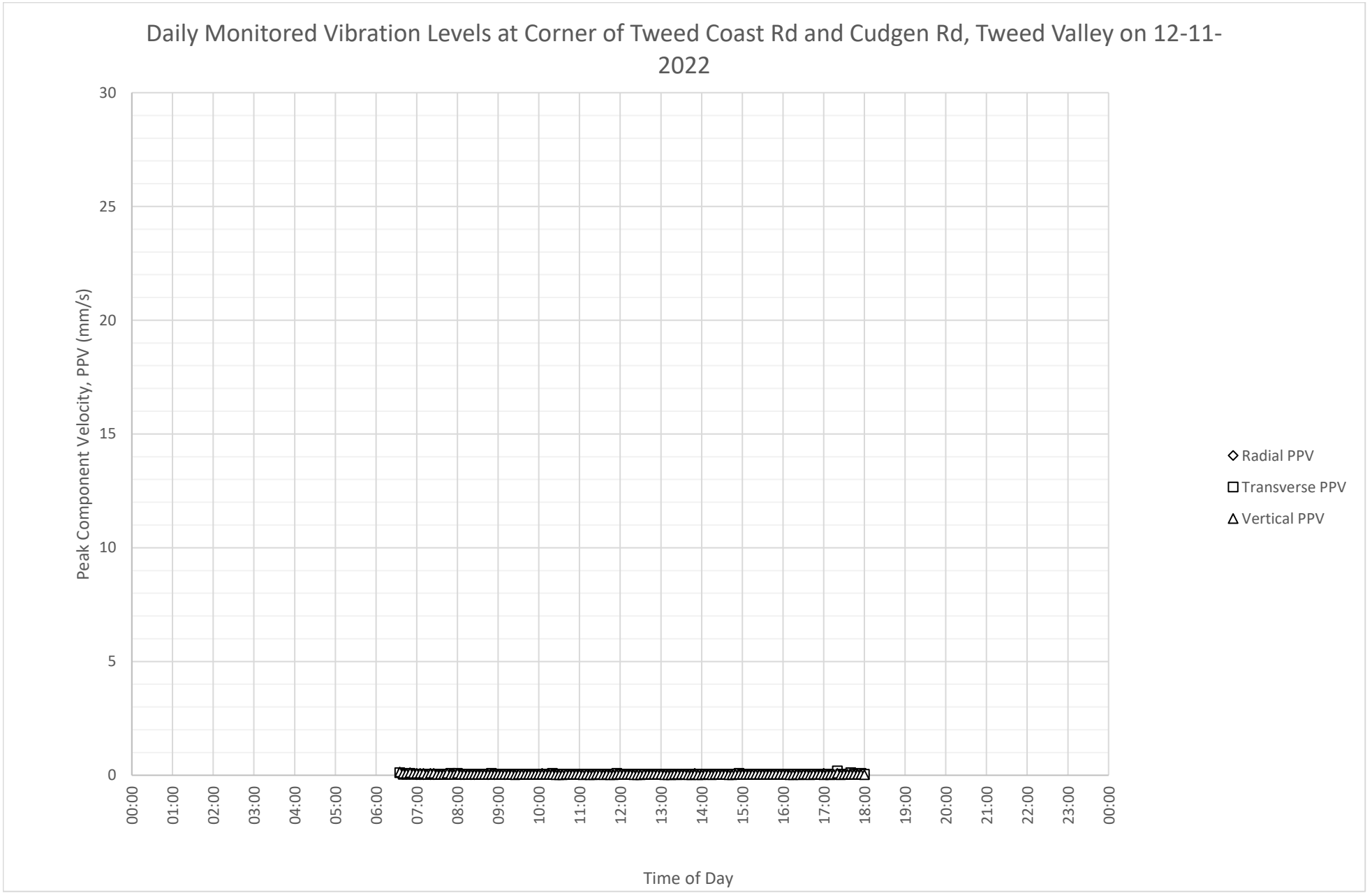
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 12-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
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01:00
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03:00
04:00
05:00
06:00
07:00
08:00
09:00
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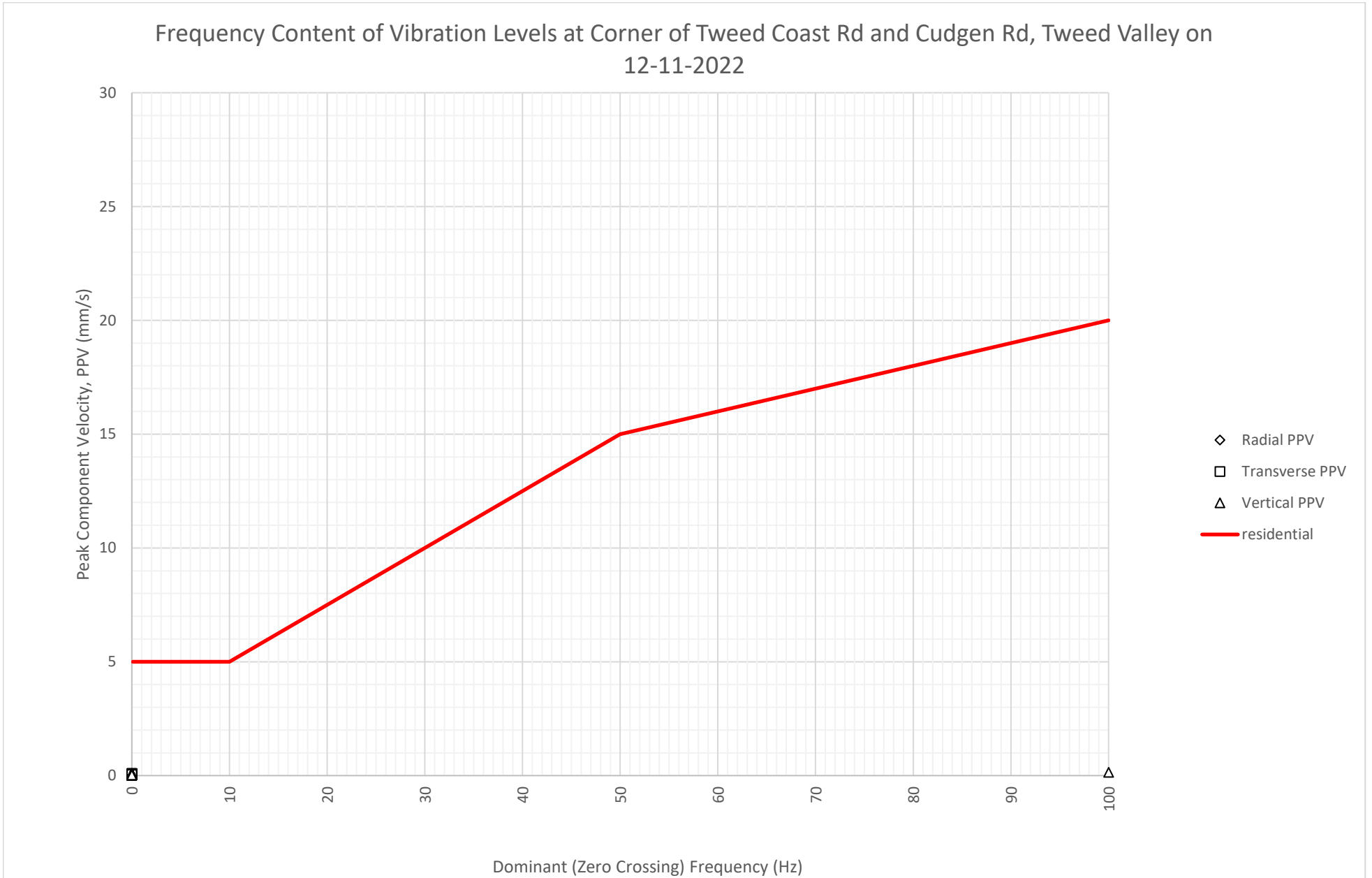
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 12-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
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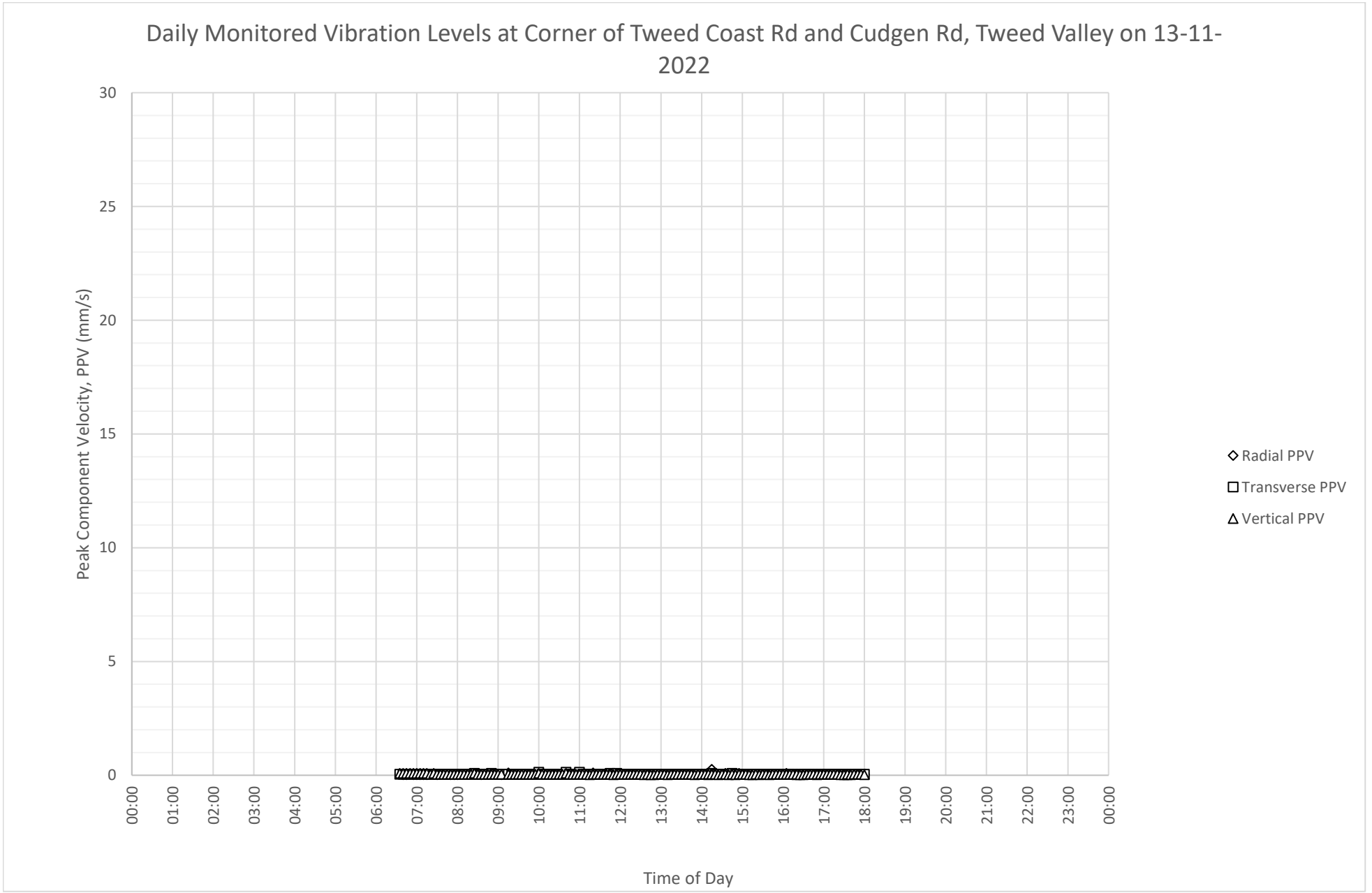
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 13-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
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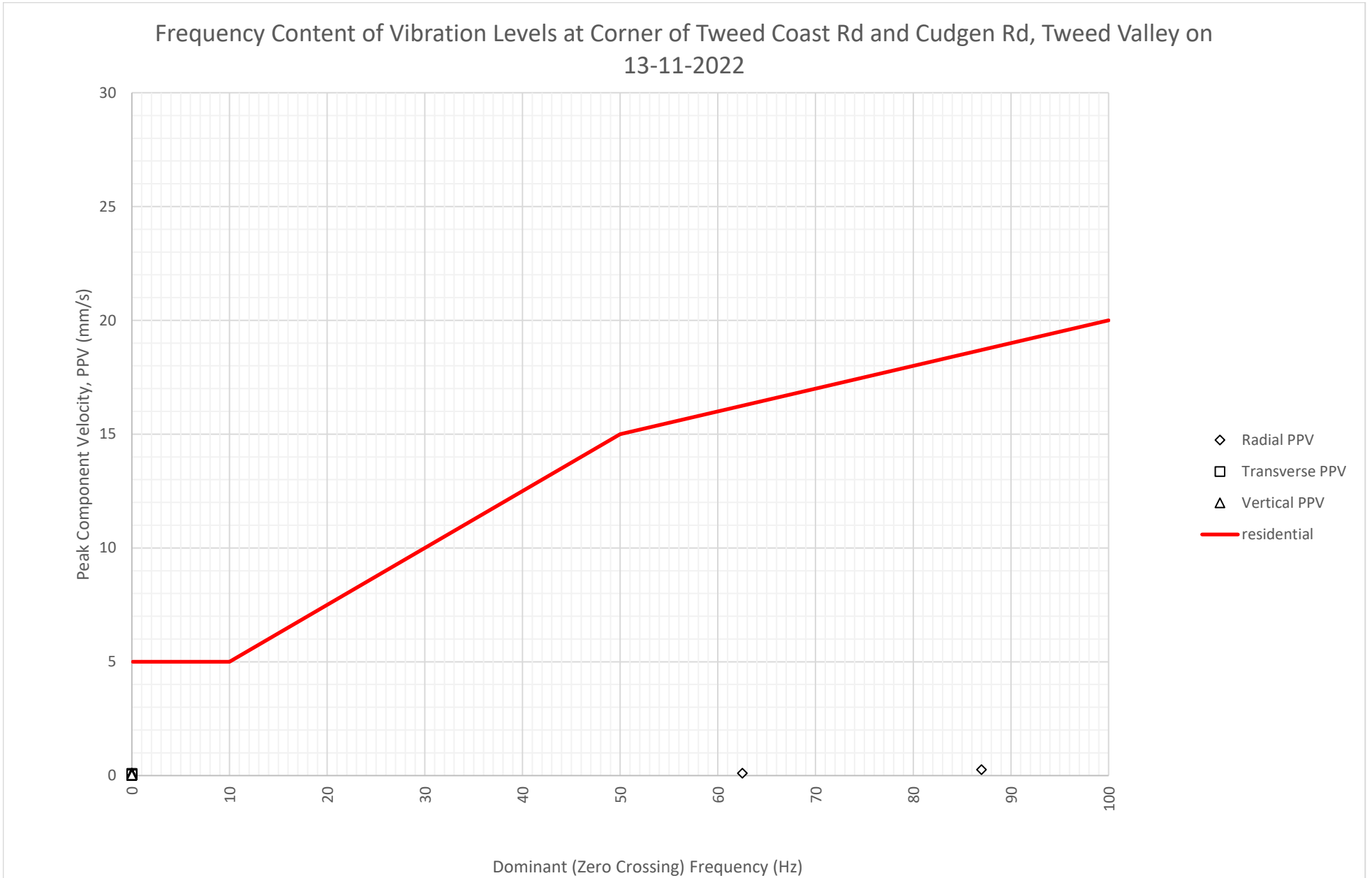
22:00
23:00
00:00
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 13-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
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10
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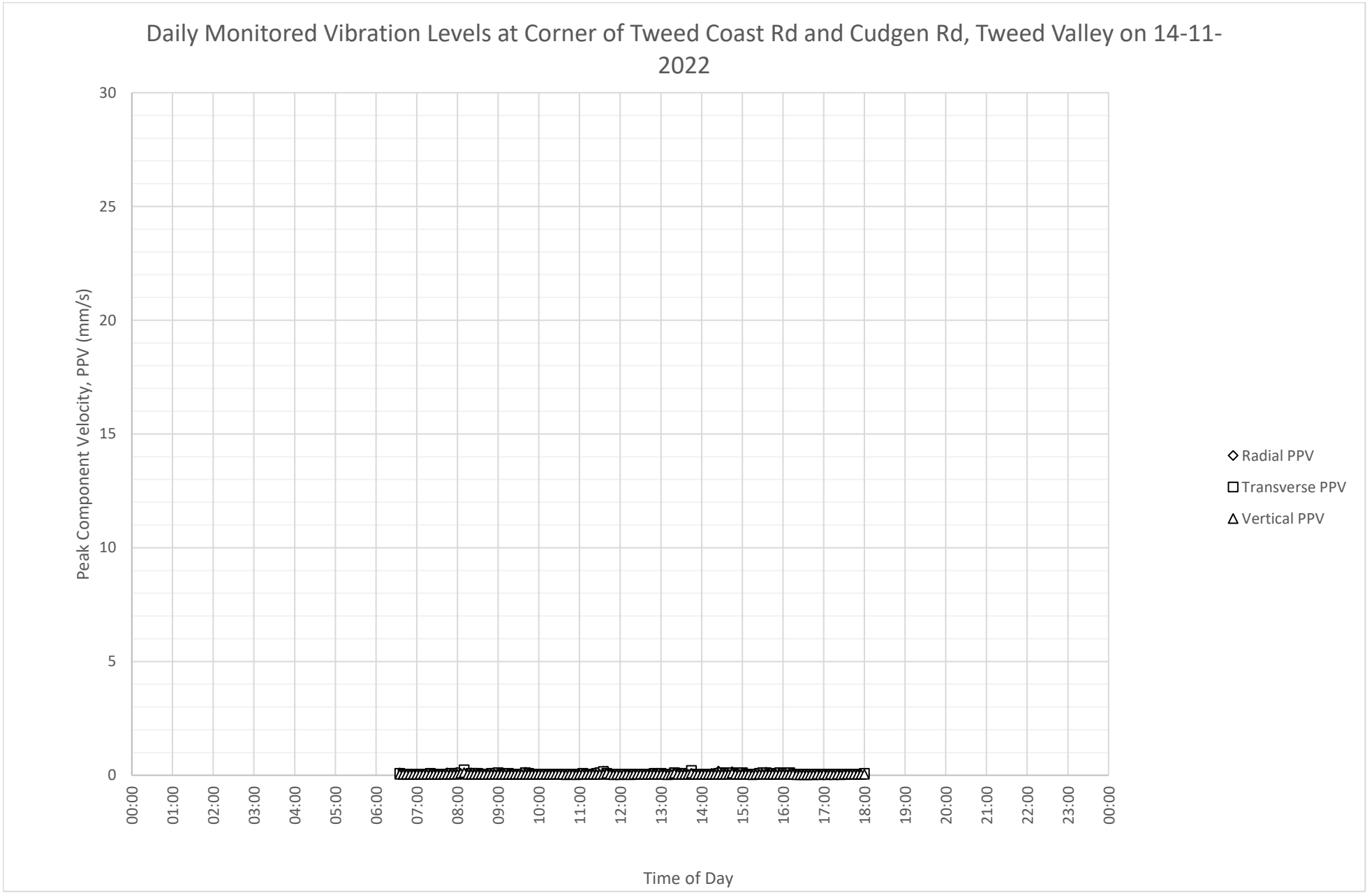
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 14-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
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01:00
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23:00
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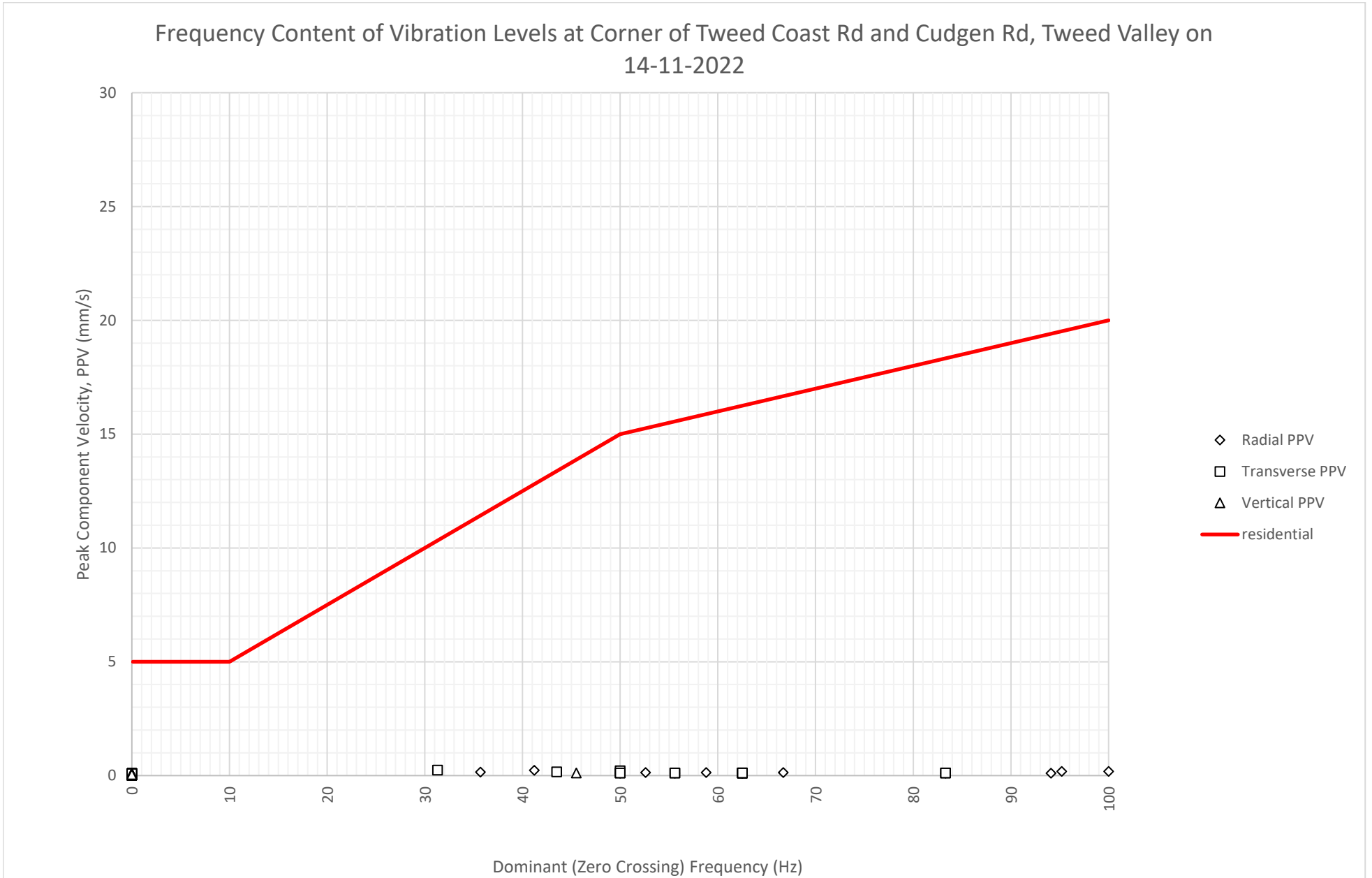
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 14-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
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30
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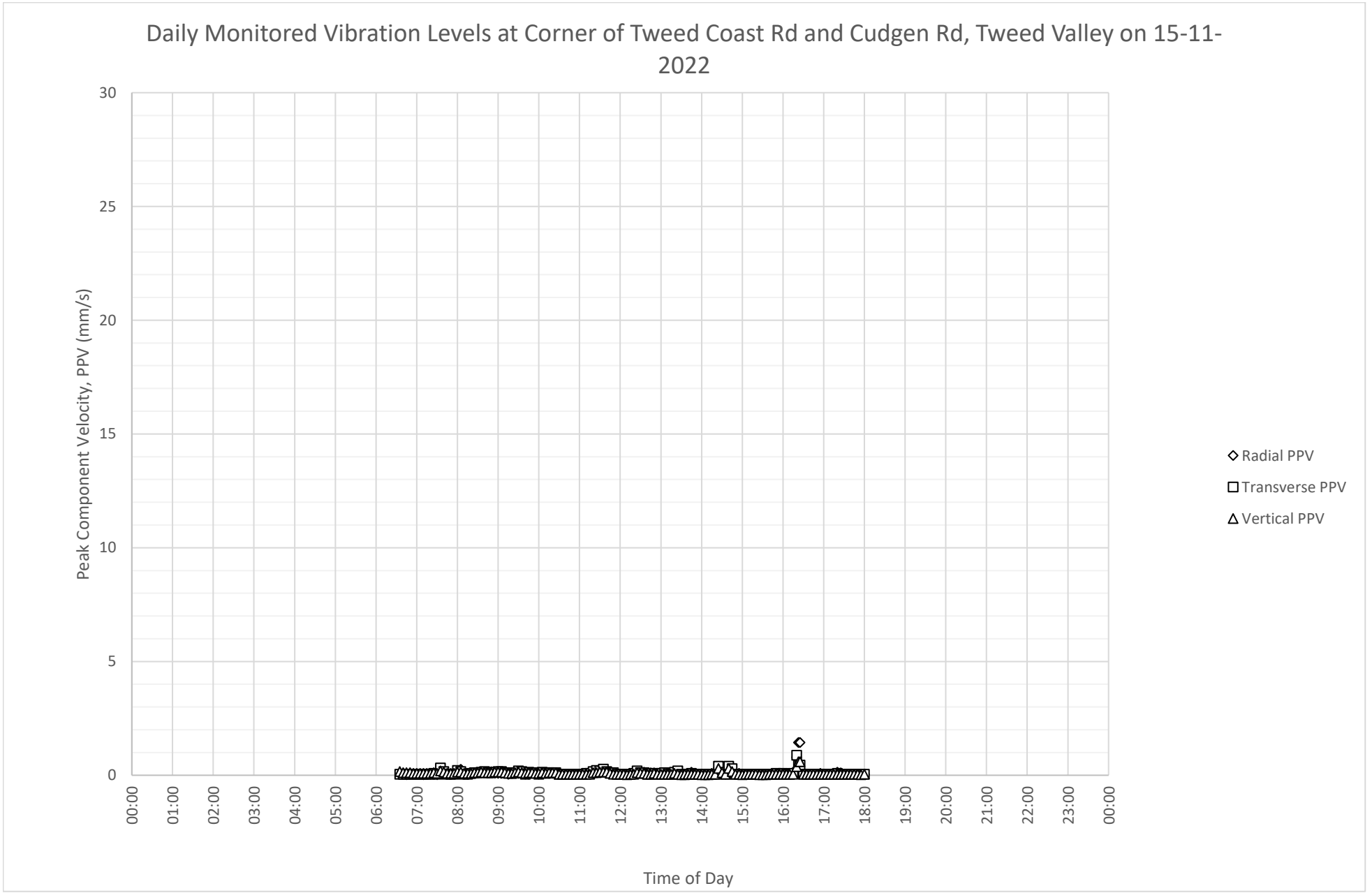
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 15-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
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22:00
23:00
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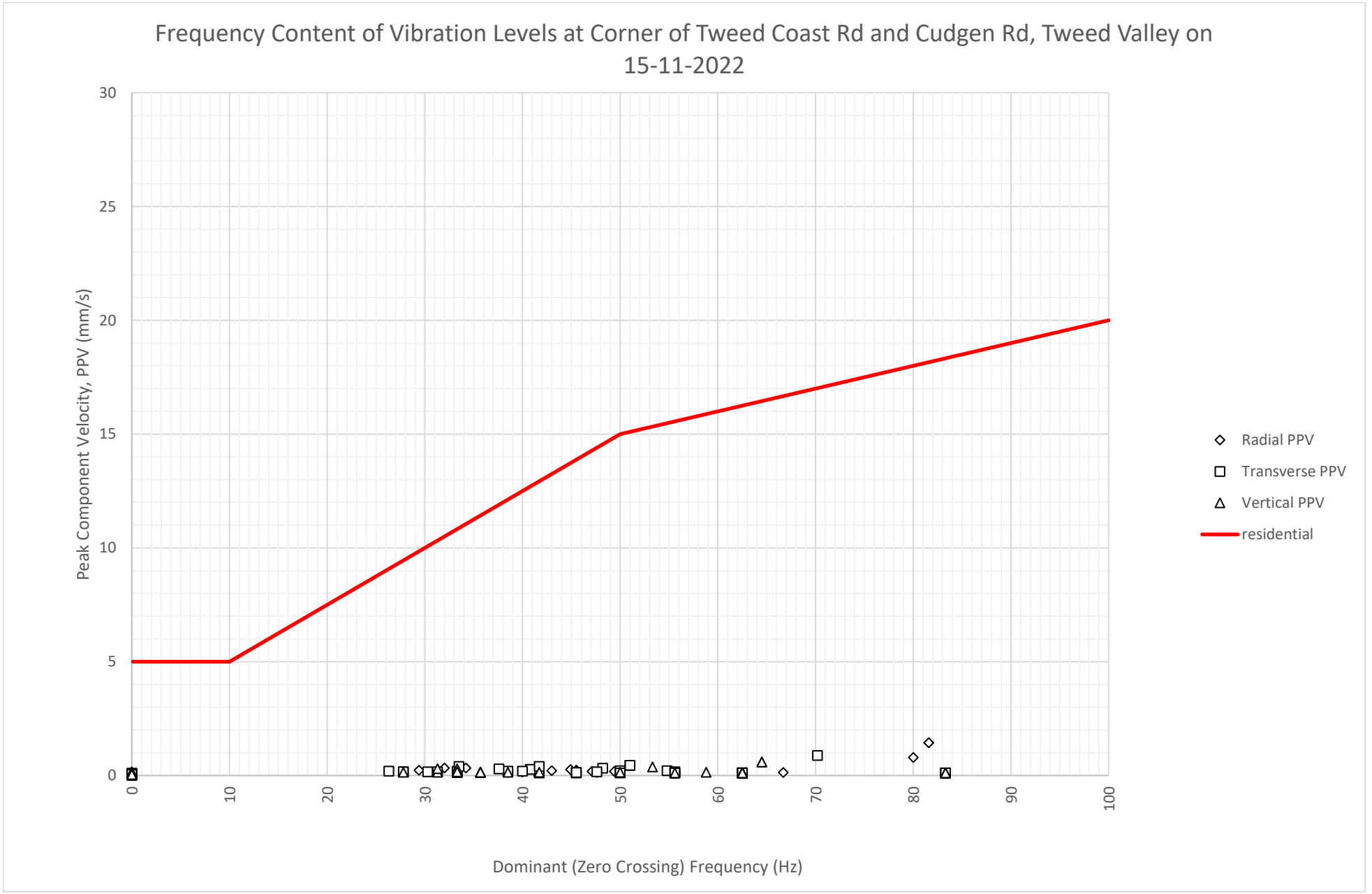
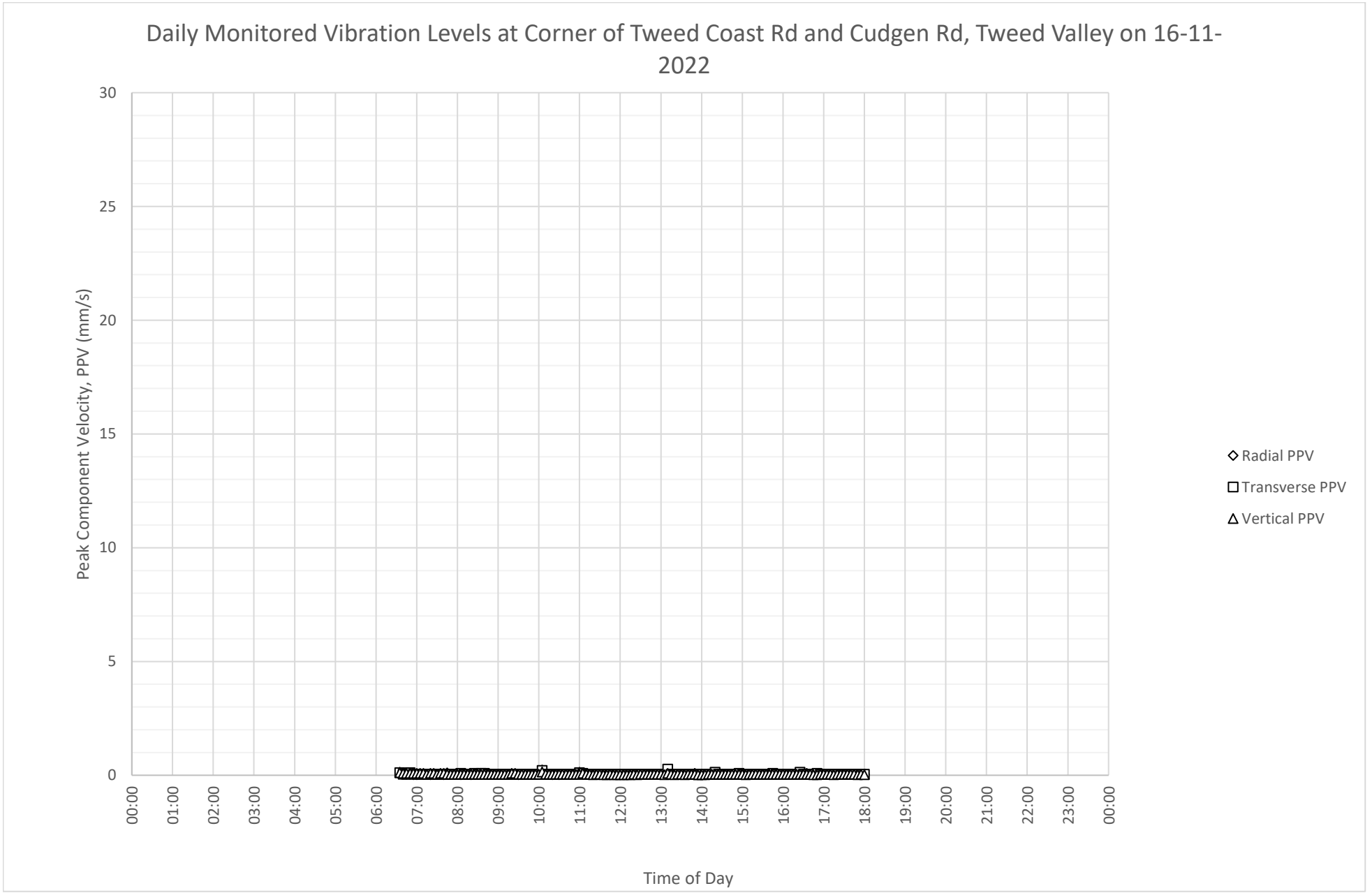
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 15-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 16-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
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10
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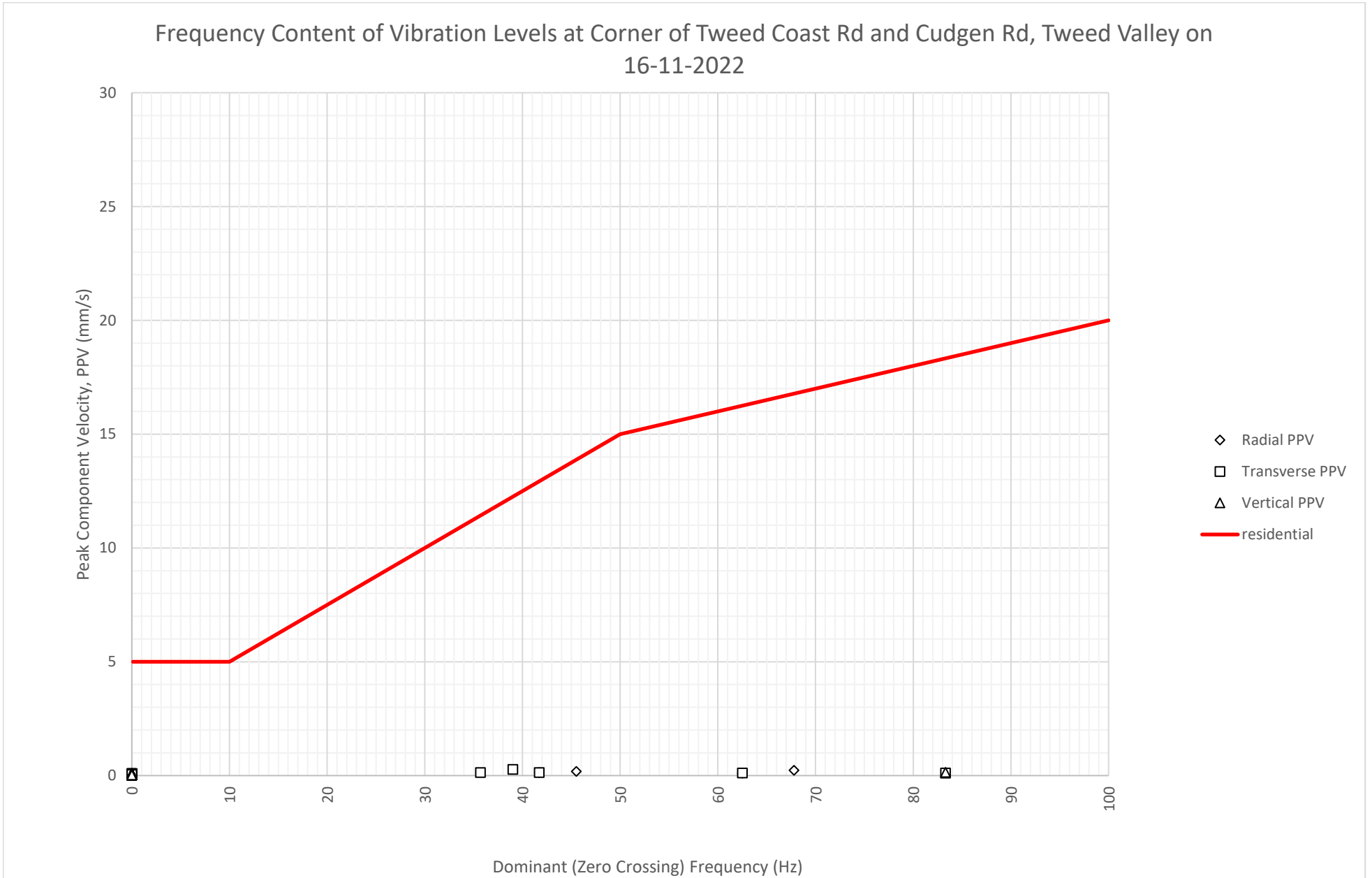
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 16-11-2022
Peak Component Velocity, PPV (mm/s)
30
25
20
15
10
5
0
0
10
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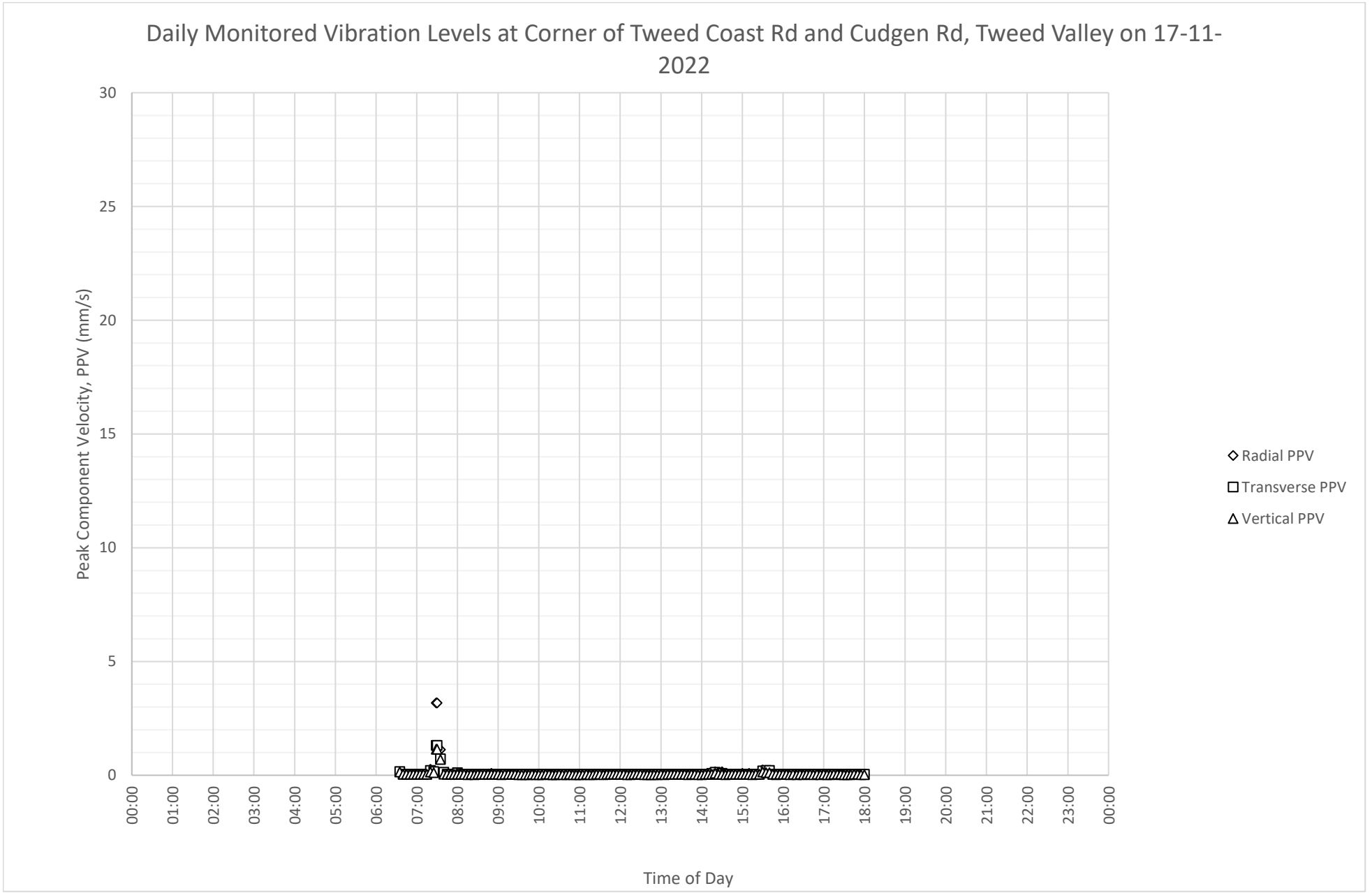
60
70
80
90
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 17-11-2022
Peak Component Velocity, PPV (mm/s)
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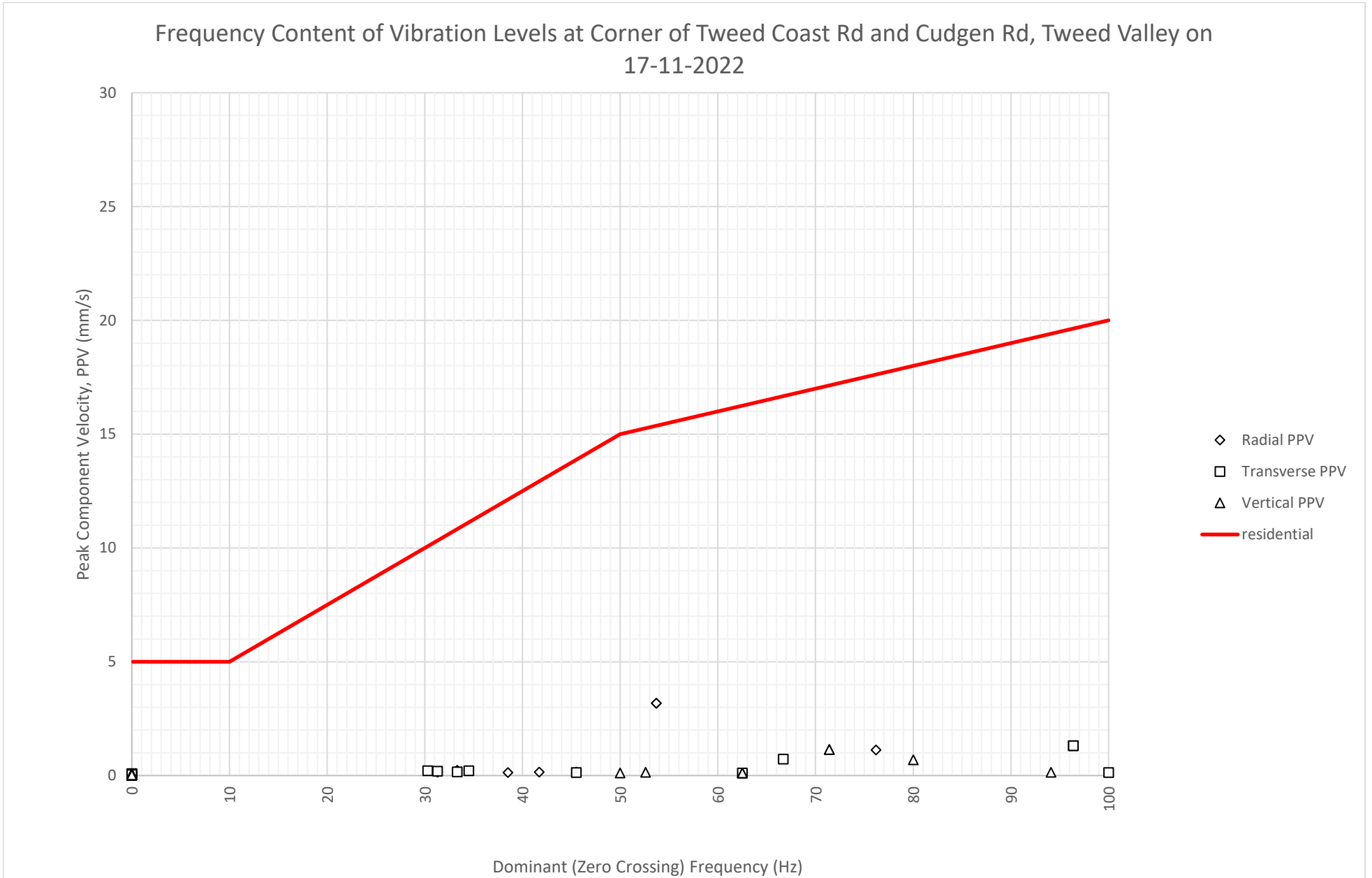
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 17-11-2022
Peak Component Velocity, PPV (mm/s)
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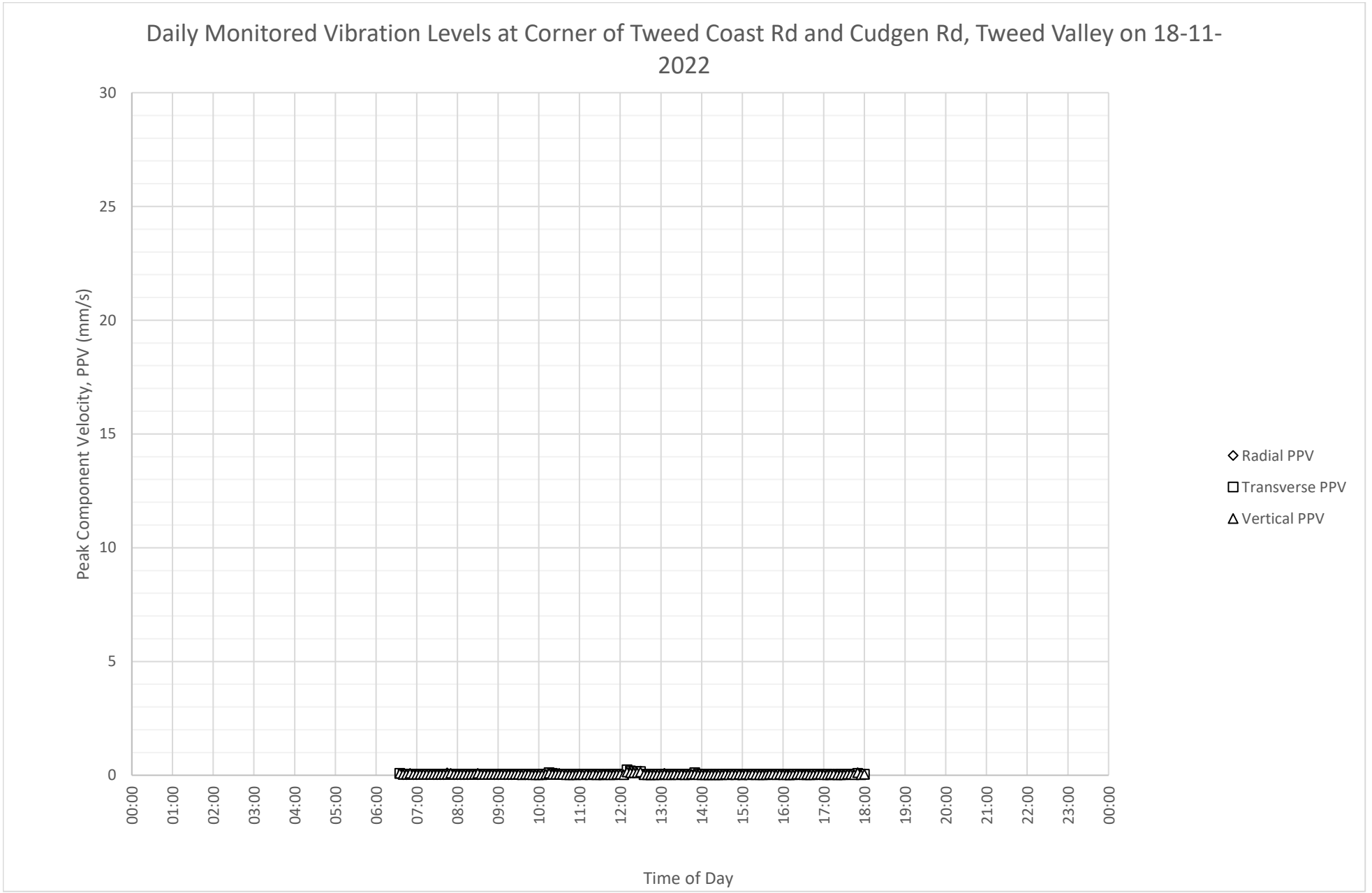
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 18-11-2022
Peak Component Velocity, PPV (mm/s)
30
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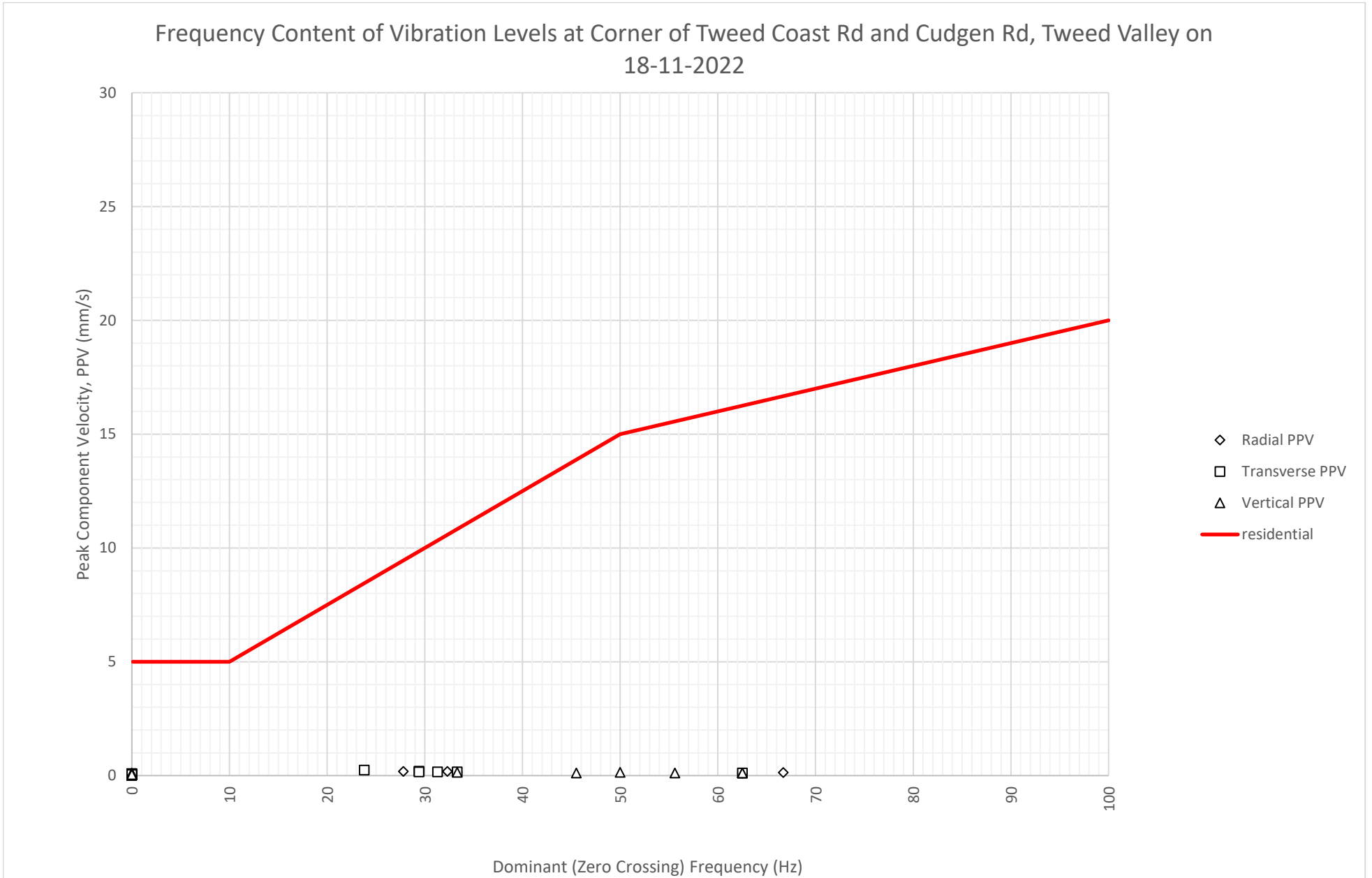
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 18-11-2022
Peak Component Velocity, PPV (mm/s)
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25
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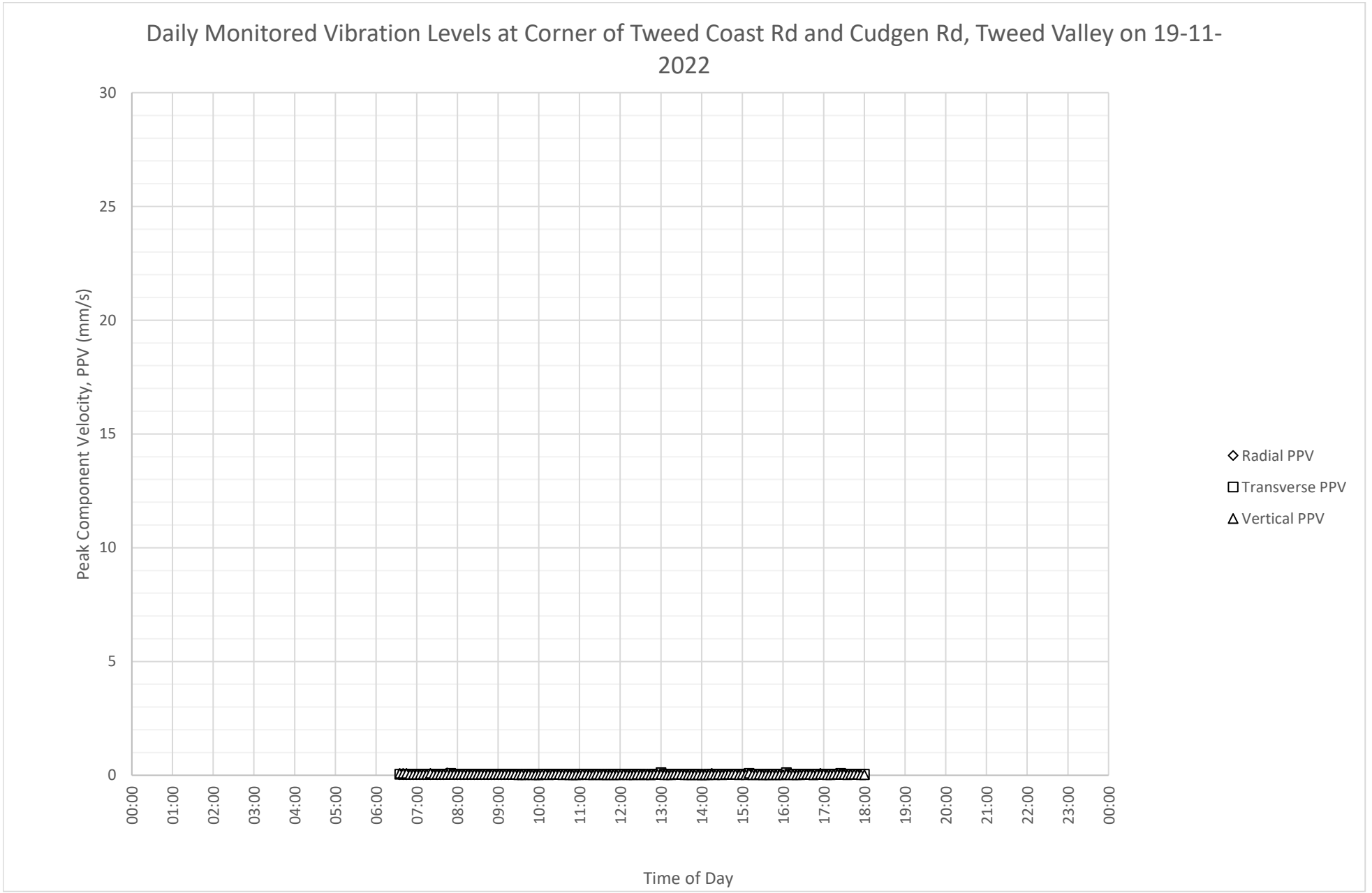
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 19-11-2022
Peak Component Velocity, PPV (mm/s)
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25
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01:00
02:00
03:00
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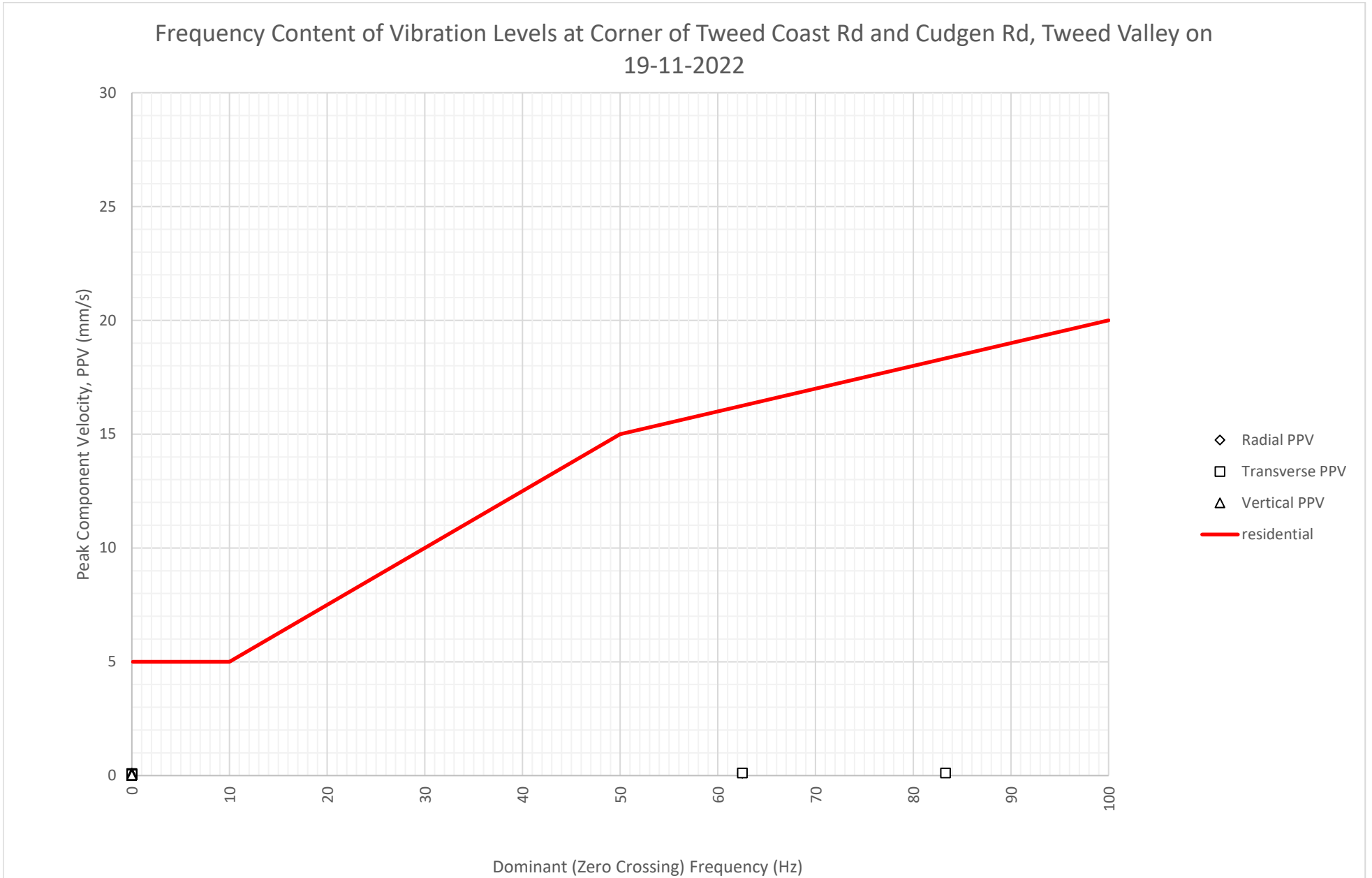
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 19-11-2022
Peak Component Velocity, PPV (mm/s)
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25
20
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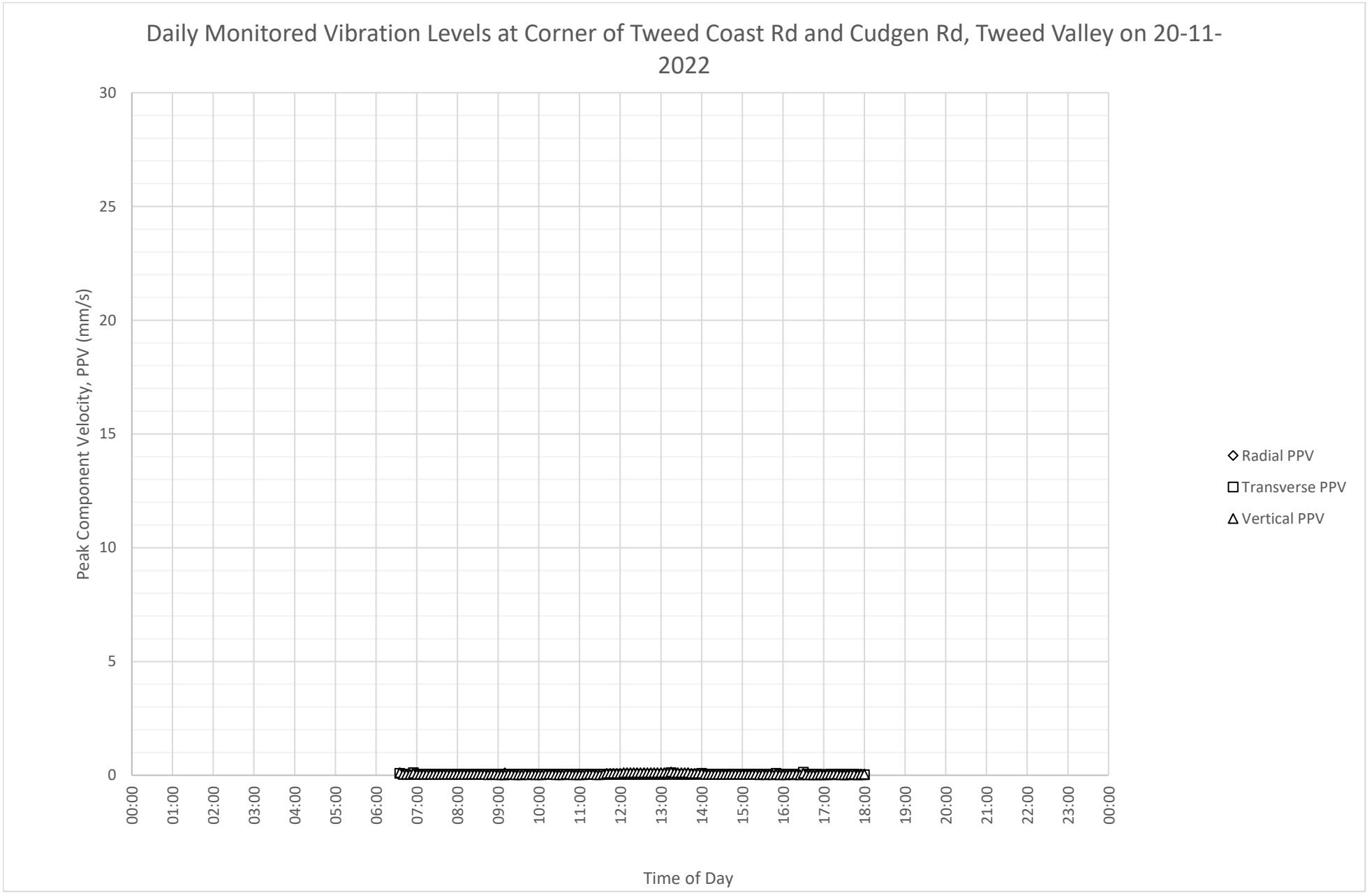
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 20-11-2022
Peak Component Velocity, PPV (mm/s)
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25
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03:00
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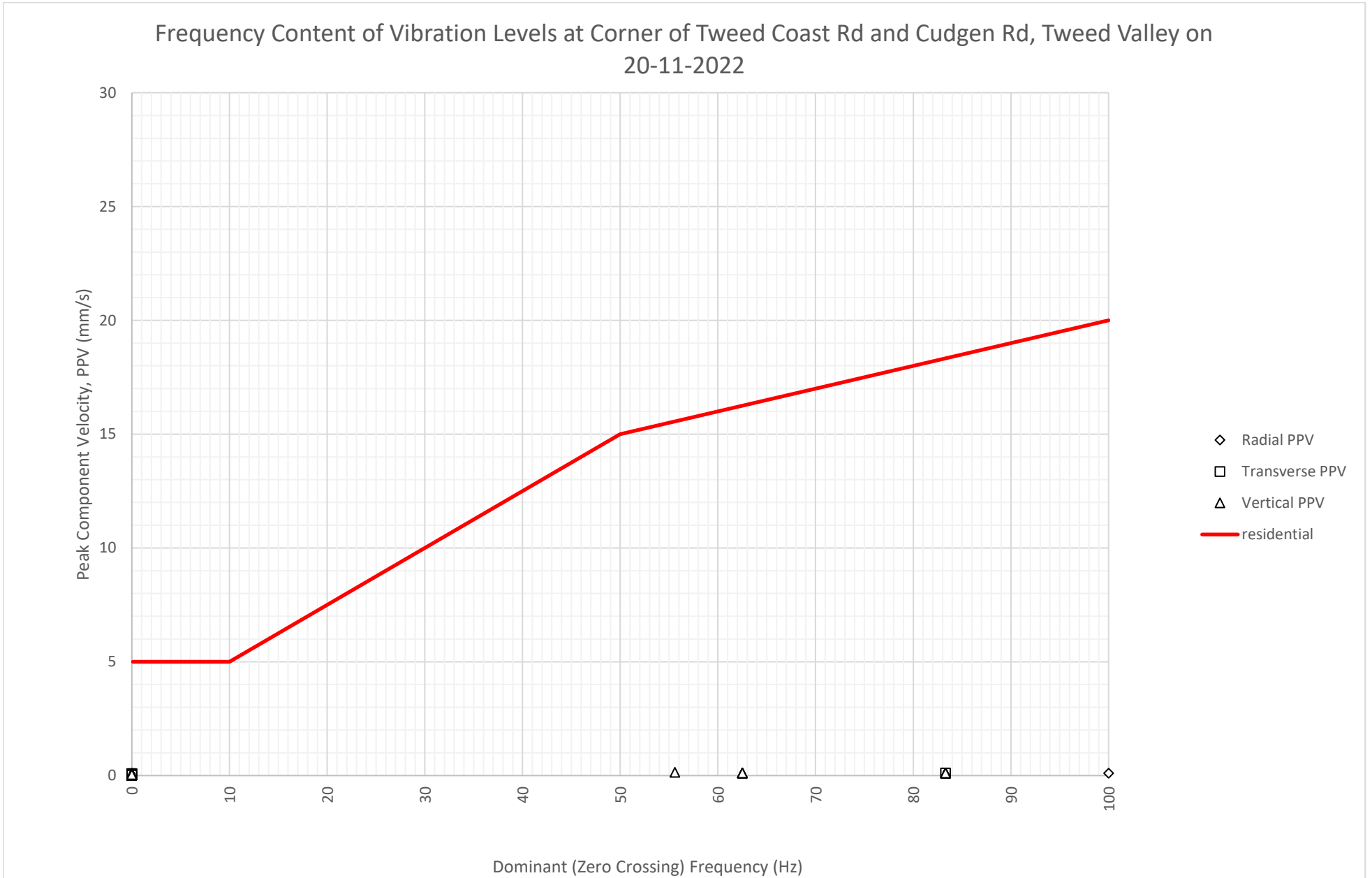
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 20-11-2022
Peak Component Velocity, PPV (mm/s)
30
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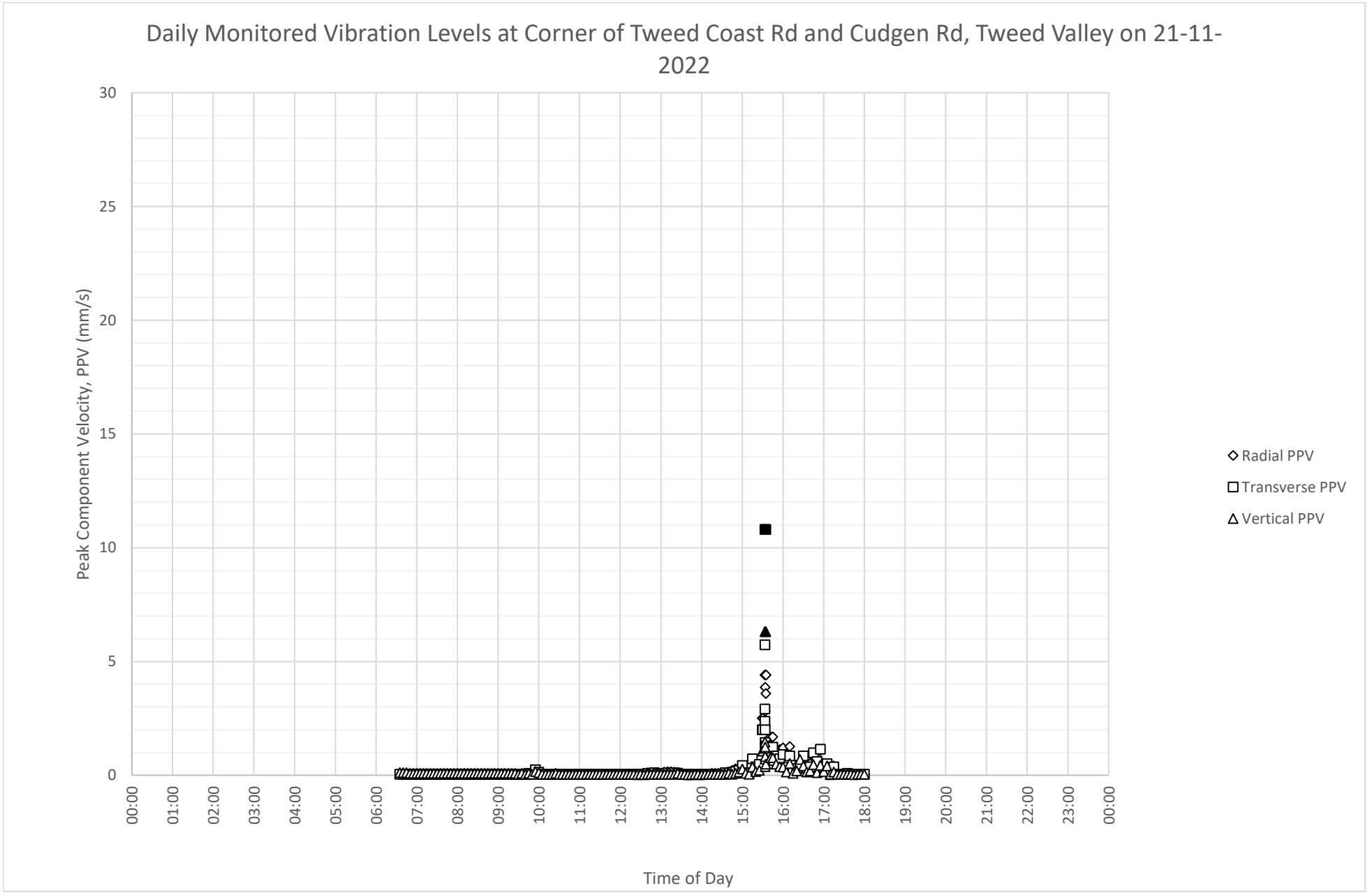
100
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential


Daily Monitored Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 21-11-2022
Peak Component Velocity, PPV (mm/s)
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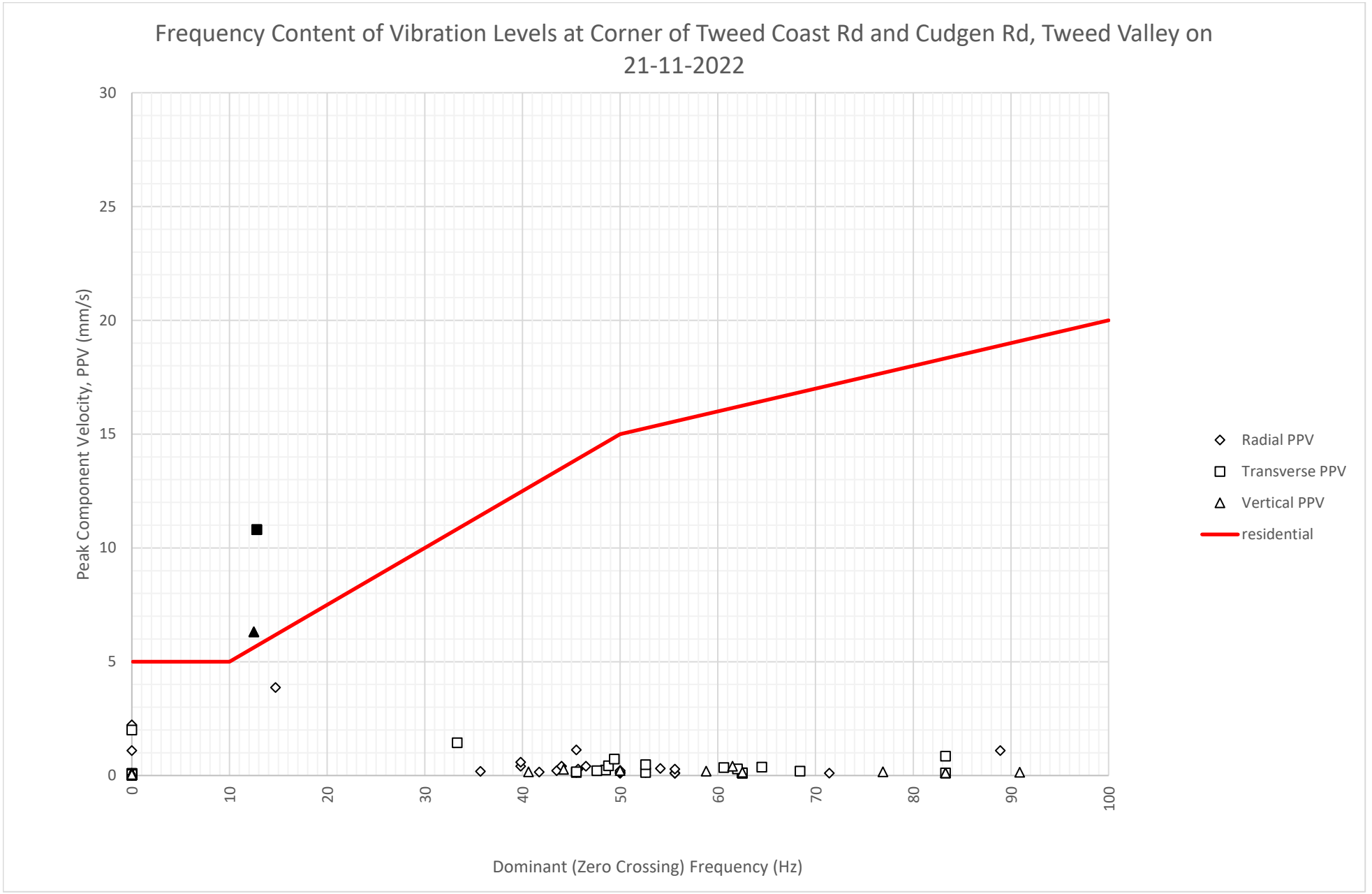
Time of Day
Radial PPV
Transverse PPV
Vertical PPV


Frequency Content of Vibration Levels at Corner of Tweed Coast Rd and Cudgen Rd, Tweed Valley on 21-11-2022
Peak Component Velocity, PPV (mm/s)
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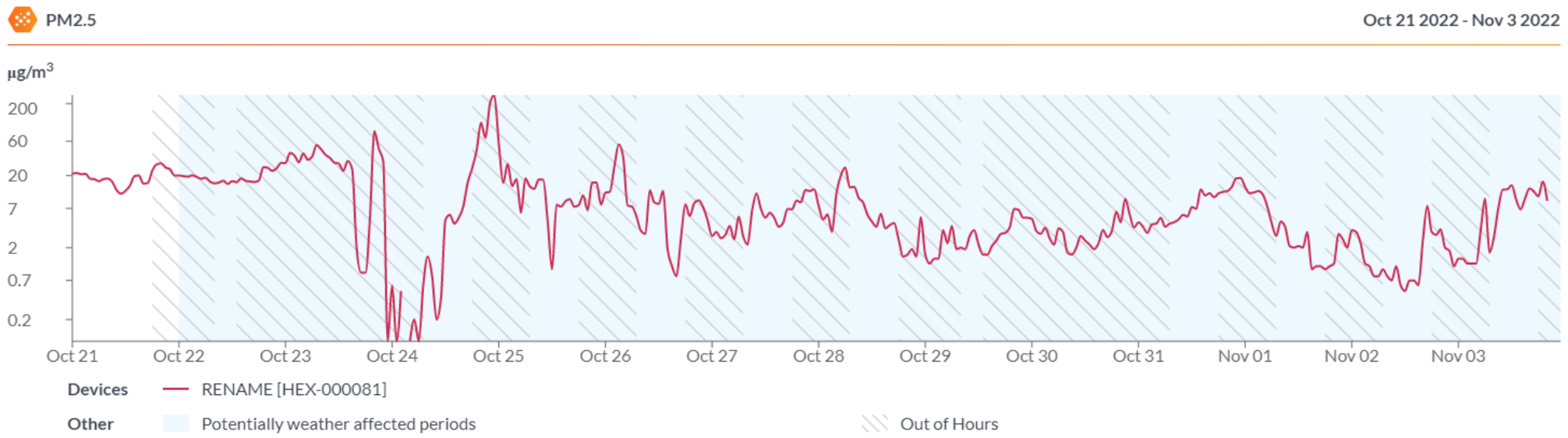
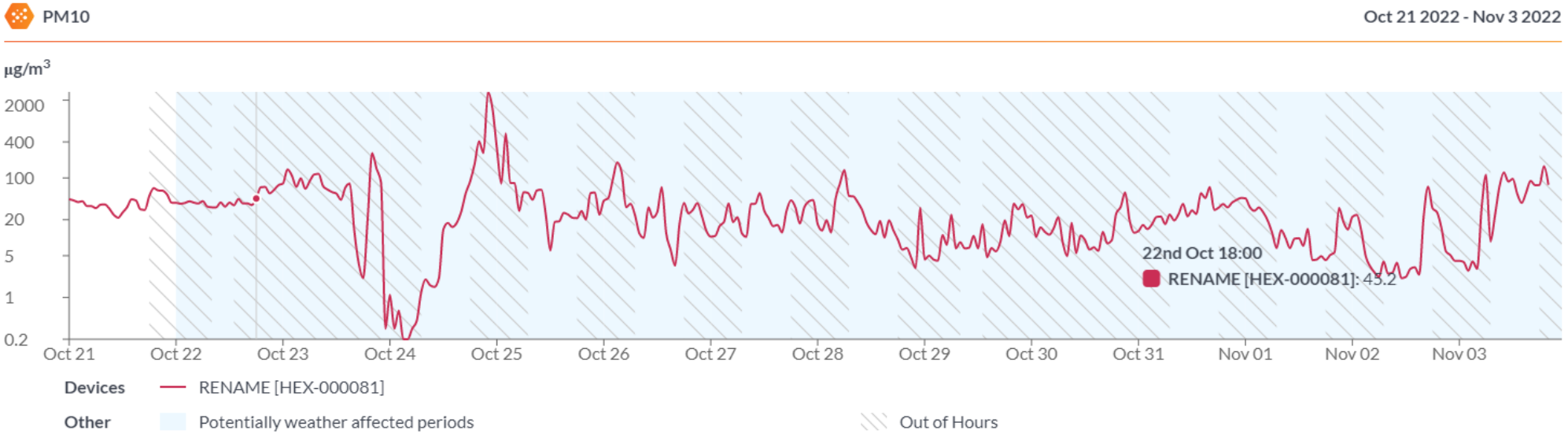
Dominant (Zero Crossing) Frequency (Hz)
Radial PPV
Transverse PPV
Vertical PPV
residential

APPENDIX 3 – DUST MONITORING RESULTS

Hourly Average





Daily average