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Acoustics

PEACOCKE TRANSFER STATION & FITZROY
NETWORK DRAINAGE WORKS
CNVMP

Rp 001 20211128 | 10 November 2021

Project: **PEACOCKE TRANSFER STATION
AND FITZROY NETWORK DRAINAGE WORKS**

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Report No.: **Rp 001 20211128**

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APPENDIX D FITZROY PIPELINE CONSTRUCTION N&V CONDITIONS OF CONSENT

1.0 INTRODUCTION

This Construction Noise and Vibration Management Plan (the CNVMP) is required to satisfy the requirements of designation A106 (Southern Links) and resource consent 010.2021.00011378.001. It identifies the performance standards and sets out best practicable options (BPO) for noise and vibration management.

This CNVMP applies to the following works:

- Peacocke Transfer Station construction, and
- Mangakōtukutuku “Fitzroy” network drainage works

This CNVMP shall be implemented throughout the construction phases. It shall be considered a ‘living document’ that is expanded and updated as the work progresses and working conditions become clearer. It is intended to be the primary tool with which to manage the Project’s construction noise and vibration effects.

A glossary of terminology is included in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Overview

The works involve two separate but inter-related projects – the Peacocke Transfer Station and the Fitzroy network drainage works.

Site maps showing works footprints and general receiving environments are attached in Appendix B.

The works are scheduled as follows:

- Peacocke Transfer Station: 351 days (30 September 2022 to 14 March 2023)
- Fitzroy network drainage works: 79 days (19 May 2022 to 7 September 2022)

Typical construction hours will be 0700 – 1800 hrs, Monday to Saturday.

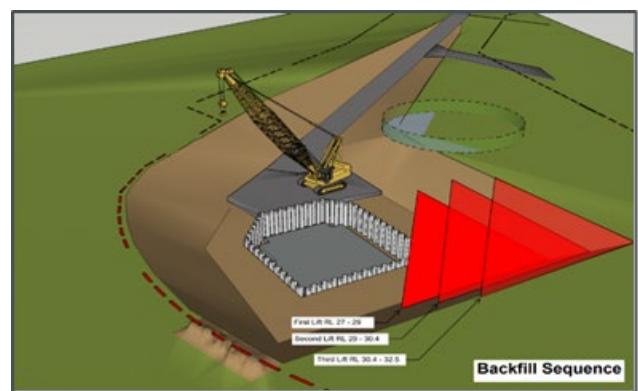
2.2 Construction Methodology

Peacocke Transfer Station Works

At a very high level the transfer (pump) station and ancillary equipment will be constructed at depth utilising an open temporary cut of approximately 9m deep then progressively constructing the main and adjacent structures along with staged backfilling operations.

The below-ground work is planned to occur in three distinct phases which, upon reaching finished ground level, will revert back to more conventional vertical construction type work.

The sheet piling operation will be the most significant in terms of impacting local surrounds and this occurs early February 2022.



Proposed backfill sequence – refer to Appendix A for larger image

Fitzroy Network Drainage Works

Work outside of the immediate transfer station site boundary occurs across a combination of designated and undesignated public and private land.

The majority of the drainage works are planned to be micro-tunnelled which significantly reduces the use of heavy construction equipment over a prolonged period.

Micro tunnelling involves the open excavation of a series of localised launch and receive pits along the pipe alignment (approximately every 100m) with the balance of the drilling and installation works happening below ground.

The work having the most effect on local residents in terms of proximity and intensity will be the construction of the Fitzroy gravity line which involves a 50m long open trench in Plateau Drive.

Advisory note: Although sheet piling is not a first-choice option in terms of the planned construction methodology it will remain as a contingency to mitigate against a number of potential environmental factors that may be encountered.

2.3 Contact Details

Contact details for the relevant personnel are listed in Table 1. The Project Manager is responsible for implementing this CNVMP.

Table 1: Contacts

Role	Name	Organisation	Phone	Email
Project Manager	Grant Gedye	BPC	027 517 5859	GrantG@fcc.co.nz
Stakeholder Engagement	Grant Hubbard	BPC	021 223 9018	Grant.hubbard@fcc.co.nz
Acoustic Specialist	Mat Cottle	MDA	021 028 59884	mat.cottle@marshallday.co.nz

3.0 PROJECT DESIGNATION AND CONSENT CONDITIONS

3.1 Peacocke Transfer Station – Designation Conditions

The transfer station is located within the Southern Links designation A106, therefore this CNVMP is required as per the designation conditions contained in Appendix C.

3.2 Fitzroy network drainage works – Consent Conditions

This CNVMP is required in accordance with consent 010.2021.00011378.001 as per the conditions contained in Appendix D.

4.0 CONSTRUCTION NOISE

Construction noise must be measured and assessed according to New Zealand Standard NZS 6803:1999 “*Acoustics – Construction Noise*”. The noise limits apply at 1m outside the façades of buildings, and only while they are occupied.

4.1 Peacocke Transfer Station – Construction noise limits

The construction noise limits from Condition 11.3 are summarised in Table 2.

Table 2: Construction noise levels for occupied PPFs and commercial & industrial receivers

Day	Time	$L_{Aeq(15min)}$	L_{AFmax}
Occupied PPFs (as defined in NZS 6806.2010)			
Weekdays	0630h – 0730h	60 dB	75 dB
	0730h – 1800h	75 dB	90 dB
	1800h – 2000h	70 dB	85 dB
	2000h – 0630h	45 dB	75 dB
Saturday	0630h – 0730h	60 dB	75 dB
	0730h – 1800h	75 dB	90 dB
	1800h – 2000h	45 dB	75 dB
	2000h – 0630h	45 dB	75 dB
Sundays and public holidays	0630h – 0730h	45 dB	75 dB
	0730h – 1800h	55 dB	85 dB
	1800h – 2000h	45 dB	75 dB
	2000h – 0630h	45 dB	75 dB
Commercial and industrial receivers			
All	0730h – 1800h	75 dB	
	1800h – 0730h	80 dB	.

4.2 Fitzroy Pipeline – Construction noise limits

The construction noise limits from Condition 10 are summarised in Table 3.

Table 3: Construction noise levels in residential zones

Time period	Monday to Friday		Saturdays		Sundays and Public Holidays	
	Leq (dBA)	Lmax (dBA)	Leq (dBA)	Lmax (dBA)	Leq (dBA)	Lmax (dBA)
06:30am to 07:30am	55	75	45	75	45	75
07:30am to 06:00pm	70	85	70	85	55	85
06:00pm to 08:00pm	65	80	45	75	45	75
08:00pm to 06:30am	45	75				

Advisory note: The lower noise limits (shaded) mean that some construction work, particularly in relation to any concrete pours, piling and earthworks, may not be able to take place during the corresponding timeframes, which includes all times on Sundays and public holidays.

4.3 Predicted Noise Levels

The following tables predict levels for high-noise construction activities. They identify the equipment that may require mitigation and/or management and the source-receiver distances where the risk begins. The tables will be kept up to date by the Acoustic Specialist when new information becomes available, e.g. through noise monitoring (Section 8.2).

4.3.1 Peacocke Transfer Station

The predicted levels for high-noise activities associated with the construction of the transfer station are given in Table 4.

Table 4: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Noise Level (dB L _{Aeq})			Setback (m)
		20 m	70 m	100 m	
<u>Excavation:</u>					
Excavator (20t)	103	72	59	55	14
3-axle dump truck (Moxy)	109	78¹	65	61	28
135t crane + vibro-hammer sheet piler	116	-	72	68	52
Hydraulic power pack	97	-	53	49	7
Generator (150kVA)	93	-	49	45	4
Dewatering pump	93	-	49	45	4
<u>Wet/dry well construction:</u>					
135T mobile crane	100	-	56	52	10
Concrete truck + pump	106	-	62	58	20
3-axle truck	103	72	59	55	14
Dewatering pump	97	-	53	49	7
Plate compactor	106	-	62	58	20
Generator (150kVA)	93	-	49	45	4
Excavator (20t)	103	-	59	55	14
Grinder (hand tools)	100	-	56	52	10
Compressor	93	-	49	45	4
<u>Site landscaping and access roads:</u>					
20T excavator (digging)	103	72	59	55	14
3-axle truck	103	72	59	55	14
7t vibratory roller	102	71	58	54	13
Bitumen truck	103	72	59	55	14

Notes to Table:

- (1) 20m setback for works adjacent to 114 Peacockes Road. This receiver and 112 Peacockes Road are within the Waka Kotahi designation boundary and are not considered to be PPFs although may still be occupied during construction
- (2) Setback distances scaled off drawing PTS000 CIV-2002 Rev D

4.3.2 Fitzroy Pipeline WWMH-A01 to WWMH-A04

This section of pipeline will be constructed via micro-tunnel boring machine (MTBM). The predicted levels for high-noise construction activities are given in Table 5.

There are currently no dwellings nearby therefore management and mitigation measures are not required.

Table 5: Indicative noise levels at nominal setback distances

Equipment	Sound Power Level (dB L _{Aeq})	Noise Level (dB L _{Aeq})			Setback (m)
		20 m	40 m	60 m	
<u>Jacking Pit Construction:</u>					
Truck (semi-trailer)	103	70	65	61	25
20T Excavator	103	70	65	61	25
Ventilation fan	102	69	64	60	22
Dewatering pump	97	64	59	55	13
<u>Pipe Jacking:</u>					
20T Excavator	103	70	65	61	25
Containerised generator	103	70	65	61	25
Hydraulic power pack	99	66	61	57	16
Ventilation fan	102	69	64	60	22
Dewatering pump	97	64	59	55	13
Concrete truck with pump	106	73	68	64	33
<u>Road surface reinstatement:</u>					
Truck (semi-trailer)	103	70	65	61	25
12T Excavator	102	69	64	60	22
Asphalt paver	109	76	71	67	44
Vibrating/Static roller	106	73	68	64	33
Plate compactor	106	73	68	64	33

Notes to Table:

(1) Adjoining land vacant as at the date of this CNVMP therefore predicted levels in Table 5 are for nominal setback distances

4.3.3 Fitzroy Pipeline WWMH-A04 to WWMH-A07

This section of pipeline will be constructed via open trenching. The predicted levels for high-noise construction activities are given in Table 6.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits (Section 6.3). If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

Table 6: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Mitigation (dBA)	Noise Level (dB L _{Aeq})			Setback (m)
			20 m	23 m	25 m	
<u>Trench excavation, pipe installation, backfilling, reinstatement:</u>						
20T excavator	103	-10	62	61	60	8
25-35T mobile crane	98	-10	57	56	55	4
12T excavator	102	-10	61	60	59	7
6-wheel truck & trailer	103	-10	62	61	60	8
7t vibratory roller	102	-10	61	60	59	7
Bitumen truck	103	-10	62	61	60	8

Notes to Table:

- (1) Depth to invert range is 6.32m to 6.63m as per 3-AWC92.00(11-06) C1210 Rev G requiring trench shoring via sheet piles
- (2) The table results include a 10 dB reduction from a noise barrier. Where no noise barrier used values in the table will be 10 dB higher and the compliance setback will increase by approximately 10 to 15m

4.3.4 Fitzroy Pipeline WWMH-A07 to WWMH-A13

This section of pipeline will be constructed via MTBM. The predicted levels for high-noise construction activities are given in Table 7.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits (Section 6.3). If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

Noise barriers may be required where jacking pits are located within 20m of dwelling façades. Minor exceedances will still occur for some activities at ~10m from dwellings therefore, stakeholder communication prior to non-compliant works will be required.

Table 7: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Mitigation (dBA)	Noise Level (dB L _{Aeq})			Setback (m)
			10 m	15 m	20 m	
<u>Jacking Pit Construction:</u>						
Truck (semi-trailer)	103	-10	68	64	62	8
20T Excavator	103	-10	68	64	62	8
Ventilation fan	102	-10	67	63	61	7
Dewatering pump	97	-10	62	58	56	4
<u>Pipe Jacking:</u>						
20T Excavator	103	-10	68	64	62	8
Containerised generator	103	-10	68	64	62	8
Hydraulic power pack	99	-10	64	60	58	5
Ventilation fan	102	-10	67	63	61	7
Dewatering pump	97	-10	62	58	56	4
Concrete truck with pump	106	-10	71	67	65	11
<u>Road surface reinstatement:</u>						
Truck (semi-trailer)	103	-10	68	64	62	8
12T Excavator	102	-10	67	63	61	7
Asphalt paver	109	-10	74	70	68	16
Vibrating/Static roller	106	-10	71	67	65	11
Plate compactor	106	-10	71	67	65	11

Notes to Table:

- (1) Depth to invert range is 2.16m to 4.34m as per 3-AWC92.00(11-06) C1211 Rev F
- (2) The table results include a 10 dB reduction from a noise barrier. Where no noise barrier used values in the table will be 10 dB higher and the compliance setback will increase by approximately 10 to 15m

4.3.5 Fitzroy Pipeline WWMH-A13 to WWMH-A15

This section of pipeline will be constructed via open trenching. The predicted levels for high-noise construction activities are given in Table 8.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits (Section 6.3). If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

Noise barriers may be required where open trenching occurs within 20m of dwelling façades.

Table 8: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Mitigation (dBA)	Noise Level (dB L _{Aeq})			Setback (m)
			15 m	20 m	40 m	
<u>Trench excavation, pipe installation, backfilling, reinstatement:</u>						
20T excavator	103	-10	64	62	55	8
25-35T mobile crane	98	-10	59	57	50	4
12T excavator	102	-10	63	61	54	7
6-wheel truck & trailer	103	-10	64	62	55	8
7t vibratory roller	102	-10	63	61	54	7
Bitumen truck	103	-10	64	62	55	8

Notes to Table:

- (1) Depth to invert range is 1.56m to 3.96m as per 3-AWC92.00(11-06) C1212 Rev F therefore use of trench shields assumed
- (2) The table results include a 10 dB reduction from a noise barrier. Where no noise barrier used values in the table will be 10 dB higher and the compliance setback will increase by approximately 10 to 15m

4.3.6 Fitzroy Pipeline WWMH-A15 to WWMH-A20

This section of pipeline will be constructed via horizontal directional drilling (HDD). The predicted levels for high-noise construction activities are given in Table 9.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits (Section 6.3). If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

Noise barriers may be required where HDD pits are located within 20m of dwelling façades.

Table 9: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Mitigation (dBA)	Noise Level (dB L _{Aeq})			Setback (m)
			15 m	20 m	40 m	
<u>Pit Construction:</u>						
Truck (semi-trailer)	103	-10	64	62	55	8
20T Excavator	103	-10	64	62	55	8
Concrete truck and pump	106	-10	67	65	58	11
<u>Drilling:</u>						
HDD rig (combined)	106	-10	67	65	58	11
10-20T excavator	102	-10	63	61	54	7
6-wheel truck & trailer	103	-10	64	62	55	8
<u>Road surface reinstatement:</u>						
Truck (semi-trailer)	103	-10	64	62	55	8
12T Excavator	102	-10	63	61	54	7
Asphalt paver	109	-10	70	68	61	16
Vibrating/Static roller	106	-10	67	65	58	11
Plate compactor	106	-10	67	65	58	11

Notes to Table:

- (1) Launch pits for HDD plant are assumed to be benched
- (2) Depth to invert range is 1.29m to 3.96m as per 3-AWC92.00(11-06) C1212 Rev F
- (3) The table results include a 10 dB reduction from a noise barrier. Where no noise barrier used values in the table will be 10 dB higher and the compliance setback will increase by approximately 10 to 15m

4.3.7 Fitzroy Pipeline WWMH-A20 to WWMH-A24

This section of pipeline will be constructed via MTBM. The predicted levels for high-noise construction activities are given in Table 10.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits (Section 6.3). If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

Noise barriers may be required where jacking pits are located within 20m of dwelling façades.

Table 10: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Mitigation (dBA)	Noise Level (dB L _{Aeq})				Setback (m)
			15 m	20 m	30 m	70 dB L _{Aeq}	
<u>Jacking Pit Construction:</u>							
Truck (semi-trailer)	103	-10	64	62	58	8	
20T Excavator	103	-10	64	62	58	8	
Ventilation fan	102	-10	63	61	57	7	
Dewatering pump	97	-10	58	56	52	4	
<u>Pipe Jacking:</u>							
20T Excavator	103	-10	64	62	58	8	
Containerised generator	103	-10	64	62	58	8	
Hydraulic power pack	99	-10	60	58	54	5	
Ventilation fan	102	-10	63	61	57	7	
Dewatering pump	97	-10	58	56	52	4	
Concrete truck with pump	106	-10	67	65	61	11	
<u>Road surface reinstatement:</u>							
Truck (semi-trailer)	103	-10	64	62	58	8	
12T Excavator	102	-10	63	61	57	7	
Asphalt paver	109	-10	70	68	64	16	
Vibrating/Static roller	106	-10	67	65	61	11	
Plate compactor	106	-10	67	65	61	11	

Notes to Table:

- (1) Launch pits will be at WWMHs A21, A22 and A24. Pipe install pits will be situated at WWMHs A20, A23 and A24
- (2) Depth to invert range is 2.97m to 3.82m as per 3-AWC92.00(11-06) C1213 Rev F therefore use of trench shields assumed
- (3) The table results include a 10 dB reduction from a noise barrier. Where no noise barrier used values in the table will be 10 dB higher and the compliance setback will increase by approximately 10 to 15m

4.3.8 PS Rising Main Peacockes Road Section C05-08

This pipeline section will be constructed via open trench or HDD. The predicted levels for high-noise construction activities using worst-case (noisiest) open trenching are given in Table 11.

Table 11: Indicative noise levels at 1m from a building façade

Equipment	Sound Power Level (dB L _{Aeq})	Noise Level (dB L _{Aeq})			Setback (m)
		40 m	50 m	70 m	
<u>Trench excavation, pipe installation, backfilling, reinstatement:</u>					
20T excavator	103	65	63	59	25
25-35T mobile crane	98	60	58	54	14
5-10T excavator	101	64	62	58	22
6-wheel truck & trailer	103	65	63	59	25
7t vibratory roller	102	64	62	58	22
Bitumen truck	103	65	63	59	25

Notes to Table:

(1) Depth to invert range is 2.99m to 5.35m as per 3-AWC92.00(11-06) C1220 Rev F and C1221 Ref E.

4.4 Construction noise effects

The noise level received inside a sensitive space (e.g. bedroom, office, living room) will depend on the external noise level, the façade performance (particularly the glazing) and the acoustics of the room. These factors can vary widely.

NZS 6803 states that, where it is not possible to measure at 1 metre from the façade, an internal assessment can be done instead assuming a façade sound level difference of 20 decibels. However, 20 decibels is conservative (i.e. low) for modern buildings.

With knowledge of the façade glazing type, typical façade performance can be estimated as follows:

- Partially open windows (all buildings) 15 decibels
- Closed windows (historic lightweight house) 20 decibels
- Closed windows (modern lightweight house) 25 decibels
- Closed windows (modern masonry apartment or commercial building) 30 decibels

Table 12 provides guidance on daytime noise effects inside different types of buildings based on the external noise level and typical the glazing types.

Table 12: Daytime noise levels in commercial & industrial buildings and habitable rooms in dwellings

External Noise Level (dB L _{Aeq})	Estimated Internal Noise Level (dB L _{Aeq})			
	Sealed glazing (office building)	Closed windows (modern building)	Closed windows (older building)	Open windows (all buildings)
80 – 85	50 – 55	55 – 60	60 – 65	65 – 70
75 – 80	45 – 50	50 – 55	55 – 60	60 – 65
70 – 75	40 – 45	45 – 50	50 – 55	55 – 60

The responses of building occupants vary, but with effective prior engagement (Section 7.0) can be summarised as follows:

Internal Level **Subjective Response:**

- < 45 dB L_{Aeq} Noticeable, but unlikely to interfere with daily activities
- 45 – 50 dB L_{Aeq} Typically acceptable, but concentration and communication would begin to be affected
- 50 – 55 dB L_{Aeq} Annoyance for some occupants and personal conversations would require a slightly raised voice
- 55 – 60 dB L_{Aeq} Generally unacceptable and occupants would actively seek respite for any extended periods
- > 60 dB L_{Aeq} Unacceptable for extended periods

5.0 CONSTRUCTION VIBRATION

5.1 Peacocke Transfer Station -Vibration Performance Standards

The construction vibration limits from Condition 11.4 are summarised in Table 13.

Table 13: Construction vibration criteria

Receiver	Details	Category A	Category B	Location
Occupied dwellings	Monday to Friday 0630hrs to 2000hrs	1.0 mm/s PPV	5.0 mm/s PPV	Inside the building
	All hours Sunday and Monday to Saturday 2000hrs to 0630hrs	0.3 mm/s PPV	1.0 mm/s PPV	
Other occupied buildings	At all times	2.0 mm/s PPV	10.0 mm/s PPV	
All buildings	Transient vibration	5.0 mm/s PPV	BS 5228.2 Table B2 values	Building foundation
	Continuous vibration		50% of BS5228.2 Table B2 values	
Underground services	Transient vibration	20.0 mm/s PPV	30.0 mm/s PPV	On pipework
	Continuous vibration	10.0 mm/s PPV	15.0 mm/s PPV	

Advisory note: If measured or predicted vibration levels exceed the Category A criteria, then a suitably qualified and experienced person shall be engaged to assess and manage construction vibration to comply with the Category A criteria. If the Category A criteria cannot be practicably achieved, the Category B criteria shall be applied. If measured or predicted construction vibration levels exceed the Category B criteria, then construction activity shall only proceed if vibration effects on those buildings at risk of exceeding the Category B criteria are assessed, monitored and mitigated by suitably qualified persons.

5.2 Fitzroy Pipeline - Vibration Performance Standards

The construction vibration limits from Condition 11 are summarised in Table 14.

Table 14: Construction vibration criteria

Type of Structure	Short-term vibration			Long-term vibration	
	PPV at the foundation at a frequency of			PPV at horizontal plane of highest floor (mm/s)	PPV at horizontal plane of highest floor (mm/s)
	1-10Hz (mm/s)	10-50Hz (mm/s)	50-100Hz (mm/s)		
Commercial/ Industrial	20	20 - 40	40 - 50	40	10
Residential/School	5	5 - 15	15 - 20	15	5
Historic or sensitive structures	3	3 - 8	8 - 10	8	2.5

Advisory note: DIN 4150-3 limits are for avoiding cosmetic building damage, such as cracking in paint or plasterwork. Cosmetic building damage effects are deemed 'minor damage' in the Standard and can generally be easily repaired. The Standard states: "*Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur.*" Much higher vibration levels (i.e. an order of magnitude higher) would be needed for potential structural damage.

Advisory note: DIN 4150-3 states that Line 3 should be used for buildings "*that, because of their particular sensitivity to vibration, cannot be classified under Lines 1 and 2 and are of great intrinsic value (e.g. listed building)*".

5.3 Predicted Vibration Levels

The following tables predict levels for high-vibration construction activities. They identify the equipment that may require mitigation and/or management, and the source-receiver distances where the risk begins.

The predictions are based on regression analyses of available vibration data. The amenity setbacks are based on typical levels, whereas the setbacks for cosmetic building damage are more conservative (i.e. addition of a 100% safety factor) to inform the need for pre-construction building condition surveys (Section 8.4).

The tables will be kept up to date by the Acoustic Specialist when new information becomes available and through vibration monitoring (Section 8.3).

Peacocke Transfer Station Construction Vibration

Vibration from the identified sources will be perceptible at the closest dwellings on Peacockes Road and are predicted to be up to 1mm/s PPV. Communication with the closest stakeholders will be required to reassure them that cosmetic damage to their homes will not occur.

Table 15: Indicative distances (m) to comply with continuous and transient vibration limits

Equipment	Occupied dwellings		All buildings	
	Cat A	Cat B	Cat A	Cat B
	0.3 mm/s PPV	1 mm/s PPV	5 mm/s PPV	50% of Table B2 BS 5228.2
Vibratory Roller	307	81	14	Not applicable ¹
Vibro-hammer sheet piler	749	122	11	Not applicable ¹
Excavator	698	80	4	0-2

Notes to Table:

(1) The limits in Table B2 of BS 5228.2 relate to transient (peak) vibration. These vibration sources produce continuous vibration

Fitzroy Network Drainage Works Construction Vibration

Vibration from the identified sources will be perceptible at the closest dwellings. Vibration will comply with the cosmetic damage limits at the setback distances noted in Table 16. Communication with the closest stakeholders will be required to reassure them that cosmetic damage to their homes will not occur.

Table 16: Indicative distances to comply with vibration limits at building foundations

Equipment	Cosmetic Building Damage Setback (m) ¹		
	Heritage 2.5 mm/s PPV	Residential 5 mm/s PPV	Commercial 10 mm/s PPV
Vibratory Roller	N/A	14	6
Excavator	N/A	4	1
MTBM	N/A	4	2

5.4 Vibration Effects

The main vibration concern of building owners and occupants is usually building damage, but they will feel vibration at levels much lower than those that would cause damage. Identified receivers will be informed about the vibration levels they may experience, and be assured that vibration damage can only occur at levels well above the threshold of perception (Section 7.1).

British Standard BS 5228-2:2009 “*Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*” provides guidance on the amenity effects of vibration. The descriptions are reproduced below, and are supplemented with our own descriptions for 2mm/s and 5mm/s (to bridge the gap between 1 and 10 mm/s in the Standard):

¹ Based on regression analysis of available vibration measurements, plus a 100% safety factor (conservative)

<u>Vibration Level (PPV)</u>	<u>Subjective Response:</u>
• 0.14mm/s	Just perceptible in the particularly sensitive environments
• 0.3 mm/s	Just perceptible in normal residential environments
• 1 mm/s	Typically acceptable with prior notification
• 2 mm/s	Clearly perceptible but typically acceptable (during daytime only) in dwellings and workplaces if it occurs intermittently, and with effective prior engagement.
• 5mm/s	Highly unsettling in dwellings and workplaces. If prolonged, some occupants may want to leave the building. Computer screens will shake, and items could fall off shelves if they are not level.
• 10 mm/s	Likely to be intolerable for any more than a very brief period

A vibration amenity limit of 0.3mm/s PPV applies in dwellings at night for the Peacockes transfer station. This level of vibration is extremely low and within the margins of any reliable prediction method. It is essentially a 'no effects' threshold to avoid sleep disturbance and practically requires that no high-vibration activities occur at night.

For some activities, construction vibration can excite the building structure at audible frequencies. This is called 'reradiated noise' and is heard rather than felt. Some activities generate both and it can be difficult for a building occupant to tell whether they are hearing or feeling the vibration. Predicting reradiated noise levels is complex and highly site-specific. Where necessary, a suitability qualified acoustic specialist will be engaged to provide guidance. The indoor effects descriptions in Section 4.4 also relate to reradiated noise.

6.0 MITIGATION AND MANAGEMENT

6.1 Training

All staff shall participate in an induction training session before starting work on the construction, with attention given to the following matters:

- Activities with the potential to generate high levels noise and/or vibration
- Mitigation and management measures (Section 6.0)
- Sensitive receivers and any agreements made through engagement (Section 7.0)
- Monitoring requirements (Section 8.0)

As the construction progresses, any updates of noise and vibration matters will be addressed during regular site meetings and/or 'toolbox' training sessions.

6.2 Equipment Selection

When selecting construction equipment:

- Use quieter construction methodologies where practicable (e.g. bored piling instead of vibro-sheet piling)
- Use electric motors rather than diesel engines where practicable
- Use rubber tracked equipment rather than steel tracked equipment where practicable
- Use equipment that is suitably sized for the task
- Maintain equipment well to minimise rattles, squeaks etc
- Fit engines with exhaust silencers and engine covers, where practicable

- Avoid tonal reversing or warning alarms (beepers). Alternatives include broadband alarms (squawkers/quackers), flashing lights, proximity sensors, reversing cameras and spotters

6.3 Scheduling

Avoid night works unless it can be demonstrated to be the BPO.

Scheduling is an important management tool, particularly where a receiver expresses concern about construction works at a certain time of day. Where necessary, high noise and vibration noisy works will be programmed to minimise disturbance.

Scheduling activities to be undertaken when nearby sensitive receiver buildings are unoccupied is the most effective measure as it avoids the effect. For example, piling works could be undertaken during the daytime when occupants of a dwelling are at work/school.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise and vibration limits. If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

6.4 General Measures

Complaints can arise even if the noise and vibration levels comply with the Project limits. To minimise complaints, the following common mitigation measures are recommended:

- Avoid unnecessary noise. This means managing the site to ensure:
 - All moving plant to have reversing “squawkers” installed prior to use on site
 - No shouting
 - No unnecessary use of horns
 - No loud site radios
 - No rough handling of material and equipment
 - No banging or shaking excavator buckets
 - No unnecessary steel on steel contact (e.g. during the loading of scaffolding on trucks)
 - No high engine revs. This includes choosing the right sized equipment and turning engines off when idle.
- Avoid unnecessary vibration. This means managing the site to ensure:
 - No unnecessary dropping of heavy objects
 - No potholes, bumps or corrugations in site accessways
 - Excavator operators are skilled and use their machine considerately
- Mitigate track squeal from tracked equipment, such as excavators. This may include tensioning and watering or lubricating the tracks regularly
- Locate stationary equipment (e.g. generators) away from noise sensitive receivers and/or screen them behind site buildings and material stores
- Orient mobile machinery to maximise the distance between the engine exhaust and the nearest sensitive building façade (e.g. excavators)
- Utilise noise barriers and enclosures where appropriate (Section 6.5)
- Utilise specific measures for the following activities:
 - Excavators (Section 6.6)
 - Piling (Section 6.7)

- Compaction (Section 6.8)
- Engagement is complete (Section 7.0) prior to commencing high-noise and vibration activities
- Undertake monitoring (Section 8.0)

6.5 Noise Barriers

Temporary noise barriers may be used where an activity is predicted to exceed the construction noise limits (Section 4.3) unless they are ineffective (e.g. where a receiver is elevated and would look over the barrier or the noise source is elevated above ground level e.g. vibro-sheet piling). They will be installed prior to works commencing and maintained throughout the works.

Effective noise barriers typically reduce the received noise level by 10 decibels.

Where practicable, the following guidelines will be used in designing and installing temporary noise barriers:

- The panels will have a minimum surface mass of 6.5 kg/m². Suitable panels include 12 mm plywood or the following proprietary 'noise curtains': proprietary
 - SealedAir 'WhisperFence 24dB' (www.sealedair.com)
 - Hushtec 'Premium Series Noise Barrier' (www.duraflex.co.nz)
 - Soundbuffer 'Performance Acoustic Curtain' (soundbuffer.co.nz)
 - Hoardfast 'Fast Wall Premium PVC partition panels' (www.ultimate-solutions.co.nz)
 - Safesmart 'Acoustic Curtain 6.5kg/m²' (www.safesmartaccess.co.nz)
 - Alternatives will be approved by a suitably qualified and experienced acoustic specialist
- The panels will be a minimum height of 2 m, and higher if practicable to block line-of-sight
- The panels will be abutted, battened or overlapped to provide a continuous screen without gaps at the bottom or between panels
- Barriers will be positioned as close as practicable to the high-noise activity to block line-of-sight between the activity and noise sensitive receivers. A site hoarding at the boundary may not be effective for all receivers. Add extra barriers close to high-noise activities to ensure effective mitigation for sensitive receivers on upper floors.

6.6 Excavators

All excavators can generate high noise and vibration levels at source. The actual level they generate depends very much on the experience and temperament of the operator.

- Use the right sized excavator for the job
- Operate the bucket and armature with smooth movements (avoid jerking)
- Tip material from the bucket rather than shaking it clean where practicable
- Avoid hitting the bucket on the ground or dropping heavy objects
- Control the weight shift of the excavator to avoid the tracks lifting and thudding on the ground

6.7 Piling

- Avoid evening and night-time periods and Sundays/public holidays
- Prioritise piling methods that minimise noise and vibration (e.g. augured, screw or press-in piles rather than drop-hammer, impact hammer or vibratory methods)

6.8 Compaction

- Avoid evening and night-time periods and Sundays/public holidays
- Match the size of plate compactor or roller to the scale of the works (i.e. large enough to undertake the works efficiently, but avoiding oversized units)
- Avoid the use of the vibratory function on rollers where practicable (e.g. roll thinner layers of fill without the vibration function to achieve the same compaction standard)
- Where the vibration function is adjustable, minimise amplitude and maximise the driving frequency to minimise vibration effects where practicable
- Minimise the duration of the vibratory function on rollers (e.g. use vibro mode to settle and align aggregate, then turn vibratory function off for subsequent static rolling compaction)
- Minimise the number of periods (e.g. complete all plate compaction or vibratory rolling in one extended period rather than two shorter periods with the same overall duration)
- Start/stop vibratory function away from buildings and pass by while the vibration level is stable
- Switch off the vibration function within the safe setback distances (Section 5.3)

7.0 ENGAGEMENT

7.1 Communication

7.1.1 Before construction

Written communication (e.g. newsletter) will be provided to building occupants within 50 m of a site at least 1-week prior to construction starting. It will include:

- Details of the overall works, its timing, and duration
- Contact details and names of personnel whose job it is to receive complaints and enquiries (should also match a person identified in Section 2.3)
- Acknowledge that some activities, listed in this document, are predicted to generate high noise and/or vibration levels and may result in disturbance for short periods

7.1.2 During construction

Once construction has begun, ongoing communication is important. Regular communication during the works will include:

- Public site signage that includes contact details
- Details of upcoming activities that may result in disturbance
- Any changes to scheduled timing and duration of activities

7.2 Consultation

Consultation will be offered to the sensitive receivers listed in Table 17. These are the neighbours where noise and/or vibration is predicted to exceed the performance standards.

Table 17: Sensitive receivers

Address	Building Type ²	Occupancy	Noise (Section 4.3)		Vibration (Section 5.3)	
			Noise	Vibration	Amenity	Cosmetic Building Damage
<u>WWMH-A04 to A07:</u>						
1A/B Plateau Drive	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4 Plateau Drive	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
6 Plateau Drive	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8 Plateau Drive	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
12 Plateau Drive	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
82A Peacockes Rd	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
84A/B Peacockes Rd	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<u>WWMH-A13 to A15:</u>						
11 Peacockes Rd	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13A Peacockes Rd	Residential	Dwelling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Notes to Table:

(1) = Does not comply with limit
 (2) = Complies with limit

The purpose of consultation is to address concerns about noise and vibration on a case-by-case basis. The Project Manager will address any concerns and complaints in accordance with Section 7.3. A copy of all correspondence will be made available to Council upon request.

Where nearby sensitive receivers are identified with particularly noise and/or vibration sensitive equipment and/or activities (e.g. recording studio or laser eye surgery), a suitably qualified and experienced specialist (e.g. Member of the Acoustical Society of New Zealand) will review the performance standards to ensure they are appropriate and participate in consultation.

Receivers that do not want ongoing consultation, will be offered communication (Section 7.1).

The following will be implemented by the Project Manager (or nominated person):

- If any exceedance of the cosmetic building damage standard is measured, that vibration activity will cease as soon as safe and practicable to do so
- Review the construction methodology, mitigation measures and management strategies to ensure they represent the BPO. The BPO considers:
 - Practicability
 - Predicted noise/vibration benefits
 - The interests of affected parties
 - Implications for Project timing and duration
 - Cost

² Classifications with respect to Tables 1 and 4 of DIN 4150-3:2016 “Vibrations in buildings – Part 3: Effects of vibration on structures” (i.e. historic/sensitive, residential or commercial/industrial)

- Consultation with affected parties to understand their sensitivities, including times they are home. The objective is to establish a collaborative approach to managing adverse noise and vibration effects
- A Project representative will be contactable during work hours (Section 2.3)
- A record of consultation will be kept at the site office and be available to affected parties and Council if requested
- Implement any measures agreed with the affected party in good faith
- Monitor the activity to verify the extent of any adverse effects (Section 8.0)
- If the vibration cosmetic building damage limits are exceeded (Section 5.1), a building condition survey will be undertaken (Section 8.4).
- Consider installing mechanical ventilation systems in buildings where external windows must be closed to avoid significant adverse noise effects and no alternative ventilation system is present. Only consider this option after all other BPO management and mitigation has been applied.
- Consider temporary relocation of sensitive receivers where all BPO management and mitigation measures have been applied and significant adverse noise effects are still likely. This will be in exceptional cases only, and advice from the Acoustic Specialist will be sought prior.

7.3 Complaints Response

Complaints will be acknowledged immediately where practicable and responded to within one day. If a more detailed response is needed, it will be provided within a timeframe agreed with the complainant.

All construction noise and/or vibration complaints will be recorded in a complaints file that is available to affected parties and Council on request. For each complaint, an investigation will be undertaken as soon as practicable using the following steps:

- Acknowledge receipt of the concern or complaint and record:
 - The name, address and contact details of the complainant (unless they elect not to provide)
 - Time and date the complaint was received and who received it
 - Time and date of the activity that caused the complaint (estimated where not known)
 - The complainant's description of the activity and its resulting effects
 - Any relief sought by the complainant (e.g. scheduling of the activity)
- Identify the relevant activity and review the activity log to verify the complaint (or otherwise)
- If a complaint relates to building damage, inform the on-duty site manager as soon as practicable and stop the relevant works pending an investigation. In most cases, stopping the activity will provide immediate relief. But in some cases, this may not be practicable for safety or other reasons, in which case the complainant will be kept updated regularly during the time it takes to stop the activity.
- Review data from monitoring (if available) to identify the time in question and, if possible, verify exceedance
- Review the predicted noise and/or vibration levels to determine if the activity was identified. Consider attended monitoring to verify the underlying reference level assumptions
- Review the mitigation and management measures in place to ensure the BPO has been applied (Section 6.0). Review the relief sought by the complainant. Adopt further mitigation and management measures as appropriate.

- Review the potential residual effects if predicted to continue to exceed the relevant performance standards
- Report the findings and recommendations to the Project Manager, implement changes and update this CNVMP as appropriate
- Report the outcomes of the investigation to the complainant, identifying where the relief sought by the complainant has been adopted or the reason(s) otherwise.

8.0 MONITORING

8.1 Overview

This is where a suitably qualified acoustic engineer visits the site and measures levels in real time. This enables:

- Review the implementation of this CNVMP, including the mitigation and management measures in Section 6.0 and engagement in Section 7.0
- Verify the predicted levels are representative and the response protocols are appropriate for the resulting effects, and
- Determine compliance

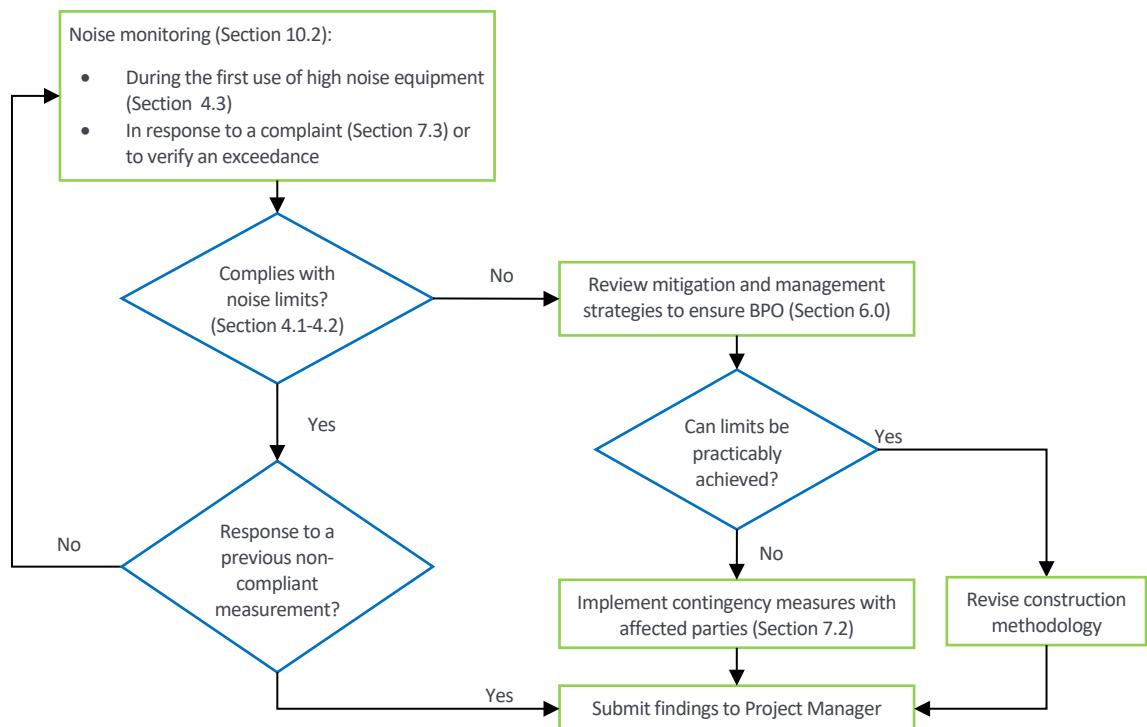
8.2 Noise monitoring

Construction noise will be monitored:

- During first use of noisy plant close to dwellings (Section 4.3)
- In response to a reasonable noise complaint (Section 7.3)
- At 1m from the building façade facing the construction site, or a proxy position adjusted for distance and façade reflection (if relevant)
- By a suitably qualified and experienced specialist (e.g. Member of the Acoustical Society of New Zealand) in accordance with the requirements of New Zealand Standard NZS 6803: 1999 “*Acoustics - Construction Noise*”
- For an appropriate duration, reported with the measured level (e.g. 65 dB L_{Aeq (30min)})
- The results will be used to update Section 4.3 if appropriate

A noise monitoring flowchart is presented in Figure 1.

Figure 1: Noise Monitoring Flow Chart



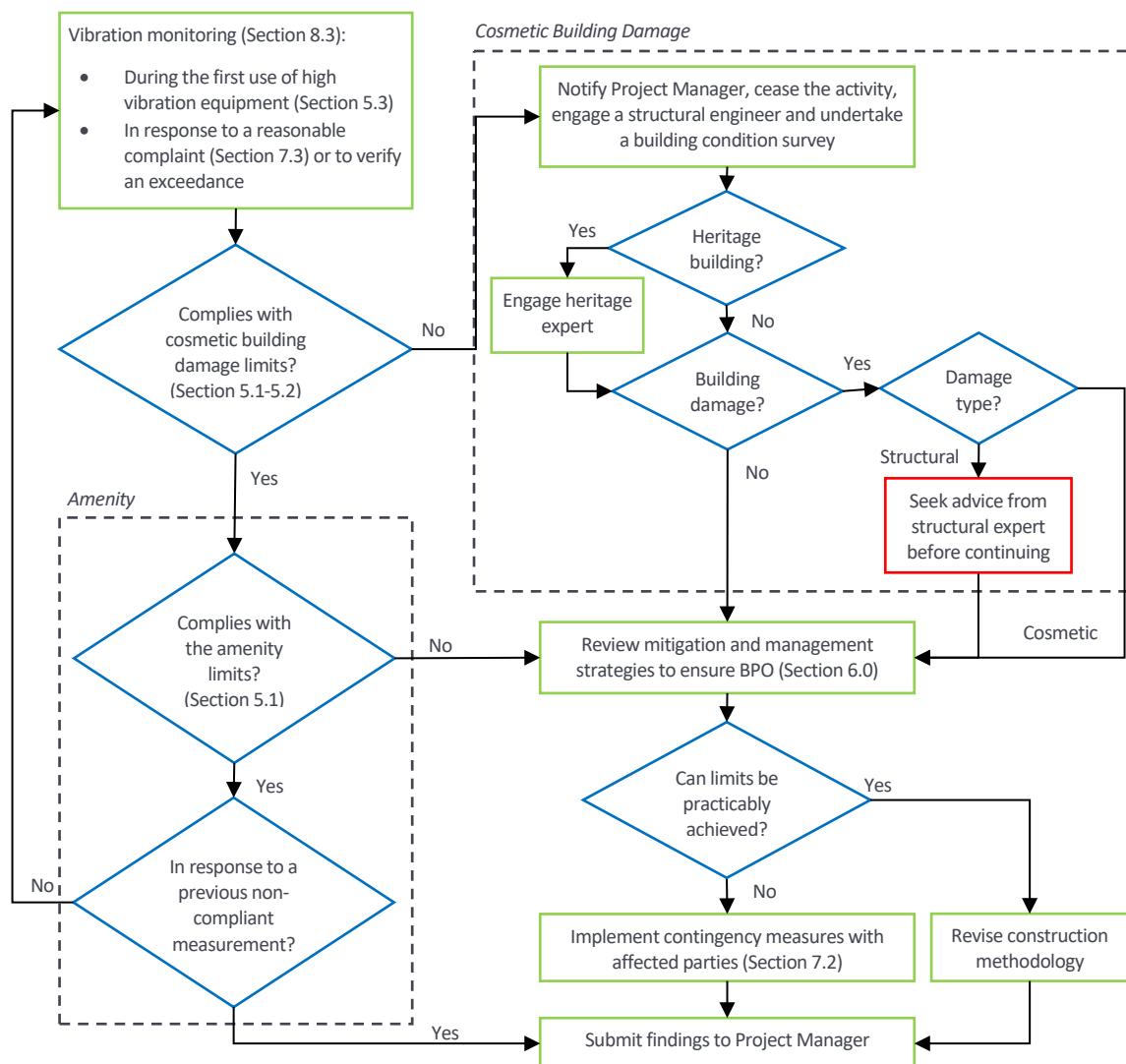
8.3 Vibration monitoring

Construction vibration will be monitored:

- During first use of high-vibration plant close to dwellings (Section 5.3)
- In response to a reasonable vibration complaint (Section 7.3)
- On the foundations and/or the top floor of the closest building as appropriate (Section 5.1), provided access to the building has been requested and granted
- By a suitably qualified and experienced specialist (e.g. Member of the Acoustical Society of New Zealand) in accordance with the requirements of German Standard DIN 4150-3:2016 “*Vibrations in buildings – Part 3: Effects of vibration on structures*”
- For a representative construction duration, measured in 2-second intervals
- The results will be used to update Section 5.3 as appropriate

A vibration monitoring flowchart is presented in Figure 2.

Figure 2: Vibration Monitoring Flow Chart



8.4 Building Condition Surveys

Building condition surveys document the state of a building, including any existing cracks or other damage. Completing this before construction provides a benchmark if damage claims are made during construction.

A condition survey will be undertaken for the following buildings:

- All Hamilton City Council buildings in Waiora Place (commercial)
- 2, 4, 6, 8, 12 Plateau Drive (residential)
- 84c, 86c, 128 Peacockes Road (residential)

The Project Manager will make a written request to the property owner for permission to undertake a building condition survey at the following times:

- Before construction starts
- During construction in response to a reasonable damage claim (Section 7.3) for properties not previously surveyed
- After construction and to avoid subsequent claims of damage from construction vibration

If monitoring shows that the vibration limit was exceeded, but no cosmetic damage has occurred, then that activity can continue provided the measured vibration level is not exceeded further and the construction methodology already adheres to the BPO. If damage has occurred, alternative construction methods will be investigated and the Lead Contractor should rectify the damage at its own cost, as soon as practicable, in consultation with the owner of the property.

Each building condition survey will:

- Be undertaken by a suitably qualified person
- Provide a description of the building
- Determine the appropriate structure type classification³ with respect to DIN 4150-3:2016 “*Vibrations in buildings – Part 3: Effects of vibration on structures*” (i.e. historic/sensitive, residential or commercial/industrial)
- Document and photograph the condition of the building, including any cosmetic and/or structural damage
- Will be available to the property owner and Council on request

³ Classifications with respect to Tables 1 and 4 of DIN 4150-3:2016 “*Vibrations in buildings – Part 3: Effects of vibration on structures*” (i.e. historic/sensitive, residential or commercial/industrial)

APPENDIX A GLOSSARY OF TERMINOLOGY

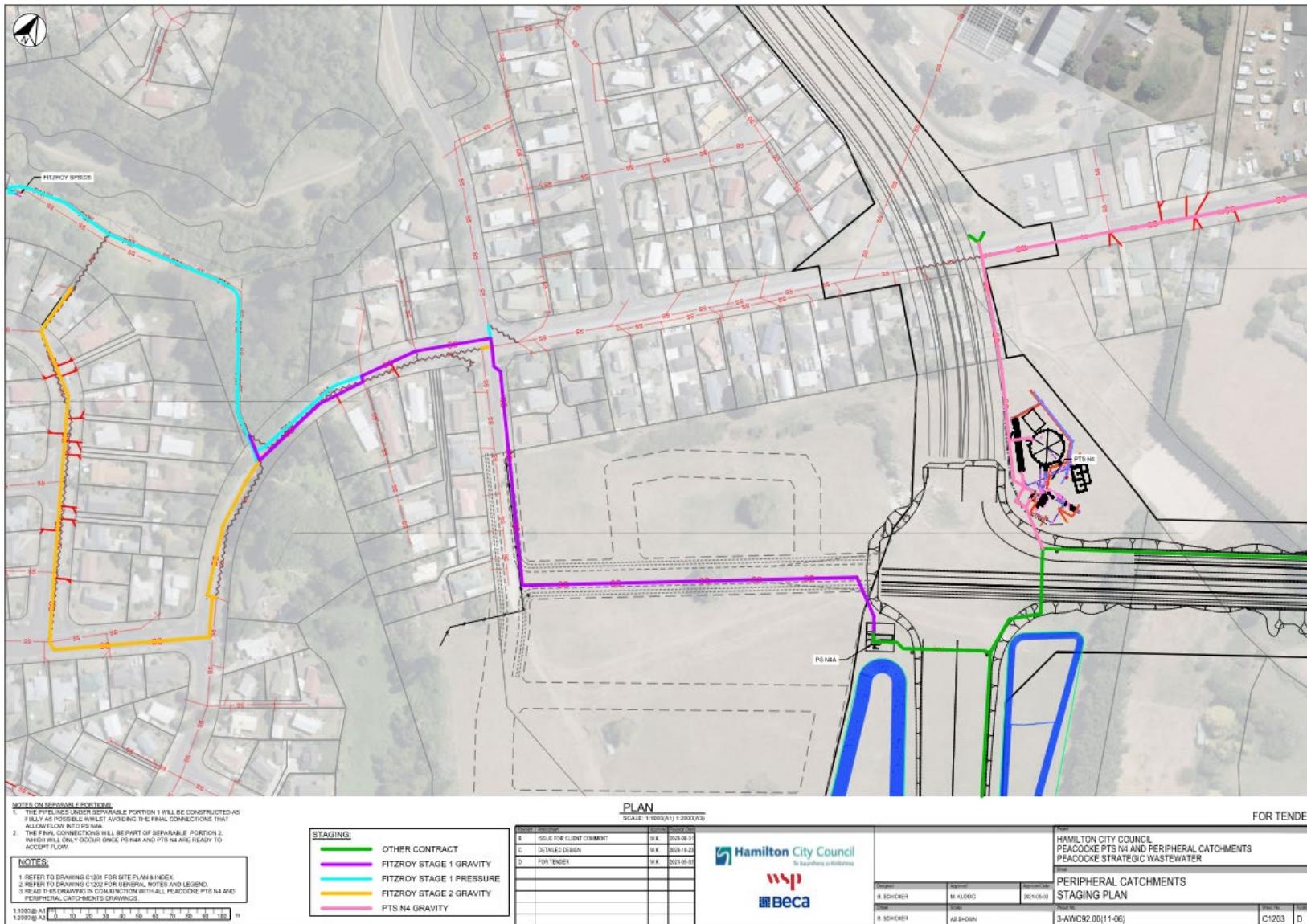
dB	Decibel (dB) is the unit of sound level. Expressed as a logarithmic ratio of sound pressure (P) relative to a reference pressure (Pr), where $dB = 20 \times \log(P/Pr)$.
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) to closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
$L_{Aeq(t)}$	The equivalent continuous (time-averaged) A-weighted sound level commonly referred to as the average level. The suffix (t) represents the period, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 "Acoustics - Construction Noise"
Vibration	When an object vibrates, it moves rapidly up and down or from side to side. The magnitude of the sensation when feeling a vibrating object is related to the vibration velocity. Vibration can occur in any direction. When vibration velocities are described, it can be either the total vibration velocity, which includes all directions, or it can be separated into vertical (up and down vibration), horizontal transverse (side to side) and horizontal longitudinal direction (front to back) components.
PPV	Peak Particle Velocity (PPV) is the measure of the vibration amplitude, zero to maximum, measured in mm/s.
BS 5228:2009	British Standard BS 5228:2009 "Code of practice for noise and vibration control on construction and open sites, Part 1: Noise, Part 2: Vibration"
DIN 4150-3:2016	German Standard DIN 4150-3:2016 "Vibrations in buildings – Part 3: Effects of vibration on structures"

APPENDIX B SITE MAPS

Figure 3: Peacocke Transfer Station overall site plan



Figure 4: Fitzroy Pipeline rising main works alignment



APPENDIX C SOUTHERN LINKS DESIGNATION A106 CONSTRUCTION N&V CONDITIONS

11.0 Construction Noise and Vibration Management Plan

11.1 No later than forty (40) working days prior to the commencement of any stage of Construction Works or as otherwise agreed with the HCC Chief Executive or their nominee, the Requiring Authority shall submit a Construction Noise and Vibration Management Plan (CNVMP) to the Territorial Authority's Chief Executive Officer or nominee for certification. The CNVMP shall be prepared by a suitably qualified and experienced expert.

The objective of the CNVMP is to provide a framework for the development and implementation of identified Best Practicable Options to avoid, remedy or mitigate the adverse effects of noise and vibration during construction and to minimise the frequency, duration and degree of exceedance of the noise and vibration standards set out in Conditions 11.3 and 11.4.

11.2 The CNVMP shall be prepared in accordance with the State Highway Construction and Maintenance Noise and Vibration Guide (NZTA, 2013), and include the procedures, methods and measures for the control of noise and vibration associated with all relevant Project Construction Works.

11.3 Construction noise must be measured and assessed in accordance with NZS 6803:1999 'Acoustics Construction Noise' (NZS 6803:1999). The construction noise limits for the purposes of the CNVMP that are to be complied with, as far as practicable, are as given in Table A below:

[Table detailed in Section 4.1]

11.4 The CNVMP must describe the measures adopted to seek to meet the Category A vibration criteria set out in Table B below, where practicable. If measured or predicted vibration levels exceed the Category A criteria, then a suitably qualified and experienced person shall be engaged to assess and manage construction vibration to comply with the Category A criteria. If the Category A criteria cannot be practicably achieved, the Category B criteria in Table B below shall be applied. If measured or predicted construction vibration levels exceed the Category B criteria, then construction activity shall only proceed if vibration effects on those buildings at risk of exceeding the Category B criteria are assessed, monitored and mitigated by suitably qualified persons. The criteria are to be applied to either predicted ground vibrations, or measured in accordance with ISO 4866: 2010 and AS 2187-2: 2006.

[Table detailed in Section 5.1]

11.5 In addition to those matters detailed in the State Highway Construction and Maintenance Noise and Vibration Guide, the CNVMP shall address the following aspects with regard to managing the adverse effects of construction noise and vibration:

- a) Identification of affected dwellings and other sensitive locations where vibration criteria apply, which shall include all houses located within 50 metres of general road construction activities, and 100 metres of piling, where those activities are undertaken on peat;
- b) Predicted noise levels set out as minimum compliance distances for key activities and items of plant and identification of any dwellings or other sensitive locations where works will be required within those minimum compliance distances;
- c) Mitigation options, including alternative strategies where full compliance with the noise criteria in Table A above and/or the vibration criteria in Table B above cannot practicably be achieved;
- d) Requirements for building condition surveys of critical dwellings, prior to and after completion of construction works and during the works if required (including all buildings measured or predicted to exceed the Category B vibration criteria contained in Table B above) and processes for repair of any damage caused by the works

11.6 Where noise or vibration predictions made in accordance with the CNVMP show that levels from a particular activity or at a specific location might exceed the limits set out in Condition 11.3 and/or 11.4,

or where measurements show that compliance is not being achieved, the Requiring Authority shall prepare Schedules to the CNVMP. These Schedules shall:

- a) be prepared in accordance with the State Highway Construction Noise and Vibration Guide and include the relevant details specified in the Guide, including activity specific and/or location specific noise and vibration predictions and mitigation;
- b) include noise limits for the activity and an overview of mitigation options that have been considered, identifying which of those options are practicable; and
- c) be provided to the Territorial Authority Chief Executive or nominee at least five (5) working days in advance of the relevant works being carried out and implemented, for certification.

11.7 In the event that either:

- a) the Territorial Authority certifies the Schedule, or
- b) fails to advise the Requiring Authority of any concerns it has with the Schedule, within the five (5) working days period following receipt, then the activities covered by the Schedule may be carried out.

11.8 If the Territorial Authority advises the Requiring Authority of a concern it has with the Schedule, then no activity related to that concern shall be carried out until the matter has been addressed by the Requiring Authority to the satisfaction of the Territorial Authority.

APPENDIX D FITZROY PIPELINE CONSTRUCTION N&V CONDITIONS OF CONSENT

Construction Noise and Vibration Management Plan

8. A Construction Noise and Vibration Management Plan (which can be part of a larger construction management plan) shall be provided to Council's Planning Guidance Manager for certification at least one month prior to construction work (including earthworks) is commenced on site. The plan shall be prepared by a suitably qualified and experienced person in construction noise and vibration and shall confirm and include the following-
 - a. The applicable construction noise and vibration limits;
 - b. Identification of likely affected properties (off-site);
 - c. Predicted noise and vibration levels at the locations of the likely affected properties;
 - d. General methods to mitigate and manage construction noise and vibration to comply with the applicable noise limits;
 - e. Identification of any construction activities (such as pile driving and concrete pours) that may require specific mitigation measures to comply with the applicable noise and vibration limits;
 - f. Provision for sound level monitoring of construction activities that may exceed the stated noise limits;
 - g. Contact details of the person in charge of construction works;
 - h. A complaint management procedure.

Advisory note: Refer to Annexes B through to F of NZS 6803:1999 Acoustics – Construction Noise for guidance on the management of construction noise and vibration. There is also a comprehensive list of mitigation measures listed in the application documentation that could be incorporated into the Plan.

9. All construction works shall be carried out in accordance with the approved Construction Noise and Vibration Management Plan.

Noise and Vibration

10. All construction work on the site shall be designed and conducted to ensure that construction noise from the site received at any other site in a residential zone does not exceed the noise limits in the following table. In the event that any sound level measurements are recorded they shall be measured and assessed in accordance with the provisions of NZS 6803:1999 Acoustics – Construction Noise

[Table detailed in Section 3.2]

Advisory note: The lower noise limits (shaded) mean that some construction work, particularly in relation to any concrete pours, piling and earthworks, may not be able to take place during the corresponding time frames, which includes all times on Sundays and public holidays.

11. Construction vibration received by any building on any other site shall comply with the criteria in the following table. In the event that any vibration levels are recorded they shall be measured and assessed in accordance with the German standard DIN 4150-3:1999 Structural Vibration – Part 3: Effects of Vibration on Structures.

[Table detailed in Section 4.2]