



SMART FREEWAY MITCHELL SOUTHBOUND HESTER AVENUE TO WARWICK ROAD UPGRADE

NOISE & VIBRATION MANAGEMENT PLAN

39021-ENV-PL-003

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TABLE OF CONTENTS

1	DEFINITIONS	3
2	INTRODUCTION AND PURPOSE	4
2.1	Introduction	4
2.2	Purpose	4
3	SCOPE OF WORKS	4
3.2	Site Location	7
4	MANAGEMENT OF CHANGE	8
4.1	Communication of Changes to Documentation	8
4.1.1	Minor Changes	8
4.1.2	Major Changes	8
5	ENVIRONMENTAL POLICY AND COMMITMENTS	8
6	OBJECTIVES & TARGETS	9
7	LEGAL & OTHER COMPLIANCE	10
7.1	Standards / Legislation and Guidelines / Specifications	10
8	KEY IMPACTS	10
8.1	Noise & Vibration Plan Overview	11
8.2	Construction Noise Management	11
8.3	Noise Monitoring and Mitigation Measures	12
8.4	Sensitive Receptors	13
8.5	Vibration Management	13
8.6	Exceedance of Vibration Limits	14
8.7	Stakeholder Engagement & Complaints	15
9	ORGANISATIONAL CHART AND TEAM	15
10	TRAINING AND INDUCTIONS	16
11	STAKEHOLDER CONSULTATION	16
12	AUDITING	16
13	MONITORING AND REPORTING	16

DEFINITIONS

Word	Description
CRS	Coordinated Ramp Signals
EMP	Environmental Management Plan
HWA	Hester Warwick Alliance
MRWA	Main Roads Western Australia
NVMP	Noise and Vibration Management Plan
PSP	Principle Shared Path

1 INTRODUCTION AND PURPOSE

1.1 Introduction

The Mitchell Freeway Southbound Upgrade - Hodges Drive to Warwick Road Project (the project) includes site investigation, design and construction required to construct a third southbound lane on the Mitchell Freeway between Hodges Drive and Warwick Road. Further construction will include an auxiliary lane between Hepburn Avenue on ramp and Warwick Road, a Principle Shared Path (PSP) upgrade between Ocean Reef Road and Warwick Train Station and the implementation of a smart freeway system from Hester Avenue to Warwick Road. NRW and Main Roads Western Australia (MRWA) have entered in an alliance known as the Hester Warwick Alliance (HWA) to complete the Project scope of works detailed in Section 3.

1.2 Purpose

The purpose of this Noise and Vibration Management Plan (NVMP) is to provide a framework to align with the HWA Project Environmental Management plan (EMP) as it applies to the Mitchell Freeway Southbound Upgrade - Hodges Drive to Warwick Road project. This document will address noise and vibration management of the environment and implement mitigation measures when required for the duration of the Project.

2 SCOPE OF WORKS

This NVMP Plan has been prepared for the Smart Freeway Mitchell Southbound: Hester Avenue to Warwick Road Upgrade Project. The Scope of Works includes delivery of the following:

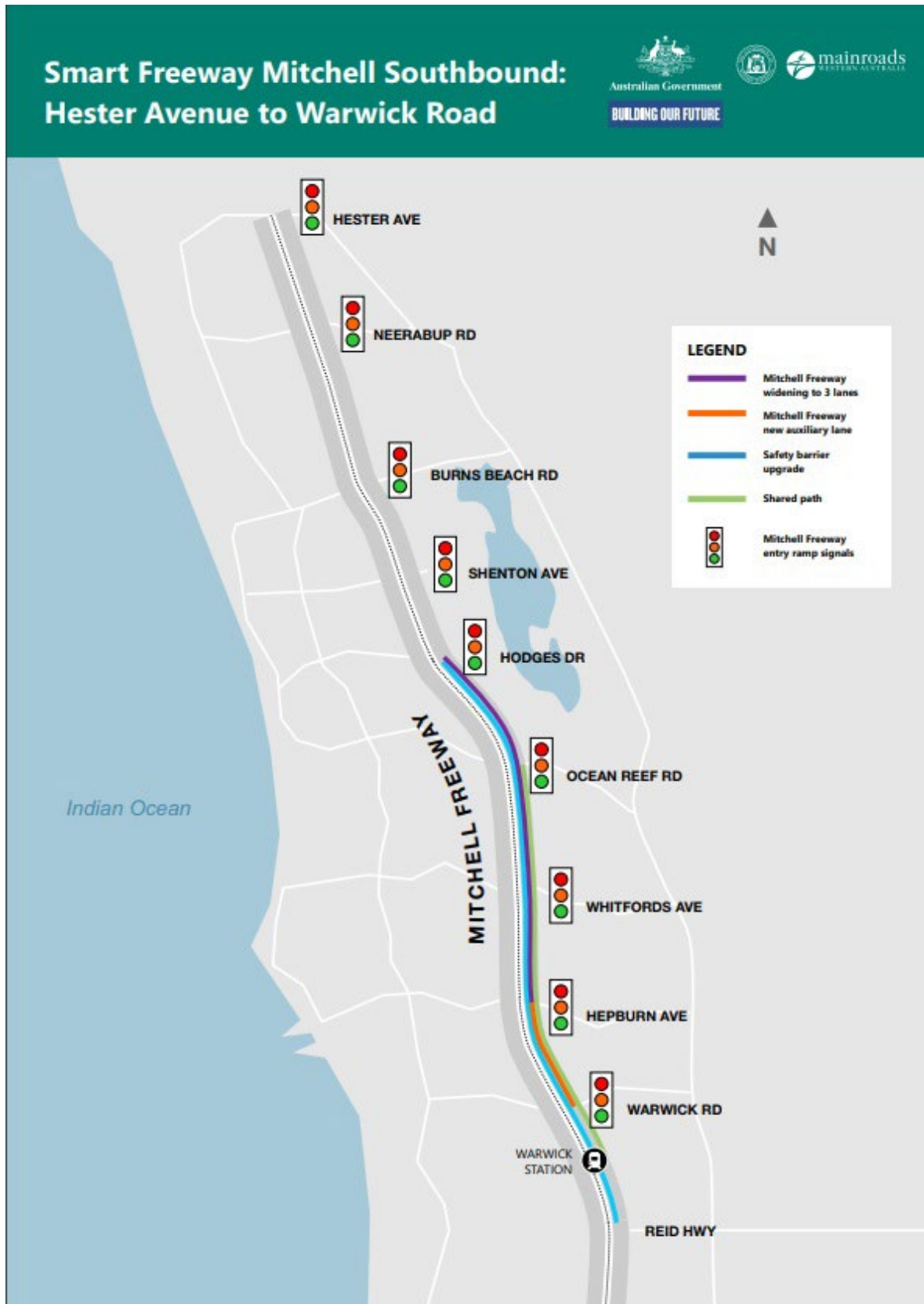
Freeway third lane	Design and construction of a third lane on the Freeway southbound on the median side between Hodges Drive interchange and Hepburn Avenue interchange, approximately 8.8 km long, to provide a continuous three lane carriageway in accordance with the specified lane configuration and cross section.
Freeway entry Ramps	Design and construction of widening or reconstruction or resurfacing of entry Ramps at Hester Avenue, Neerabup Road, Burns Beach Road, Shenton Avenue, Hodges Drive, Ocean Reef Road, Whitfords Avenue, Hepburn Avenue and Warwick Road to accommodate Coordinated Ramp Signals (CRS).
Freeway auxiliary lane	Design and construction of a fourth lane on the Freeway southbound on the left side from Hepburn Avenue entry ramp No.H590 to Warwick Road interchange in accordance with the specified lane configuration and cross section.
Shared paths and footpaths	Construction of a continuous PSP along the east side of the Freeway from Ocean Reef Road to Warwick Station including connections to the existing network. Associated infrastructure including retaining walls, drainage, signage, line marking, fencing and lighting. Replacement of existing paths where required.
Structures	Construction of modifications to pedestrian underpass No. 9110 at Whitfords Avenue to create a wider path underneath.

Road safety barriers	<p>Replacement of all existing road safety barriers with TL5 concrete barriers between the Freeway southbound and the railway from rail underpass No. 1472 to Reid Highway.</p> <p>Installation of a W beam barrier from rail underpass No. 1472 to Chainage 26050.</p> <p>Design and construction of access gates to the railway corridor.</p> <p>A continuous road safety barrier on the east side of the Freeway from Chainage 17000 to Chainage 26050.</p>
Noise barriers	Construction of traffic noise mitigation structures.
Accommodation works	Construction of accommodation works to properties affected by the project Works including accesses.
Emergency stopping bays	Provision of emergency stopping bays on the Freeway.
Roadside help phones	Relocation of existing roadside help phones.
Resurfacing	<p>Resurfacing of existing pavements where lane markings change.</p> <p>Resurfacing of the Freeway southbound carriageway from at least Chainage 17200 to Chainage 26000, and from Chainage 14250 to Chainage 15800.</p> <p>Resurfacing of ramps.</p>
Drainage	Design and construction and/or modification of all associated drainage including underground drainage, swales, basins, subsoil drainage and culverts.
Lighting	Design, installation, modification and upgrading of lighting on the Freeway and PSP.
Traffic Signals	Modification of traffic signals to accommodate ITS infrastructure.
Intelligent Transport System	<p>Design, installation, testing and commissioning of Intelligent Transport Systems (ITS) to implement a smart freeway system from Hester Avenue to Warwick Road, including:</p> <ul style="list-style-type: none"> (A) Coordinated Ramp Signals at all entry ramps; (B) Electronic Message Boards; (C) vehicle detection stations; and (D) CCTV cameras. <p>Relocation or replacement of existing ITS infrastructure where affected by the works.</p>
Signing and Pavement marking	Removal of signing and pavement markings no longer required, provision of new signing and pavement markings and modifications to existing signing and pavement markings which are required as a consequence of the project works.
Services	Relocation or modification of all services which are affected by work carried out by the contractor in order to complete the project works.

<p>Revegetation and Landscaping and Urban Design</p>	<p>Design and installation of revegetation and landscaping of all disturbed areas of the project.</p> <p>Design and installation of urban design elements for the project including public and community art.</p>
<p>Modifications</p>	<p>Provision of all connections, modifications and improvements necessary to connecting roads and properties affected by the project works, including removal of redundant road infrastructure, modifications to drainage, signage, islands and associated new lane markings as necessary.</p>
<p>Provision for future works</p>	<p>The Project Works must be designed and constructed to accommodate:</p> <ul style="list-style-type: none"> (A) future widening of the Freeway southbound carriageway to: <ul style="list-style-type: none"> (I) a continuous three lanes from Romeo Road to Burns Beach Road (widened on median side); (II) a continuous four lanes from Burns Beach Road entry ramp H803 to Hodges Drive (widened on median side); (III) a continuous four lanes from Hodges Drive entry ramp H659 to Hepburn Avenue (widened predominantly on verge side); and (IV) a continuous five lanes from Hepburn Avenue entry ramp H590 to Reid Highway exit ramp (widened on verge side). (B) future extension of the PSP south, including an underpass at Warwick Road.
<p>Design</p>	<ul style="list-style-type: none"> (A) Design, verification and preparation of all documentation including detailed construction drawings and specifications in accordance with the design for the Project Works. (B) Road safety audits. (C) Preparation of preliminary designs for future works.
<p>Testing</p>	<p>Testing and commissioning of all equipment prior to opening the project works to traffic.</p>
<p>Others</p>	<p>Any other works described elsewhere in the scope other than the maintenance obligations described in clause 7.</p>

2.2 Site Location

The location of the works, including the optional works are along the freeway as shown in the below figure.



3 MANAGEMENT OF CHANGE

Required changes to this plan during project execution will be reviewed at both project and corporate levels. If required, changes will be approved by both the HWA Project Manager and submitted to the MRWA Project Manager for review.

Changes to the NVMP will be initiated due to:

- Environmental Approval non-conformance;
- To reflect any changes to management plans inputs or risks;
- Contingency actions;
- Performance targets not met;
- Negative audit results; and
- Breach of HWA's management processes.

Awareness training may be undertaken following major changes to this plan. The HWA QM-P-024 Change management procedure will be implemented when an issue, site instruction, drawing/ specification change or anomaly, etc. is encountered relating to this management plan.

Any changes associated with the HWA project management system, documentation and drawings will be controlled and authorised in accordance with the HWA QM-P-009 Project Document Control Procedure.

Changes associated with design management are enabled via the design change request process and compiled within the design change registers.

3.1 Communication of Changes to Documentation

3.1.1 Minor Changes

All minor changes to this NVMP shall be approved by the HWA Director prior to incorporation and application.

The project team will be advised via the relevant document management system. A brief description of changes will be included in the correspondence from the relevant system.

3.1.2 Major Changes

Major changes to this NVMP will be approved by the MRWA Project Manager prior to incorporation and application. Presentations or detailed emails will be prepared by the nominated Business Process Owners (BPOs) before any changes are implemented through the document management system to the wider project team. These presentations will then be communicated to the project team by the on-site HWA Project Environmental Representative. A brief description of changes will be included in the correspondence generated from the project communications system.

4 ENVIRONMENTAL POLICY AND COMMITMENTS

This Project NVMP is based on the ISO 14001 certified Environmental Management System

The Environmental Policy (HSEQ Policy) reflects our commitment to ISO 14001 and will ensure:

- The policy is appropriate to the purpose and context of the HWA Project and supports its strategic direction;

- It provides a framework for setting environmental objectives;
- Includes a commitment to satisfy applicable requirements and legislative approval across the project;
- Includes a commitment to continual improvement of the Environmental Management System.
- The policy and commitment statement are supplied to each of the subcontractors;
- The policy guidelines are part of the environmental induction; and
- The policy will be displayed on all noticeboard across the Project site.

5 OBJECTIVES & TARGETS

Environmental objectives and targets are defined in the Australian/New Zealand Standard AS/NZS ISO 14001: 2004 as:

- Environmental Objective: “Overall goal, consistent with the environmental policy, that an organisation sets itself to achieve”
- Environmental Target: “Detailed performance requirement, applicable to the organisation that arises from the environmental objectives and that is decided and then achieved to enable the project to meet those objectives”

The objective of this plan is to provide a NVMP to align with:

- MRWA scope requirements 9.4(j)(ii) and 9.4(k)(i) as presented within the MRWA Scope of Works document;
- *AS/NZS 2436-2010:2016 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites*; and
- Legislative guidelines.

As per MRWA scope requirement 9.4(j)(ii) and 9.4(k)(i), this NVMP outlines the management requirements that will be utilised to address potential construction noise and vibration generated by the project.

The noise level objectives are outlined in Table 1 below.

This NVMP will be managed in conjunction with the HWA Environmental Management Plan (EMP) that defines the overall project requirements.

Related project management plans include:

- Integrated Management System (IMS) Manual, 59003-HS-PL-001;
- The Health and Safety Management Plan; and
- The Quality Management Plan.

One of the key objectives during project works is to avoid noise exceedance or vibration levels as specified in Table 2. HWA will comply with the Environmental Protection Act 1986 (WA), Environmental Protection (Noise) Regulations 1997 (WA) and endeavour to minimise disruption to public receptors throughout the project. Vibration level targets are to not exceed 5mm/s during project works.

Table 1 - Objectives & Key Performance Indicators for Noise & Vibration

Objective	Target	Key Performance Indicator
Comply with the <i>Environmental Protection (Noise) Regulations 1997 W.A.</i>	No non-compliance with the <i>Environmental Protection (Noise) Regulations 1997</i>	No environmental audit non-conformances in relation to noise.
Manage vibration to comply with industry best practice	Adjacent residential buildings are not significantly affected by vibration from construction works	No evidence of significant vibration impact on buildings and structures as assessed pre-construction and post-construction property condition reports
Manage noise and vibration to avoid adverse social impacts	No excessive number of complaints from residents received for excessive noise or vibration during construction	No evidence of significant impact on residents, buildings and structures as assessed by property reports.

6 LEGAL & OTHER COMPLIANCE

All works under contract will comply with the relevant Acts and Regulations, and other applicable statutory obligations as stated within the Project EMP. Additional statutory obligations not presented within the EMP that are specific to this NVMP are presented within the following sections:

6.1 Standards / Legislation and Guidelines / Specifications

For the project the following Australian Standards and relevant Legislation are applicable and to be complied with for the project works.

Australian Standards

- *AS/NZS 2436-2010.:2016 Guide to noise and vibration control on construction, demolition, and maintenance sites.*

Legislation and Guidelines – Western Australia

- *Environmental Protection Act 1986 (WA)*
- *Environmental Protection (Noise) Regulations 1997 (WA).*

Specifications

- Scope – Contract 99/19 Mitchell Freeway Southbound Upgrade, Hodges Drive to Hepburn Avenue Project

7 KEY IMPACTS

Construction activities undertaken by HWA will be in accordance with state and commonwealth environmental legislation and site-specific environmental aspects identified by HWA. The management measures described, refer specifically to site noise & vibration sources that may impact surrounding dwellings and infrastructure.

7.1 Noise & Vibration Plan Overview

The NVMP's focus, is to monitor, minimise or eliminate disturbance to local residents and surrounding dwellings through the use of a range of mitigating controls. Noise mitigation controls can be in the form of continuous monitoring, adaptive construction methodologies including the use of specifically designed structures (temporary noise walls), using the quietest and appropriately sized equipment practicable.

MRWA scope conditions outline the parameters, regulations and guidelines that this NVMP will comply to and accordingly is described in the remainder of this document.

7.2 Construction Noise Management

The HWA Project is adjacent to noise sensitive receptors, and subsequently the below noise level construction site noise parameters are applicable. Noise pollution can have an adverse effect on public places close to the projects construction areas. Reducing noise at source is the initial objective and the first stage of noise pollution mitigation.

It is noted that the NVMP will align with the environmental standards of the Local Government Authorities (LGA), in this case the City of Joondalup and the City of Stirling.

The *Environmental Protection (Noise) Regulations, 1997* do not apply to noise as a result of construction works carried out between 0700 hrs and 1900 hrs on any day which is not a Sunday or public holiday if it can be shown that:

- construction works are carried out in accordance with the controls of environmental noise practices set out in *Section 4 of AS 2436-2010, Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites*;
- The equipment used on the construction site is the quietest reasonably available; and
- there is a noise management plan in which works are undertaken in accordance with.

Table 2 - Construction Site Noise Parameters: AS/NZS 2436-201:2016

Time Period	Base Objective – Noise Sensitive Premises: highly sensitive area
0700-1900 hrs (Mon-Sat)	Minimise noise disruptions to surrounding residents, noting there are no noise level targets required.
1900-0700 hrs (Mon-Sat and 0900 hrs Sun)	L _{A max} 55 dB(A)
0900-1900 hrs (Sun and public holidays)	L _{A max} 65 dB(A)

As stated in MRWA Scope of Works Clause 8.1(a), "Except as required by law the maximum working hours permitted must be between 7:00 am and 7:00 pm, Monday to Saturday, except that work outside these hours may be permitted for specific operations subject to the approval in writing of the Project Manager and

compliance with the noise limits objectives MRWA clause 4.14(b)(ii). No work will be allowed on public holidays except as permitted by law and then only with the prior approval in writing of the Project Manager”.

In the event of night works, noise generation will be of major considerations prior to works being approved. A noise management plan approved by the Local Government Authority (LGA) is required for all night works where noise levels will exceed 55 db. Works that produce excessive noise will be minimised where possible outside of general working hours. These works will be discussed with the Main Roads Project Manager prior to commencing and works will be planned to minimise noise impacting the surrounding area.

HWA will ensure plant and equipment is maintained on a regular basis as far as practicable and in particular ensure factory fitted noise controls are in good working order (e.g. exhausts silencers, comply with occupational health and safety standards and the use of broadband (croaker) reversing alarms rather than tonal alarms and no servicing of machines will occur outside normal working hours.

7.3 Noise Monitoring and Mitigation Measures

Noise monitoring will be utilised, if required, to compare with pre-works noise baseline monitoring levels. The testing method will comply with *Section 5, AS 2436-2010*. All noise measuring equipment will comply with *Schedule 4 of the Environmental Protection (Noise) Regulations*.

Areas where noise levels exceed the specified site values may require erection of temporary noise barriers, should the above compliance mitigation measures not be sufficient. Where there are concerns around noise levels, then noise monitoring will be undertaken. Noise monitoring will be conducted using sound level meters which meet or exceed requirements of AS IEC 60942-2004 Electroacoustics-Sound calibrators, for class 1 or class 2 sound sources, as the case requires, *Schedule 4 of the Environmental Protection (Noise) Regulations*.

Noise monitoring will be conducted in compliance with the *Environmental Protection Act 1986 (WA)* and the *Environmental Protection (Noise) Regulations 1997 (WA)*. Where the extrapolated noise levels exceed the Noise Level Objectives, HWA will undertake remedial works that will result in compliance.

Other mitigation measures that will be employed by HWA in the event of a complaint from the community of exceedance of noise levels include:

- Limiting works in sensitive areas to the permitted normal working hours;
- Ensure the exhaust silencers and mufflers are in good working order and comply with OH&S standards;
- The use of reduced speed limits on temporary trafficable surfaces;
- Undertaking fabrication work off-site where possible;
- Use of material/mulch stockpiles as temporary noise barriers;
- Erection of temporary noise curtains; and
- Distancing work away from existing dwellings where possible, (e.g. mulching cleared material or mechanically mixing of material).

7.4 Sensitive Receptors

Noise-sensitive land-use and/or development is generally determined by land-uses or development as zoned by a local planning scheme or structure plan that is occupied or designed for occupation or use for residential purposes.

The HWA Project areas of noise and vibration impacts will include:

- Dwellings, residential buildings (local community);
- Short-stay accommodation;
- Caravan parks;
- Sports grounds and recreation centres;
- Educational establishments, (Schools/ Colleges and Universities);
- Child-care premises;
- Hospitals and care facilities;
- Nursing homes; and
- Places of worship.

7.5 Vibration Management

Excessive vibration may cause disturbance to existing infrastructure in the form of structural change. In some instances, impulsive vibration may be a triggering mechanism that may result in the failure of building/structural components, that have previously been in a stable state. Therefore, it is necessary to conduct a property condition survey prior to work commencing, as per MRWA Scope section 9.4(I). The survey will be performed by a third party independent, qualified assessor. All properties within 100m of the construction zone will be surveyed. The dilapidation survey will be completed for each property and records maintained with the status for each survey.

The report for each property will contain the following:

- Reference number, address, type of dwelling and date assessed;
- Properties of heritage significance
- Summary of the property type and condition;
- Detailed assessment of the property, including photos and descriptions specifically noting any defects or damage to the property; and
- Photos of any damage in particular.

In accordance with MRWA Scope clause 9.4(I)The survey will be carried out within the extent of the area that may be affected by the activity. As a minimum the extent of the property condition survey will include:

- All properties within 100 m of any construction activities;
- Any nearby properties of heritage significance;
- Existing railway stations at Greenwood, Whitfords and Edgewater; and
- Existing bridges and retaining walls within 20 m of construction works.

A copy of the report will be maintained by the Project team, and provided to the homeowner for reference.

At the completion of the HWA Project each property owner will be provided the opportunity to request a follow up survey to assess if damage has occurred on the property as a result of the Project works.

To minimise the risk of damage to surrounding properties, HWA will limit ground vibrations by ensuring that the ground particle velocities from any necessary operation including vibratory compaction or percussion equipment use cause minimum impact and do not exceed statutory limits that could result in damage to property. Sustained vibration levels will be limited to a 5 mm/s limit.

Low vibration or non-vibrating construction methodologies will be adopted in consultation by the Project Engineers and Superintendent during construction activities close to adjoining properties. Soil compaction will be undertaken by a smallest/lightest equipment practicable to obtain required compaction levels.

In alignment with MRWA Scope clause 9.4(k): A baseline vibration measurement will be taken in a location and within a nominated time by the Environmental Manager and will coincide with the commencement of works involving the vibratory compaction and percussion equipment.

HWA suggest that the baseline vibration monitoring should take place in areas adjacent to where the staged construction activities are due to commence.

HWA will monitor vibration levels during construction activities involving the operation of vibratory or percussion equipment. The monitoring equipment will have real-time measuring capability and notifications sent the Construction Manager, Superintendent and Environment Manager, when predetermined vibration limits are exceeded.

Furthermore, the equipment will provide a copy of measurements for each month will be submitted to MRWA in the monthly report, as stated in 9.4(k) of the Project Scope.

If a complaint is raised by a resident, HWA will inform MRWA of the complaint and issue a response at the earliest opportunity and no later than 24 hours after the complaint was received. In addition, HWA will take vibration measurements within the vicinity of the impacted residence. If the vibration limits are greater than 5mm/s limits, HWA will modify the construction method to reduce vibration impacts.

7.6 Exceedance of Vibration Limits

If a scenario arises where the allowable vibration limit is exceeded, an alert will be sent via text message to the Project Construction Team and the following actions will take place:

- Works involving vibrating or percussion equipment, adjacent to the impacted area will cease, until a less destructive method of construction is found;
- The construction methodology will be revised, and alternative means of ground compaction will be investigated;
- The compaction equipment may be swapped out for a low/micro vibration or oscillation compactor. These machines are specifically designed to minimise the adverse effects of vibrations to the surrounding structures / environment;
- Should any unplanned settlement occur due to vibration then works will be stopped and an alternative method will be developed and trialed to ensure compliance;

- When an alternative methodology is agreed upon and approved by the HWA Project Manager, a trial run will take place in the previously impacted area, with the monitoring equipment in place, to clarify that the new methodology does not exceed the specified vibrations limits; and
- If/when the alternative methodology has been deemed satisfactory by the HWA Project Manager, any further works involving vibration or percussion equipment in the area will be closely monitored, until that particular activity/task has been completed.

Table 3 - Noise, Vibration Contingency Actions

Trigger	Action
Non-compliance with management measures	Immediately investigate the cause of the non-compliance and take preventative actions to prevent further occurrences <ul style="list-style-type: none"> • Review management measure’s practicality or relevance. • Consider further education of staff/sub-contractors to ensure understanding and prevent any reoccurrence
Complaints received concerning noise or vibration	Manage complaints and ensure a rapid response occurs

7.7 Stakeholder Engagement and Complaint Handling Process

If a resident has a complaint or query regarding noise or vibrations, they can call the MRWA Customer Information Centre on 138 138, whose team operate 24/7. Call centre operators have access to the HWA site team to direct queries to for resolution.

HWA will advise the Project Manager and Communications and Stakeholder Engagement Manager who will respond to any complaint at the earliest opportunity if received from residents, but no later than 24 hours after the complaint is received. In addition, HWA will take noise or vibration measurements within the vicinity of the affected residence. If regulatory vibration limits are exceeded, HWA will endeavour to modify the construction method to reduce vibration.

The Community and Stakeholder Engagement Plan will detail response times in alignment with the Main Roads’ *Customer Service Charter*. HWA will use the Main Roads’ corporate customer relationship management (CRM) system and align the management of such enquiries to the Main Roads’ corporate processes.

Prior notification in accordance with the level of engagement supplied by MRWA will be provided for construction activity impacts including noise, vibrations and out of hours works will be provided to impacted residents. HWA will determine the appropriate community and stakeholder engagement processes for enabling and considering community and stakeholder input into specific noise and vibration issues.

8 ORGANISATIONAL CHART AND TEAM

The interrelations of project site personnel are described in the organisational chart within the main Project EMP. The latest revision of the organisation chart will be displayed within the project office.

All personnel working on the project have a position description that outlines their site roles and responsibilities. The key personnel involved in the ongoing monitoring and management of this NVMP will be the Health and Safety Manager, the Community Stakeholder and the Environment Manager. All site personnel will be supported by the administration team as required.

9 TRAINING AND INDUCTIONS

Training records and renewals will be managed by the HWA HSE Program. Before employees can enter the work site, they will be required to complete the following inductions:

- HWA HSE Induction;
- Site Specific Induction; and
- A Construction White Card.

Where specific training requirements are identified for site personnel, occupational skills will be updated accordingly. A detailed training matrix will be maintained on site to document all training that is completed by personnel.

10 STAKEHOLDER CONSULTATION

Engagement with the local community is detailed within the Community and Stakeholder Engagement Plan for the HWA Project. All properties within 100m of the works will be provided an opportunity for a dilapidation survey to assess the current state of the properties. If complaints regarding damage to these properties are received, then the property will be reassessed and where applicable the damage rectified.

11 AUDITING

HWA will regularly audit the project in alignment with the corporate Environmental Management System and government Statutory requirements as documented within the Project Environmental Management Plan.

12 MONITORING AND REPORTING

Monitoring and reporting of noise and vibration will be undertaken as noted above in Section 7 of this document. Any observed exceedance to noise and vibration limits will be managed as detailed within this document.