NORTHERN NETWORK ALLIANCE

MANAGEMENT PLAN

Air Quality, Noise and Vibration Management Plan

Document number: NNA001-A-PLN-009

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Date	Reason for Issue	Revision	Originator	Signature	Checked By	Signature	Approved By	Signature
	Issued for Review	A	Construction Environment Manager		Project Controls Manager		Alliance Manager	
	Issued for Review	B	Construction Environment Manager		Project Controls Manager		Alliance Manager	

Prepared by:

Northern Network Alliance

End of Sunridge Farm Road

Chevallum QLD 4555

PO Box 515 Nambour 4560

Telephone: (07) 3811 8800

Facsimile: (07) 5456 4203

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1 INTRODUCTION

This Air Quality, Noise and Vibration Management Plan (AQNVMP) is one component of the Construction Environmental Management Plan (EMP) which provides a system and procedures to ensure that Northern Network Alliance (NNA) establishes and maintains best practice controls to manage potential environmental impacts during the construction of the Northern Pipeline Interconnector Stage 2 and associated infrastructure (hereafter referred to as the 'Project') and, wherever practicable, realise opportunities for enhanced environmental outcomes.

The NN Alliance consists of the following partners:

- LinkWater
- Abigroup Contractors
- McConnell Dowell
- Kellogg Brown &Root Pty Ltd

NN Alliance (referred to as the Alliance) is committed to providing the services it offers in a manner that conforms to the contractual requirements and to all relevant regulatory and legislative requirements. To achieve this, the Alliance will plan, implement and control an integrated management system that achieves the stated environmental outcomes.

The Alliance will ensure that controls are properly implemented and regularly monitored and audited to assess their effectiveness. Changes to the controls will be instigated if they are not achieving their objectives.

1.1 Project Description

NPI Stage 2 forms part of the drought contingency pipeline to connect existing and future water infrastructure on the Sunshine Coast with the Brisbane network. The NPI will be constructed in two stages and will allow the transfer of up to 65 ML/d of potable water between the Sunshine Coast and Brisbane. Stage 1 of the NPI project—between Landers Shute water treatment plant (WTP) and Morayfield—is due for completion by 31 December 2008.

The completed NPI (Stage 1 and Stage 2) will supply a target volume of 65 ML/d of potable fresh water to existing facilities at Caboolture for distribution to localities in the greater Brisbane region. NPI Stage 2 will have the capacity to deliver up to 18 ML/d (under existing utilized entitlements for the Noosa Shire).

Subsequent interconnection of Stages of the NPI may be constructed to link with the proposed Traveston Crossing Dam and/or other bulk water sources proposed for the Sunshine Coast. These subsequent Stages are not considered in this report. However, the use of a large diameter pipe capable of transporting bulk water is a basis for the design of both Stages 1 and 2 of the NPI.

The key components of the NPI Stage 2 project are as follows:

- approximately 48 km of underground pipe between Noosa water treatment plant (WTP) and the termination point of NPI Stage 1 at Eudlo;
- a balance tank with a 5 ML capacity;
- three new pump stations; and

- a new water quality management facility (WQMF) and upgrades to an existing WQMF at Landsborough.

A number of additional above-ground facilities would be required for commissioning, operation and maintenance of the system. These include:

- Water quality maintenance structures
- Water branch mains
- Cleaning and communications stations

1.2 Purpose and Scope

Linkwater is committed to conserving and enhancing the biological environment where possible for the duration of the Project while achieving positive environmental, commercial and social outcomes.

The purpose of this AQNVMP is to:

- ensure appropriate environmental controls and procedures are implemented to aid in minimising impacts on local residents and other sensitive receivers along the pipeline route
- describe the practical measures and best management practices to be included in design and construction to prevent or mitigate potential impacts relating to air quality, noise and vibration
- outline the roles, responsibilities and the tasks to be performed in regard to the design and implementation of air quality, noise and vibration management controls
- outline an effective implementation, monitoring, auditing and reporting framework

1.3 Objectives and Targets

Objectives:

- Define the roles, responsibilities and the tasks to be performed, in regard to the control and monitoring of emissions affecting air quality and activities generating noise and vibration
- Avoid or minimise the impact on air quality, and the generation of noise and vibration associated with the construction of the project
- Comply with the EP Act and associated policies
- Protect the amenity of residents and other sensitive receptors
- Prevent damage to adjacent public utilities, structures and buildings resulting from vibration
- Reduce the impact of construction noise on passive recreational areas
- Educate all employees of their responsibilities in regard to air quality, noise and vibration

Targets:

- No complaints from nearby residents relating to air quality, noise and vibration impacts during construction
- Community complaints in relation to air quality, noise and vibration investigated and responded to within 24 hours and corrective action taken for each incident
- No significant negative or long-term impacts from air quality, noise and vibration on sensitive receptors (such as urban residences or listed native flora or fauna)
- No non-compliances with regard to statutory requirements or permit conditions
- 100% of employees trained on their responsibilities in regard to air quality, noise and vibration

The above performance criteria have been developed for this MP to assist to deliver desirable outcomes. The performance criteria will be linked to Key Performance Indicators (KPIs) for the Project.

2 LEGISLATION AND REGULATORY REQUIREMENTS

2.1 Licences/ Permits

There are no licences and approvals required for the management of air quality, noise & vibration associated with the project however there are relevant processes and procedures which must be implemented. Related management plans include the blast management plan, traffic management plan and Health and Safety management plan.

2.2 Commitments

The *Environmental Impact Statement* for the proposed NPI Stage 2 has several commitments for the management of air quality, noise and vibration. Table 1 identifies examples of these commitments.

Table 1. Air Quality, Noise and vibration Management Requirements/Commitments (refer NNA EIS 2008, Appendix E for final commitments)

Document	Section	Requirement/Commitment
	3.2	All directly affected landowners will be consulted to identify potential issues, concerns, and mitigation strategies.
	3.5	Construction will not result in significant long-term impacts on air quality
	3.5	Dust management will include the use of water trucks and reduced speed limits on the ROW
	3.5	An air quality management plan, developed in conjunction with the EPA, will include all relevant mitigation strategies
	3.7	Relevant approvals will be obtained for any construction works required outside normal construction hours.
	3.7	A project-specific noise and vibration management plan will be developed in consultation with the EPA.
	3.7	Building condition inspections will be completed for structures in proximity to the ROW prior to the commencement of any potentially damaging construction activities (such as blasting, pile driving, dynamic compaction).
	3.8	A comprehensive traffic management plan will be developed in consultation with relevant government agencies.

3 EXISTING ENVIRONMENT

3.1 Air Quality

The existing air quality environment along the pipeline route is influenced by regional air pollutant sources (mainly transport and industry related), with minor contributions from local traffic, construction and commercial/industrial sources.

Variations in local air quality will occur due to the proximity of sources such as major roads, regional events such as bushfires and dust storms and variations of meteorological conditions such as wind speed, wind direction and atmospheric stability.

Wind roses for Stage 2 of the NPI were compiled from data obtained from the Bureau of Meteorology's monitoring stations at Tewantin and Nambour.

The annual wind rose indicates that winds tend to be experienced from the southern and northeastern quadrant and are typically light to moderate, having and average wind speed of between 1.5 m/s and 8 m/s. Further details of seasonal wind patterns can be found in Appendix L of the EIS.

The implication of these wind speeds is that winds less than 5.5 m/s are typically not strong enough to entrain dust from stockpiled earthworks material. However, wind speeds may exceed 5.5 m/s during the construction phase, and dust mitigation strategies will be in place.

3.2 Noise

The existing noise environment was established through background monitoring at sensitive locations in the vicinity of the NPI Stage 2 corridor. Noise monitoring locations were chosen to represent the densest residential areas or the most sensitive receivers adjacent to the route, with monitoring also conducted at the pump station locations. For the purposes of the project, the term 'sensitive receivers' generally refers to residential properties along the proposed route.

Noise monitoring at selected sites was undertaken using Acoustic Research Laboratories Types EL-316 and EL-215 environmental noise loggers programmed to record various statistical noise levels over consecutive 15-minute intervals. All noise measurements were conducted in general accordance with the Environmental Protection Agency's *Noise Measurement Manual* and AS 1055.1–1997 *Acoustics—Description and measurement of environmental noises: General procedures*. A summary of the noise monitoring locations is provided below (refer NNA EIS 2008):

Table 2. Measured Rating Background Levels and Standard Deviation

Location		Day	Evening	Night
Con 1	Leafy Lane, Woombye	38	35	28
Con 3	Retirement community Zealey Road, Nambour	49	45	38
Con 4	92 Sheanans Road, Yandina	39	44	33
Con 5	Yandina Caravan Park, Old Bruce Highway, Yandina	39	39	29
Con 6	2 Low Street, Yandina	47	50	52

Con 7	121 Holts Road, Cooroy	42	46	47
Con 8	39 Nandroya Road, Cooroy	37	35	27
Con 9	19 Swift Drive, Cooroy	34	35	32
Con 10	6 Woombye-Palmwoods Road, Woombye	40	45	47
Con 11	Panorama Drive, Nambour	38	35	28
Op 1	Nobels Road, Mooloolah Valley	49	45	38
Op 4	415 Lake Macdonald Drive, Lake Macdonald	39	44	33
Op5	300 Image Flat Road, Image Flat	39	39	29

* Night-time levels adjusted to account for the influence of cicadas (or other insects)

Further desktop studies, investigation/surveys may be undertaken prior to construction, as required to satisfy this MP.

4 PROJECT POTENTIAL IMPACTS

4.1 Introduction

Air pollutants associated with the project are mostly emitted during construction in the form of particulates, with very minor contributions of carbon monoxide (CO) and nitrogen oxides (NOx) associated with fuel combustion from vehicles and plant.

The most significant noise source during construction of the NPI Stage 2 will be from mechanical plant operation. Unless unforeseen dig-ups and repairs are required to the pipe, there will be no mechanical plant associated with the operation phase of the project, and no noise or vibration is expected.

4.2 Potential dust associated pollutants

During dry conditions, on-site construction activities have the potential to generate dust. The following activities are those identified as a specific potential source of dust generation as a result of construction works:

- Vegetation clearing
- Earthmoving activities and excavation including construction of batters and stabilisation of earthworks.
- Movement of vehicles and construction machinery, both within and outside the construction site.
- Wind erosion of exposed areas.
- Transport of construction materials, fill, rubble and waste.
- Stockpiling of materials. Build-up of material around erosion and sedimentation controls.

Most of the activities mentioned above will occur for a limited period at any location along the pipeline route.

Construction activities will generally be of a low intensity. Earthworks over most of the pipeline length will be restricted to trenching and filling activities. Equipment to be used on site will include excavators, cranes, tip trucks, backhoes, generators and compressors. Access to the pipeline will be by sealed and unsealed roads.

Air quality impacts can potentially result in:

- Deposition on surfaces where it may cause damage and/or lead to a need for increased cleaning or repair
- Vehicle exhaust/site equipment emissions caused by inefficient engine operation
- Aesthetic effects which arise from the visible airborne dust plumes and of deposits of dusts on surfaces
- Potential adverse health effects including eye, nose and throat irritation from excessive inhalation of fine particles
- Impacts on water quality from dust deposition
- Impacts on urban areas including impacts on living areas, swimming pools, cars, rainwater tanks and general amenities

- Complaints from the general public relating to visible dust or odours.

Dust and particulate emissions associated with construction and earthworks can impact on amenity and human health. Health impacts depend on particulate size. The term *"particulate matter"* refers to a category of airborne particles typically less than 50 microns (μm) in diameter and ranging down to 0.1 μm in size. Particles less than 10 μm and 2.5 μm are referred to as PM_{10} and $PM_{2.5}$ respectively.

The main impact, dust generation, will be short-term in nature as the construction team works through an area. The impacts on air quality associated with the Project are thus expected to be low and manageable through accepted practices.

4.3 Construction activity noise summary

Generic construction equipment sound pressure levels were used to determine the likely 'noise levels' of construction activities along the pipeline route. The table below summarises the sound pressure levels and the anticipated noise levels at given offset distances from the pipeline alignment and assumes no acoustic shielding from topography, buildings or noise barriers between construction activity and receiver.

Table 3. Construction Activities

Construction Equipment	Maximum Sound Pressure Level (dBA)	Construction Noise Levels (dBA)					
		SPL[1] @ 5m	SPL[1] @ 10m	SPL[1] @ 20m	SPL[1] @ 50m	SPL[1] @100m	SPL[1] @200m
Excavator	110	83	77	71	63	57	51
Cranes	105	78	72	66	58	52	46
Tip Truck	111	84	78	72	64	58	52
Generator	107	80	74	68	60	54	48
Backhoe	107	80	74	68	60	54	48
Bored Piling Rig	116	89	83	77	69	63	57
Rock Breaker	137	110	104	98	90	84	78
Directional Drilling Rig	115	88	82	76	68	62	56

Note 1: LA10 Sound Pressure Level (derived by subtracting 5 dBA from the maximum sound pressure level).

Given that work will only occur in the restricted time allocations and that machinery will only be running while in use (i.e. machines not to be left idling), noise impacts arising from construction activities should be minimal.

4.4 Construction Vibration Impacts

4.4.1 Construction Vibration Sources

The major potential sources of ground vibration are bulldozers, heavy vehicle movements and hydraulic rock breakers. Blasting is also likely during construction of the project but will only be considered where the geology is too hard for the use of an excavator. The management of vibration impacts potentially arising from blasting activities has been covered in the Construction Management Plan (NNA001-A-PLN-048) for the Project.

Typical ground vibration levels from bulldozers ripping terrain range from 1 mm/s to 2 mm/s at distances of approximately 5 m. At distances greater than 20 m, vibration levels are usually below 0.2 mm/s.

It is expected that there should be no building damage or human comfort impacts associated with vibration from bulldozer movements or ripping on this project.

Rock breakers and rock drills can generate relatively high vibration levels at close distances. However, the vibration usually contains higher frequencies, to which buildings and building occupants are less susceptible. The table below outlines the typical ground vibration levels at various distances from a large rock breaker operating in hard sandstone.

Table 4. Typical Rock Breaker Vibration Levels (mm/s) versus Distance

	Vibration Level (mm/s) at Given Distance					
	5 m	10 m	20 m	30 m	40 m	50 m
Heavy Rock Hammering	4.50	1.30	0.40	0.20	0.14	0.10

Heavy trucks passing over normal (smooth) road surfaces generate relatively low vibration levels, typically ranging from 0.01 mm/s to 0.2 mm/s at the footings of buildings located 10 m to 20 m from a roadway. Very large surface irregularities can cause levels up to 5 to 10 times higher.

Provided all truck routes are maintained to avoid large surface irregularities (e.g. potholes), there should be no building damage or human comfort impacts associated with vibration from truck movements on this project.

5 ENVIRONMENTAL MITIGATION MEASURES

This section contains both general and specific procedures and systems to manage air quality, noise and vibration for NPI Stage 2.

Mitigation measures and responsibilities for identified actions to minimise air quality impacts during construction are outlined in table 5 below.

Site-specific information including identification of sensitive receivers and management measures will be detailed in the relevant WMS's. If required dust deposition gauges will be installed where necessary as construction works progress, and in particular in response to any complaints received.

Table 5. Air Quality Mitigation Measures

Activity Type	Management Mitigation Measures	Responsibility	Timing
Pre construction	Identify sensitive land uses/sensitive receivers on the SAPs and within relevant WMS's, prior to works commencement.	Environmental Manager	Pre-construction
	Establish a protocol/procedure for handling dust complaints in conjunction with the Community and Stakeholder Relations Manager which includes recording, reporting and implementing corrective actions (refer to Community and Stakeholder Management Plan),	Environmental Manager	Pre-construction
	Incorporate discussion on dust sources, impacts and mitigation measures during Site Induction and ongoing Toolbox Talks.	Environmental Manager/ Environmental Officer	Pre-construction
General construction	The size of areas that require clearing will be minimised. Ensure clear delineation of the limit to clearing prior to the commencement of construction.	Construction Manager	Prior to commencement of construction
	Ensure appropriate equipment is available on site at all times to manage any potential for dust generation. Site specific dust mitigation measures to be outlined in the relevant WMS's.	Site Superintendents	At all times
	Where particularly sensitive residents or other land uses (e.g. schools) have the potential to be impacted by wind-borne dust, the installation of dust screens (e.g. earth banks or shade cloth material on Project boundaries) will be considered and implemented where appropriate. If required, dust deposition gauges can be implemented where particularly sensitive residents or land uses are identified, and complaints are forthcoming.	Construction Manager	Prior to commencement of construction
	Undertake ongoing monitoring for dust through visual inspection along the ROW and use relevant WMS's to assess the effectiveness of mitigation measures.	Environmental Officer	Ongoing
	Water carts or similar to be used as required for dampening exposed surfaces (temporary access roads and open areas) to control dust generation. Recycled water will be used where possible including water from sedimentation ponds.	Superintendent	As required
	Cleared areas should be revegetated/ rehabilitated as soon as practicable, particularly on dusty soils. Cleared vegetation can be chipped/mulched and used to minimise wind-generated dust rather than being burnt.	Environmental Manager/ Environmental Officer	As required
	Works undertaken around identified contaminated sites or live	Superintendent	As required

Activity Type	Management Mitigation Measures	Responsibility	Timing
	sewerage systems to be undertaken in a manner to ensure risk of odour impact on community and workforce is mitigated; for example, limiting the time that trenches are open and sealing/closing pits that are not being actively worked on.		
	Where possible, schedule work in dusty soils during low wind times, such as early morning.	Superintendent	As required
Vehicle and Transport Management	Vehicle speeds to be limited on site to ensure dust generation is minimised and, if required, to be below site speed limits.	Superintendent	At all times
	Measures to ensure no dirt tracked off-site and sweepers used where necessary.	Superintendent	At all times
	Any dirt tracked onto public roadways resulting from construction vehicles exiting the worksite(s), to be removed and appropriately disposed of as soon as practicable.	Superintendent	As required
	Trucks carrying spoil or sand onto or off site are to be covered wherever practicable. Tailgates, under-rigs and towing apparatus of all trucks to be checked to ensure they are secured, prior to trucks leaving the worksite.	Superintendent	At all times
	Exhaust systems of construction plant, vehicles and machinery to be maintained to minimise exhaust emissions to atmosphere. All equipment and vehicles are to be regularly maintained and records kept of maintenance.	Plant Manager	Ongoing
Materials Management	Temporary stockpiles are to be to covered/re-vegetated/water sprayed regularly as required if seen to be creating a dust nuisance.	Superintendent	As required
Extreme weather conditions	Dust generating activities are to be assessed during periods of strong winds (40-50 km/h) and rescheduled where control of dust generation cannot be achieved to reduce dust dispersion from the site activities.	Site Superintendent	As required
	A 'call-out' system will be developed and implemented for response to events that require dust suppression out of hours and on weekends/holidays.	Communications manager	As required
Revegetation Strategy	Revegetation works to be undertaken in accordance with the Vegetation Management Plan (NNA001-A-PLN-013) and Rehabilitation and Revegetation Management Plan (NNA001-A-PLN-010).	Environmental Manager	On completion of construction works
	Cleared areas and embankments to be progressively revegetated as soon feasible during construction, to prevent dust generation potential from long-term unsealed areas.	Site Superintendent	As required
	Management and maintenance programs for revegetation are to include watering regimes, weed management, and replacement of vegetation that may have died. Refer to Rehabilitation and Revegetation Management Plan (NNA001-A-PLN-010).	Environmental Manager	Ongoing/On completion of sections of work

Measures to be implemented to manage noise and vibration throughout construction are outlined below in Table 6

.

Table 6. Summary of General Mitigation Measures

Activity Type	Management Mitigation Measures	Responsibility	Timing
Construction Hours	Works will be carried out generally within standard Construction Hours 6.30 a.m. to 5.00 p.m. Mon to Fri 7.00 a.m. to 1.00 p.m. on Sat.	All personnel	Daily
	Any works which are proposed to be undertaken outside of standard construction hours will require the approval of the Construction Manager	Construction Manager	Prior to any out of hours works
Deliveries	Deliveries will be carried out generally within standard Construction Hours.	All personnel	Daily
Site Access Tracks	Construction vehicles travelling along site access tracks will adhere to the assigned speed limits.	All personnel	Daily
Site Layout	Where possible, plant will be located / orientated to direct noise away from sensitive receivers. Site sheds, materials and stockpiles will be used to increase acoustic shielding, where feasible.	Site Supervisors and plant operators	Daily
Suitable Equipment	Plant and equipment will be selected to minimise noise emission, in-so-far-as possible whilst maintaining efficiency of function. Residential grade mufflers will be fitted and all noise control equipment will be maintained in good order. Trucks will not use exhaust brakes on site. Dampen or line metal trays and bins.	Site Supervisor	Daily
Plant Noise Audits	Periodic vehicle noise tests and after complaints or plant outside normal working hours. Test levels to be compared to recommended criteria and background levels, noisy plant to be removed and serviced.	Environmental Officer/Noise consultant	Weekly to fortnightly and as required for complaints
Reversing Alarms	Mobile plant and trucks operating on site for a significant portion of the project will have reversing alarm noise emissions minimised in-so-far-as possible, recognising the need to maintain occupational safety. Where possible, subject to Council / DMR access permission, drive-on / drive-off arrangements for trucks will be provided, eliminating the need for reversing alarms to be used.	Site Supervisor	Daily
Fixed Plant	Fixed plant will be provided with noise controls to comply with regulatory requirements.	Site Supervisor	Daily
PA System	No public address systems will be used at the construction compounds.	Site Supervisor	At setup
Vibration Buffer Zones	General safe working distances for rock breaking, vibratory compaction and impact pile driving, described in Table 4, will be adhered to.	Plant operators	Daily

Activity Type	Management Mitigation Measures	Responsibility	Timing
	Monitoring will be carried out to confirm these buffer zones close to sensitive receivers.	Environmental Officers	
Truck Noise (off site)	All trucks regularly used for the project (e.g. spoil trucks) are to have mufflers and any other noise control equipment in good working order. Trucking routes will use main roads where feasible.	Plant operators	Daily
Community Liaison	A programme of community liaison and complaint response will be implemented, as described in the NVMP and the Complaints Management Procedure, contained in the Community and Stakeholder Management Plan.	Community Relations Officers	Throughout the Project
Training	Site induction training will include a noise awareness component.	Training Officer	As required
Building Condition Surveys	Building condition surveys may be undertaken before the commencement of construction activities where there is considered to be a risk of damage occurring to structures as a result of the works.	Area Manager/ Consultant	As required

6 INSPECTION AND MONITORING

6.1 Inspections

Weekly inspections will be undertaken throughout the construction period by the Site Environment Officers, the Site Supervisor and Project Engineers. This inspection will ensure that appropriate air quality, noise and vibration controls are being implemented and are effective. It will also ensure that where necessary additional monitoring is undertaken as a result of changes to activities/construction methods and community complaints. Any issues identified during the weekly inspections will be recorded in the Weekly Environment Inspection Checklist (G-FRM-001).

6.2 Monitoring Details and Program

Construction air quality, noise and vibration monitoring procedures have been developed to address the initial and ongoing monitoring of emissions from work sites to assist in planning of excavation and construction works. This will be of particular importance where work activities are close, that is, less than 100 m to residences or other sensitive receivers.

Pre-condition dilapidation surveys will be conducted for building condition in vibration-sensitive zones prior to commencement of construction.

Ongoing spot checks of noise intensive plant and equipment will be undertaken. Construction noise and vibration levels will be monitored throughout the construction phase to verify compliance with the goals developed. Monitoring will be undertaken at those locations where predictions indicate exceedance of the nominated project air quality, noise and vibration criteria. Supplementary air quality, noise and/or vibration monitoring may also be conducted to identify issues of concern in response to any complaints.

6.2.1 Construction Air quality Monitoring program

Likely dust monitoring and inspection measures and responsibilities are outlined in table 7.

Table 7. Construction Dust Monitoring and Inspection Measures

Monitoring and Inspection Measures	Responsibility	Frequency
Visual inspections to monitor air quality, dust dispersal and the effectiveness of mitigation measures.	Site Environmental Officer/ Supervisor	Daily
All monitoring data and associated calibration records to be recorded and filed with the data available for auditing and review upon request.	Site Environmental Officer	Ongoing
Conduct additional dust monitoring as part of the investigation of complaints, where initiated through the Complaints Management System and the protocol/procedure for handling dust complaints. If required Dust Deposition Gauges to be installed at sensitive receivers subject to the complaints received throughout the construction period. DDG will be installed, maintained and data collected.	Site Environmental Officer	Ongoing as required by complaints at sensitive locations

Results of air quality monitoring undertaken along with relevant calibration records will be recorded in QESE.

6.2.2 Construction Noise Monitoring Program

The noise monitoring program for the Project are summarised in the following table 8. Prior to any monitoring being undertaken the noise monitoring equipment will be calibrated in accordance with the manufacturer's guidelines and calibration records will be kept on QESE.

Table 8 Construction Noise Monitoring Program

Monitoring	Responsibility	Schedule	Locations	Procedures and Instrumentation
Attended Monitoring	Environmental Manager/Environmental Officer/ Environmental Specialist	Typically once a week to fortnight or as required.	Typically at the nearest receiver to each site specific activity (refer to Table 3), and at the nearest receiver to each pipeline works crew.	Attended measurements to quantify and qualify construction noise emissions using a calibrated sound level meter capable of measuring L_{A90}, L_{Aeq}, L_{A10} and L_{A1} statistical noise levels in 15 minute intervals. One 15 minute sample per survey location is generally sufficient. Extraneous noise (e.g. cars, trains etc) may be excluded from the measurements. Sources contributing to the noise levels are to be noted.
Plant Noise Audits	Environmental Manager/Environmental Officer/ Environmental Specialist	During Maintenance or servicing plant a noise audit may be undertaken Typically, a representative item of plant /equipment will be tested prior to construction and periodically during construction.	On site, typically at 7 m from the item of plant in the direction of dominant noise emission. Closer to the source if other sources prevent measurement at this distance.	Attended measurements using a calibrated sound level meter capable of measuring L_{Aeq}, L_{A10} and L_{A1} statistical noise levels. Select the items of plant which appear to be the most dominant sources of noise. Measure noise emissions under conditions of maximum noise normally occurring for that source. For most noise sources, a one minute sample will be satisfactory, although sampling may be extended up to 15 minutes for sources varying greatly over time. Compare results with levels presented in Table 3 and 4. Equipment significantly exceeding the appropriate noise levels may not be permitted to continue operation on site until noise control measures have been inspected and upgraded.
Response to Complaints	Environmental Manager/Environmental Officer/ Environmental Specialist	As required	As appropriate to address the particular complaint.	Attended or unattended measurements as appropriate to identify and measure the source in question.
Blasting	Environmental Manager/Environmental Officer/ Environmental Specialist	As required	As appropriate for sensitive receptors	Refer to the CMP (NNA001-A-PLN-048)

Results of noise monitoring undertaken along with relevant calibration records will be recorded in QESE.

6.2.3 Construction Vibration Monitoring Program

Vibration monitoring recommendations for the Project are summarised in Table 9.

Table 9 Construction Vibration Monitoring Program

Monitoring	Responsibility	Schedule	Locations	Procedures and Instrumentation
Routine Monitoring	N/A	Not required	-	-
Response to Complaints	Environmental Manager/ Environmental Officer/ Environmental Specialist	As Required	At base of potentially affected structure for structural damage issues.	Attended and/or unattended measurements using a calibrated instrument capable of measuring peak particle velocity in 3 axes.
			On the affected floor for human comfort issues.	Attended and/or unattended measurements using a calibrated instrument capable of measuring RMS velocity, or acceleration in 1/3 octave bands.
Buffer Distance Tests	Environmental Manager/ Environmental Officer/ Environmental Specialist	As required (e.g. piling, tunnelling, vibratory rolling or work within or close to established buffer zones)	At base of potentially affected structure	Attended measurements using a calibrated instrument capable of measuring peak particle velocity in 3 axes.
Blasting	Environmental Manager/ Environmental Officer/ Environmental Specialist	As required.	As appropriate to address areas/ receivers of concern.	Refer to the CMP (NNA001-A-PLN-048)

Results of vibration monitoring undertaken along with relevant calibration records will be recorded in QESE.

7 CORRECTIVE AND PREVENTATIVE ACTIONS

7.1 Community liaison and complaint management

Complaints represent an opportunity to enhance project environmental performance. All project complaints, including those from members of the public, stakeholder groups and Government agencies, will be managed via the NNA 1800 243 998 phone number to be listed in the Inquiry and Complaints Management Procedure, contained in the Community and Stakeholder Management Plan.

Complaints from any source must be registered using the QESE complaint record section. Where the complaint is environment-related, the complaint will be investigated by the Environmental Manager or Environmental Officer in consultation with the Site Manager or delegate and action/s taken to enable satisfactory closure.

Feedback to relevant personnel will be managed by the community relations team. As required, complaint details (including type and preventative/corrective actions) will be advised to field staff via pre-start meetings, toolbox talks or the Health, Safety and Environment Committee as appropriate.

7.2 Environmental incident/emergency reporting

All project staff and subcontractor personnel shall report all environmental incidents to the Environmental Manager, although initial response may go via the Site Manager/Spread Supervisor or Environmental Officer.

7.3 Incident/emergency preparedness and response

An Incident Response Plan will be prepared for the project. This plan documents suitable incident procedures to ensure effective response in the event of an emergency (including environmental emergencies such as fire, flood and large fuel spills).

The emergency procedures shall be tested on a six-monthly basis. Records are to be maintained of all site emergencies and results of emergency practice drills. The Emergency Response Controller for the project will be defined within the Incident Response Plan.

The key to effective prevention of incidents is monitoring, surveillance and training. During construction activities, inspections and preventative action to be performed by the Alliance will include:

- daily inspections of active worksites and completion of routine environmental checklists
- issue and quick close-out of NCR/EIN
- maintenance of constant supervision on site
- ongoing environmental training
- environmental audits of worksites, subcontractors and compliance issues.

Environmental and safety information on hazardous substances (e.g. Material Safety Data Sheets [MSDS]) will be available at the main site office, including information on where and how such substances are to be stored. An up-to-date list of emergency response personnel and organisations will be maintained at the main office and compounds. A list of key environmental personnel will also be included.

Specific measures will also be implemented to minimise the risk of an incident occurring due to spillage, storage of hazardous materials or fire. Further information will be detailed in the Incident Response Plan.

7.4 Incident investigation

All incidents will be documented, investigations conducted and action plans (if required) developed to ensure no repetition of the event. Where current procedures are identified as being ineffective, the CEMP and any relevant WMS will be revised by the Environmental Manager and/or Health and Safety Manager.

An environmental investigation includes the following basic elements:

- advising the environmental authority(ies) if any substantial pollution has occurred
- identifying the cause and extent of and responsibility for the incident
- identifying and implementing the necessary corrective action
- identifying the personnel responsible for carrying out the corrective action
- implementing or modifying controls necessary to avoid a repeat occurrence of the incident
- recording any changes required to written procedures.

All personnel are required to report all incidents, as incident reporting is regarded as a valuable method of addressing shortcomings in procedures, training or equipment, and is an opportunity for improvement. It is also an offence not to report to the EPA any incident causing serious environmental harm.

7.5 Non-conformances

Non-conformances will be resolved according to the Quality Management Plan. The Environmental Manager or delegate will issue a Non-conformance Report (NCR) or an Environmental Improvement Notice (EIN) in response to inappropriate or non-conforming work methods, equipment selection, maintenance of controls or other identified concern.

In the event of a non-conformance:

- the nature of the event will be investigated by the Environmental Manager
- advice may be sought from a specialist
- monitoring may be undertaken
- the effectiveness or need for new/additional controls will be reviewed
- an appropriate preventative and corrective action will be implemented
- strategies will be identified to prevent reoccurrence
- the NCR will be closed-out
- environmental documentation/WMS will be reviewed and revised
- will be documented on QESE.

8 DEFINITIONS AND ACRONYMS

Acronym	Glossary
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
BCC	Brisbane City Council
CAR	Corrective Action Requests
CGAC	Coordinator-General's Approval Conditions
CGR	Coordinator-General's Report
CHMP	Cultural Heritage Management Plan
CRMP	Community Relations Management Plan
DES	Department of Emergency Services
EIN	Environment Improvement Notice
EIS	Environmental Impact Statement (Draft) as prepared by SRWP Co. April 2006
EMP	Construction Environmental Management Plan
EPA	Queensland Government Environment Protection Agency
ERA	Environmentally Relevant Activity
Linkwater	SRWPCo now trades as Linkwater, which is 100 per cent owned by the Queensland Government
NCR	Non-Conformance Report
NNA	Northern Network Alliance
NPI	Northern Pipeline Interconnector
NVMP	Noise and Vibration Management Plan
QESE	Quality Environment Safety Engineering Database
RBL	Rating Background Level
SAP's	Sensitive Area Plan's
SEIS	Supplementary Environmental Impact Statement
Sensitive receivers	Inhabitants or occupants of residential or institutional land uses (e.g. health care and educational facilities)
SRWP Co.	Southern Regional Water Pipeline Company
WMS	Work Method Statement
dBA	Decibels A-weighted
LAeq	Equivalent continuous sound pressure level
LAeq(60seconds)	Equivalent continuous sound pressure level measured over 60 seconds
LAmax	Maximum sound pressure level
LAmax, adj, T	Maximum sound pressure level, adjusted for tonality and/or impulsiveness, measured over a given time period (T)
LA1	Sound pressure level exceeded for 1% of the measurement period

Acronym	Glossary
L_{A10}	Sound pressure level exceeded for 10% of the measurement period
L_{A90}	Sound pressure level exceeded for 90% of the measurement period
µm	Micron

9 REFERENCE DOCUMENTS

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Australian Standard AS1055.1 (1997) Acoustics - Description and measurement of environmental noise - General procedures

Australian Standard AS1055.2 (1997) Acoustics - Description and measurement of environmental noise - Application to specific situations

Australian Standard AS2187.2 (2006) Explosives – Storage and use

British Standard BS7385 Part 2 (1993) Evaluation and measurement for vibration in buildings - Guide to damage levels from groundborne vibration

German Standard DIN 4150-3 (1999) Structural Vibration Part 3: Effects of vibration on structures National Environment Protection Council 1998 National Environmental Protection Measures for Ambient Air Quality

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