

## 9. Air Quality and Noise

## Burnett Catchment Water Infrastructure - Burnett River Dam

### 9.1 Legislative Guidelines

Air Quality goals for Queensland are set out in the *Environment Protection (Air) Policy 1997* (Air EPP) and the non-mandatory National Environment Protection Measure (NEPM) as set out by the National Environment Protection Council (NEPC).

Noise and vibration issues are addressed in the *Environment Protection (Noise) Policy 1997* and *Environment Protection Regulation 1998*. DMR have also issued guidelines to address traffic noise.

#### 9.1.1 Queensland Air EPP

The Queensland Environmental Protection Policy EPP (Air) is largely based upon the National Guidelines published by the Australian and New Zealand Environment and Conservation Council (ANZECC). The only air quality parameter relevant to the proposed dam project is particulate matter, and only during the construction phase. There will be emissions of other pollutants by vehicles onsite but this will have negligible impact off-site. The goals for particulate matter are shown in **Table 9.1**.

**Table 9.1: Air EPP goals for ambient air concentrations of particulates**

Pollutant	Goal concentration	Averaging Period
Total Suspended Particulate (TSP)	90 $\mu\text{g}/\text{m}^3$	Annual
Particulate (PM <sub>10</sub> )	150 $\mu\text{g}/\text{m}^3$	24 hours
Dust deposition	100 – 120 $\text{mg}/\text{m}^2/\text{d}$	24 hours

#### 9.1.2 National Environmental Protection Measure

One of the aims of the NEPM is to provide a consistent approach to managing air quality throughout Australia. The NEPM objective for PM<sub>10</sub> is 50  $\mu\text{g}/\text{m}^3$ , which is more stringent than the EPP objective.

#### 9.1.3 Queensland Noise EPP

##### General

The *Environmental Protection Act 1994* (EP Act) is the principal piece of legislation that governs noise and vibration issues in Queensland. The *Environment Protection (Noise) Policy 1997* (Noise EPP) is subordinate legislation to the EP Act. The purpose of this policy is to protect and enhance environmental values, namely the wellbeing of the community and individuals. In addition the Noise EPP specifies an acoustic objective of achieving and ambient level of 55 dB(A) or less for the majority of Queensland's residential population. It is not intended that, in achieving the acoustic quality objective, any part of the existing acoustic environment be allowed to deteriorate.

The Noise EPP does not specify noise criteria for activities or development. Rather, it lists the issues that the administering authority must consider when making a decision to approve a development application. These issues include:

- the characteristics of the noise from the noise-relevant activity;
- other noises ordinarily present at or near the relevant place; and
- any other information or other matter concerning the effect of the noise-relevant activity on the acoustic environment.

The Environmental Protection Agency has also published *A User's Guide for the Environment Protection (Noise) Policy 1997*. This document adds that the administering authority should also consider:

- the background level;
- the ambient level;
- the number of noise events emerging above the background;
- the maximum sound pressure level of the events;
- the characteristics of the noise emissions; and
- the receiving environment.

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### Development Noise

The Noise EPP does not specify any absolute or relative sound pressure level criteria for developments. However, the legislation that preceded the Noise EPP did provide sound pressure level objectives relative to background noise. These objectives were:

- 7 am - 6 pm: background + 5 dB(A)
- 6 pm - 10 pm: background + 5 dB(A)
- 10 pm - 7 am: background + 3 dB(A)

These objectives are also consistent with the *User's Guide to Queensland's Environmental Protection (Noise) Policy 1997* which states that administering authorities often apply background + 5 dB(A) noise criteria.

Therefore the above objectives have been used in this assessment as indicators of noise impacts. These objectives are consistent with other state and international criteria.

### Road Traffic Noise

Schedule 1 of the Noise EPP sets planning levels for noise. The planning levels for road traffic noise at sensitive locations are:

- 68 dB(A) for state controlled roads assessed as the  $L_{10}$  (18 hour) level;
- 63 dB(A) for another public road assessed as the  $L_{10}$  (18 hour) level;
- 60 dB(A), assessed as the highest 1 hour equivalent continuous A-weighted sound pressure ( $Leq(1h)$ ) level between 10.00 p.m. and 6.00 a.m.; and
- 80dB(A), assessed as a single event maximum sound pressure level.

The Noise EPP specifies acceptable noise models for use in road traffic noise assessments, however none of those specified are appropriate for the low flow conditions experienced in the region of this project. A USEPA model has been used instead. Similarly, the noise level objectives quoted above are not specific for a low traffic flow road.

$L_{10}$  (18 hour), for a specified day, means the arithmetic average of 18 individual  $L_{10}$  1 hour levels measured between 6.00 a.m. and midnight on the day. This indicator is widely used to represent road traffic noise exposure.

#### 9.1.4 Department of Main Roads Guidelines

The Department of Main Roads (DMR, 2000) has published the *Road Traffic Noise Management: Code of Practice*.

This guideline sets out a number of priorities and criteria for road construction and upgrade projects.

The relevant priority criteria for this project states that, for upgrading existing roads, measures for noise attenuation should be considered when the  $L_{10}$  (18 hour) measured or predicted road traffic noise is predicted to be  $\geq 68$  dB(A) and at least 3 dB(A) above the pre-construction level.

#### 9.1.5 Environment Protection Regulation

The *Environment Protection Regulation 1998* states that blasting is not unlawful if:

- The air-blast overpressure is not more than 115 dB for four out of any five consecutive blasts.
- The ground vibration is:
  - not more than 25 mm/s peak particle velocity for vibrations of more than 35 Hz vibration,; or
  - not more than 10 mm/s, peak particle velocity for vibrations of not more than 35 Hz

EPA prefer that a peak particle velocity should be less than 5 mm/s for ground vibrations less than 35 Hz.

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### **9.1.6 Environmentally Relevant Activities**

The dam itself is not an environmentally relevant activity (ERA), so it will be subject to the *Environment Protection Regulation 1998* (EP Nuisance Regulations). These laws empower the EPA to issue warnings and on the spot fines for causing nuisance.

The quarry and /or dredge operations, as well as the concrete batching plant are categorised as ERAs, and will require development approval and license. It is likely that the Licenses will require the prevention of the release of odour, dust and/or particulate matter, spray-drift, smoke, aerosols, or fumes which cause or are likely to cause a nuisance.

## **9.2 Existing Environment**

### **9.2.1 Local Area**

The proposed dam site is within a rural environment, characterised by agricultural activity comprising predominantly pastoral areas (beef cattle), National Parks, State Forests and some intensive horticulture (mostly citrus) and sugar cane interspersed by rural service centres.

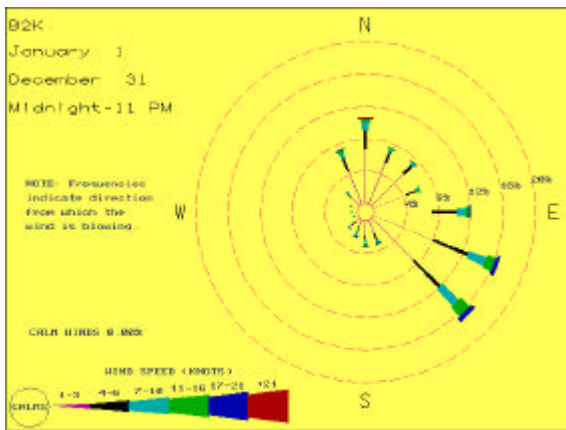
### **9.2.2 Meteorology**

The distributions of wind speeds, and the frequency of the varying wind directions are shown in a wind rose on the basis of meteorological observations of wind speeds and wind directions. This is based on a one year datafile for Bundaberg as supplied by the EPA which is a composite of the most 'typical' observed months over a period in excess of 20 years. The wind roses for all hours and four 6 hour periods though-out the day are shown in **Figure 9.1** through **Figure 9.5**. It should be noted that while Bundaberg is the closest meteorological station., it is on the coast, compared with the proposed dam, some 70 km inland. Therefore these wind data are indicative only.

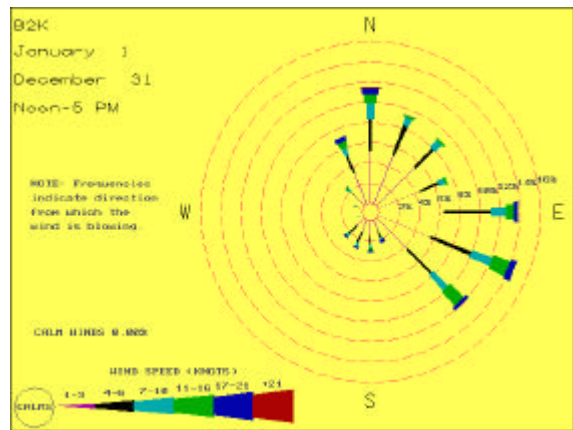
The compass has been divided into 16 sectors, one for each 22.5 degrees of the horizon. The radius of the outermost, wide wedges gives the relative frequency of each of the 16 wind directions, i.e. how often is the wind blowing from that direction. The inner wedges show the frequency of the wind blowing from that direction for different wind speeds. Note that 1 knot is equal to 0.5 m/s.

These wind roses show that the predominant wind direction is from the south-east during all hours of the day. From the afternoon till early evening there are relatively common north to north-east winds due to sea-breeze effects. The higher wind speeds, which are of concern with regard to dust impacts are predominantly from the southeast and to a lesser extent from the north. The meteorology for the site indicates that residences to the north west and to a lesser extent to the south of the site are most likely to be impacted by particulate.

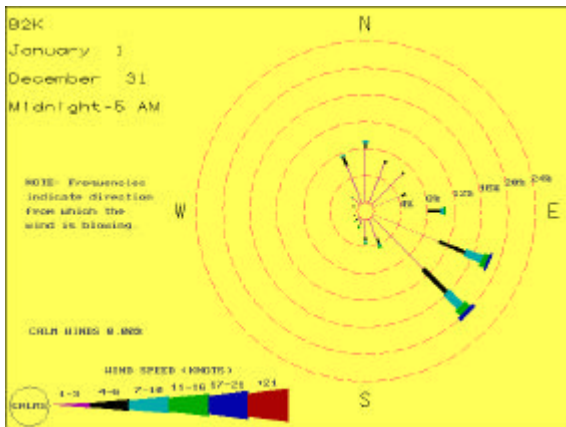
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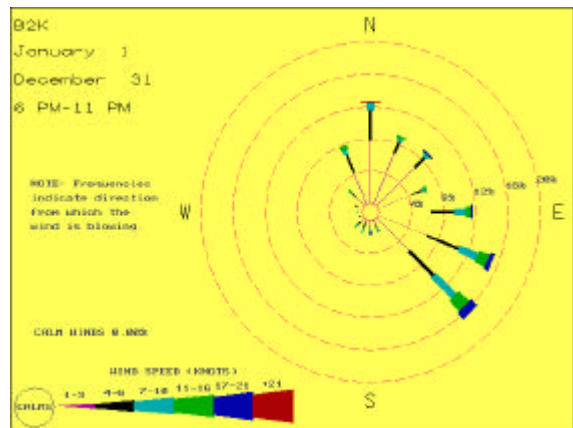
**Figure 9.1: Wind rose for all hours derived from the Qld EPA Bundaberg meteorological file.**



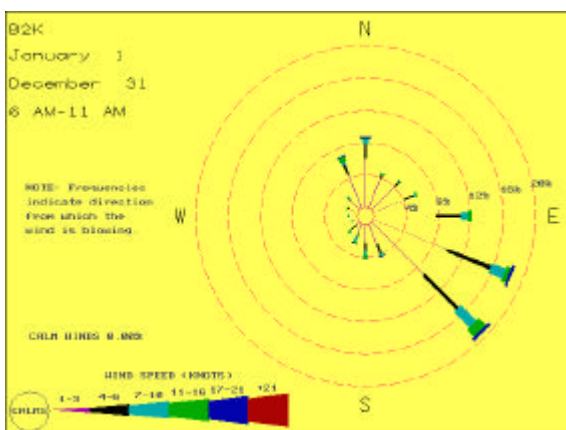
**Figure 9.4: Wind rose from 12 noon to 5 pm derived from the Qld EPA Bundaberg meteorological file.**



**Figure 9.2: Wind rose from midnight to 5am derived from the Qld EPA Bundaberg meteorological file.**



**Figure 9.5: Wind rose from 6pm to midnight derived from the Qld EPA Bundaberg meteorological file.**



**Figure 9.3: Wind rose from 6am to 11am derived from the Qld EPA Bundaberg meteorological file.**

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### 9.2.3 Existing Air Quality

There has been no long term air quality monitoring in the Lower Burnett River area. As a result it has been necessary to estimate likely background concentrations using qualitative judgements based on previous studies on concentrations likely in cane-farming based rural areas. The worst case concentrations would occur when low wind speeds are coincident with extensive bushfires or cane burning in the region.

The EPA monitors particulates in the Mackay region which is expected to have a similar extent of cane burning during the harvest season. Therefore as a guide to the likely extent and frequency of elevated particulate levels in the area, data from Mackay has been utilised. Twenty four hour averaged data for 1 year up to June 2000 was obtained from the EPA and analysed. The data indicates PM<sub>10</sub> concentrations in the range 5 - 50µg/m<sup>3</sup> with a median concentration of 15µg/m<sup>3</sup>. A conservative value corresponding to a 95<sup>th</sup> percentile concentration of 30 µg/m<sup>3</sup> has been adopted.

Vehicle emissions would contribute nitrogen oxides, particulate matter, ozone and carbon monoxide. Given the relatively low density of vehicles on roads in the region, these emissions are likely to be readily dispersed, so that environmental levels would be low.

### 9.2.4 Existing Noise Levels

No noise measurements have been carried out in the vicinity of the proposed construction site. The site is a remote rural location and would have background noise levels in the range of 30 dB(A) to 40 dB(A). An 18 hour average of 35 dB(A) has been assumed.

The main existing sources of noise in the vicinity of the dam wall and access roads would be:

- Vehicles
- Cattle lowing
- Dogs barking
- Agricultural machinery

All of these noises are intermittent in nature, and due to the low density of activity in the area, would not impact on the rural quietude.

Closer to the coast there are additional noise sources associated with cane harvesting and milling, however these would not be audible at the dam site.

### 9.2.5 Sensitive Receptors

Humans and animals are considered sensitive receptors to air quality and noise in the vicinity of the proposed construction site. The density of human population is quite low. The closest occupied residence to the dam site is Campbell's Orchard which is 500 – 1000 m away from construction activities, to the north east. The next closest residence is over 1.5 km away, also to the north east. There are approximately 10 residences along the dam access road. Most of these are offset by at least 100 m from the road, except near Campbells Orchard where residences are within 20 m of the road.. **Figure 9.6** identifies the location of residences in the vicinity of the dam site (within 2 km) and along the access road.

## 9.3 Potential Impacts

### 9.3.1.1 Air Quality

The major pollutant of concern in relation to the proposed dam, is particulate matter, mostly from dust. The main access road to the site will be sealed to minimise the impact on the community due to wheel generated dust. Any haul roads used for transport of quarry or dredged material may not be sealed, resulting in potential dust emissions. In the case that unsealed roads are used as haul routes, dust minimisation methods such as road wetting will be undertaken when necessary. Transported goods will either be covered, or in the case of quarried material, wetted, to control dust.

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The main source of particulate emissions from the dam site will be from excavation and wind suspension of particulates from cleared areas. The clearing will be left as late as possible in the construction program. The clearing will only be to clear trees of significant size and in most areas there will remain a limited vegetative cover until it is inundated. In cleared areas not to be inundated, i.e. near the dam wall, a rapid and progressive reinstatement of disturbed areas will be carried out to stabilise soils and prevent wind blown dust emissions. The quarry is a potential source of dust generated during the blasting, and crushing stages.

A summary of the dust minimisation techniques that will be incorporated in the Environmental Management Plan will include:

- Wetting of exposed areas
- Rapid and progressive reinstatement of disturbed areas will be carried out to stabilise soils and prevent erosion from occurring. Techniques such as hydroseeding will be used to establish a rapid vegetation cover. Disturbed areas will be restored to the pre-construction state or better.
- Restrictions on activity during high winds
- Removal of vegetation from the inundation area will be undertaken as late as possible before closure of the dam
- Dust deposition monitoring

Dustfall gauges will be installed at key sensitive sites around the site to verify that the mitigation measures are effective during all phases of the construction. If this monitoring shows that dustfall at sensitive receptors is greater than 120 mg/m<sup>3</sup>/d, then this is an indication that health effects or nuisance are likely. In this case mitigation measures will be reviewed and modified as required. The sensitive receptors to dust are the residences adjacent to the dam site (and quarry site, when identified). Although these residences are generally close (500 – 1500 m), they are to the north east, and not in the direction of the prevailing winds, so significant dust impact is not expected.

All plant and equipment and vehicles used in construction will produce exhaust emissions containing carbon dioxide, carbon monoxide, nitrogen oxides, sulphur oxides and particulates. (A list of the expected onsite equipment is shown in **Section 3.2.8**). Australian standards require all construction equipment to have emission control equipment installed and to be able to meet specified limits for pollutants. These emissions are considered to be readily dispersible in this rural environment. It is therefore considered that vehicle or machinery emissions would make a negligible contribution to the environmental pollutant concentrations.

### **9.3.1.2 Traffic Noise**

During construction typical work hours will generally be 7 am to 5 pm, 6 days per week, although a second shift may operate if construction works fall behind schedule. If heavy vehicle haulage needs to be scheduled to occur outside these hours, then the community will be consulted.

The main site access road will be an upgraded existing road from Dallarnil to the dam site, as indicated on Figure 4.1 (Section 4). An haul road will also probably be constructed from the quarry site/s to the dam site, or an existing road upgraded. The location of the quarry or the haul road has not been confirmed, although it is expected to be in the impoundment area, about 2 km from the dam.

It is estimated that the number of heavy vehicle movements along the site access road and haul roads could be between 50 and 100 per day during construction. These movements would be spread reasonably evenly throughout the day. The workforce during construction is anticipated to be typically 40, peaking to 80 in the peak season. Assuming no car pooling, car movements along the main access road could therefore be in the order of 80 to 160 per day, mostly concentrated in peak periods at the beginning and end of shifts. This is a significant increase in the existing traffic flow along the roads, and will result in significant increase in the noise levels experienced by the residents.

For the noise impact assessment, it has been assumed that there will be a flow of 80 passenger vehicles and 10 heavy vehicles per hour during two peak periods, and 10 heavy vehicles and 10 passenger vehicles per hour for the non peak periods, along the main access road. 10 heavy vehicles per hour, throughout the day, has been assumed for any secondary access roads.

Preliminary noise predictions for various distances are shown in Table 9.2.

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**Table 9.2: Traffic Noise Level Predictions**

Distance from road	1 hour peak	18 hour average (dB(A))
10 m	59 – 62 (dB(A))	46 (dB(A))
30 m	55 – 58 (dB(A))	42 (dB(A))
100 m	49 – 52 (dB(A))	37 (dB(A))
300 m	42 – 45 (dB(A))	33 (dB(A))

These sound pressure levels have been determined for external areas. Within a house, the perceived sound pressure level would be approximately 10 dB(A) less.

The Noise EPP does not specifically identify a noise level objective for a low density traffic flow road, however the 18 hour average for a residence over 100 m from the road is significantly less than the quoted 63 dB(A) for non-state controlled roads, and is within 3 dB(A) of the assumed 18 average background level of 35 dB(A), which concurs with the DMR recommendations. Residences within 100 m (near Campbells Orchard) may experience noise levels notably above background levels.

Noise monitoring will be conducted periodically at residences along the access roads. If this shows that nuisance is likely or in the case that justifiable complaints are received, then the mitigation measures for noise will be reviewed and modified as necessary. Possible mitigation measures include changing the number or timing of the vehicle traffic (e.g. running a bus for construction staff to reduce car numbers) or erecting temporary noise barriers.

It is not anticipated that the construction and traffic noise would impact significantly on the livestock in the region.

### 9.3.1.3 Construction Site Noise and Vibration

The construction works at the dam site will involve regular use of excavators, haul trucks, dozers and cranes, as well hydraulic drills. A preliminary noise assessment has been undertaken, assuming the simultaneous operation of:

- 1 x hydraulic drill
- 4 x excavators
- 1 x rock breaker
- 1 x graders

The sound pressure levels have been calculated as:

- 49 dB(A) at 500 m
- 38 dB(A) at 1000 m
- 27 dB(A) at 2000 m

These noise levels are for external receptors, and may be up to 10 dB(A) less inside the house.

For residents greater than 1 km distant, the noise levels would be less than 5 dB(A) above background. The closest residence (Campbell's Orchard) is slightly less than 1000 m away and may experience construction noise, although noise levels are still anticipated to be within 5 dB(A) of background. To minimise impacts, noise emissions from plant and equipment will be controlled at the source by ensuring that mufflers and other noise control devices on equipment are installed and operating correctly.

Noise monitoring will be conducted at the closest residence to verify that the noise levels are acceptable. In the event that the monitoring indicates excessive noise levels or in the event of complaints the mitigation measures will be reviewed and amended as required. Potential mitigation measures include modifying the timing and location of activities or the erection of sound barriers.

Most construction activities will occur only during daylight hours, particularly with respect to the highest noise levels. However, some construction may occur at night during concrete pours, and quarry operations may also continue at night. If noisy activities are likely to occur at night, potentially affected persons should be notified of the schedule and types of noises in advance.

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Construction at the dam may also involve blasting, the extent of which will depend on the underlying geology, determined during preliminary siteworks. Any blasting will be in accordance with the *EP Regulation*, guidelines so that:

- the air-blast overpressure is not more than 115 dB for four out of any five consecutive blasts.
- the ground vibration is:
  - not more than 25 mm/s peak particle velocity for vibrations of more than 35 Hz vibration, or
  - not more than 10 mm/s, peak particle velocity for vibrations of not more than 35 Hz.

In addition, all potentially affected residences will be made aware of the timings and duration of the blasting and made well aware that it will be relatively infrequent and of short duration.

### **9.3.1.4 Quarry Site Noise and Vibration**

In sourcing rockfill and concrete aggregate for the dam construction, crushing and blasting may be required at a quarry or borrow pit, the site of which is yet to be confirmed. The closest residence to the sites are unknown, although the site will be selected to minimise impact to neighbours. These activities will only occur during daylight hours, and in accordance with the *EP Regulation* guidelines so that:

- Noise levels at sensitive receptors do not increase more than 5 dB(A) above background
- the air-blast overpressure is not more than 115 dB for four out of any five consecutive blasts.
- the ground vibration is:
  - not more than 25 mm/s peak particle velocity for vibrations of more than 35 Hz vibration,; or
  - not more than 10 mm/s, peak particle velocity for vibrations of not more than 35 Hz.

Monitoring will be conducted at the closest residence to verify that the noise and vibration levels are acceptable. In the event that the monitoring or in the event of complaints the mitigation measures will be reviewed and amended as required.

The quarry will be an environmentally relevant activity and will need appropriate approvals prior to establishment.

## **9.3.2 Operation**

### **9.3.2.1 Noise and Vibration**

Main operating noise will be the sound of flowing water as water is released from the dam. There would also be occasional noises from maintenance and repair equipment. Neither of these issues are anticipated to affect the nearby residents and will comply with relevant noise regulations.

### **9.3.2.2 Air Quality**

Operation of the dam is not anticipated to cause any impact on the local or regional air quality and will comply with all relevant air quality goals.

## **9.4 Conclusions**

Construction activities will be controlled to minimise dust emissions and will comply with the relevant Work Place Health and Safety Standards. Vehicle and machinery will have emission control equipment installed in accordance with Australian Standards, and will not result in significant impact to local or regional air quality.

The quarry or borrow pit location will be selected and operated such that there will be negligible impact upon residences in the area. The major noise impact arising from the dam construction is traffic flow along the access road and haul roads. This may impact on the amenity and quietude of some residents living close to the roads.

Traffic noise mitigation measures that will be introduced include:

- Road maintenance to ensure defects such as potholes are repaired as soon as possible
- Establish speed limits within the sensitive zones
- Limit the use of engine exhaust brakes

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In the event of legitimate complaints from residents there will be monitoring conducted to determine the likely source and the EMP modified where possible. If it is not possible to mitigate the problem through modifications of equipment or operating practice, negotiations will be undertaken with the resident(s) to determine an acceptable solution. These could include erection of temporary noise barriers or the temporary installation of air conditioning or filtration devices.

Construction noise may detrimentally affect the closest residents. To minimise impact all feasible and reasonable mitigation measures will be put in place. Contractors involved in the construction of the proposed dam raising should familiarise themselves with methods of controlling noisy machines and alternative construction procedures as explained in Australian Standard AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*. This details typical plant and equipment sound power levels, provides advice on project supervision, and gives guidance on noise control and reduction. Noise-level checks on equipment such as rock- and concrete-breakers and compactors should be conducted regularly.