# 16 VIBRATION

## 16.1 INTRODUCTION

This chapter provides further description of potential blasting impacts for the Supplementary Environmental Impact Statement (EIS), in response to various submissions on the EIS and refinements/modifications to the Project. The information presented builds on the EIS Volume 1, Chapter 16 Vibration and should be read in conjunction with the EIS chapter.

Chapter 6 Project Operations of the Supplementary EIS provides further details of refinements/modifications to the Project.

Further detailed information is located in the Addendum to the blasting technical report, STR 16-1-SV1.5 Addendum to the Technical Report Environmental Impacts from Blasting.

## 16.2 METHODOLOGY OF ASSESSMENT

The methodology used to assess potential impacts in relation to the changes in Project scope is consistent with the EIS approach for the Project as detailed in the EIS, Volume 1, Chapter 16 Vibration, section 16.2.

### 16.2.1 BLASTING CRITERIA

The Environmental Protection Regulation 1998, which included blasting criteria as discussed in the EIS Volume 1, Chapter 16, section 16.2.1, has been replaced by the new Environmental Protection Regulation 2008, which does not contain blasting criteria. Blasting criteria from the Environmental Protection Regulation 1998 are now covered under section 440ZB of the *Environmental Protection Act 1994* (EP Act). These EP Act criteria are less stringent than the EPA Guideline: Noise and vibration from blasting (EPA 2006) used in the EIS, and therefore the blasting criteria used in the EIS are still relevant to this assessment.

## 16.3 EXISTING ENVIRONMENT

### 16.3.2 SENSITIVE RECEPTORS

Sensitive receptors are discussed in the EIS Volume 1, Chapter 16 Vibration, section 16.3.2. Some sensitive receptors have been acquired by the WJV or the WJV are under current negotiations with the existing owners. This includes the abattoir, described as sensitive receptors MLA-740 and MLA-741, which has been purchased by the WJV. Chapter 1 Introduction, section 1.2.1 identifies sensitive receptors that are no longer considered as such because they have been purchased by the WJV and/or are under negotiations to purchase.

## 16.4 DESCRIPTION OF PROPOSED DEVELOPMENT

A description of proposed refinements to the mine development is provided in Chapter 6 Project Operations of this Supplementary EIS. Refinements that relate to the vibration and blasting impact assessment are summarised in this section.

These refinements involve the further design of the Austinvale North Pit, the deferment of mining the Woleebee South Pit within the timeframes of this Project, the addition of a new pit, Wubagul Pit, and the establishment of a 2 km zone around the western side of the township of Wandoan in which mining will not initially be undertaken in the first years of operation, with the potential for future mining dependent upon the current and ongoing monitoring program results. The following sections describe the changes to the proposed mining operations.

### Austinvale North Pit

The Austinvale North Pit is designed to extract a shallow coal reserve that lies to the north of the rail spur near the mine infrastructure area (MIA). The intention is to mine this area as part of the initial mine development and to utilise the resulting void as the fine rejects (tailings) disposal storage area from the coal processing plant (CPP).

A dragline will excavate the periphery of the pit and place the overburden to form the outer walls of the tailings storage area, leaving the overburden in the centre of the resource to be removed by excavators and trucks to complete the construction of the tailings storage facility. Overburden thickness varies from 10 to 15 m on the northern boundary, increasing to 17 m to 28 m on the southern boundary. These modest overburden thicknesses will largely comprise weathered material, much of which may be able to be excavated without blasting or require minimal explosive energy to generate sufficient looseness for efficient excavation.

The Project accommodation facilities will occupy an area approximately 800 m by 400 m and at its closest point lies 500 m to the north of the western end of the Austinvale North Pit. Blasts with therefore be required at distances that range from 500 m to more than 2,000 m from the nearest boundary of the accommodation facilities.

### Frank Creek Pit

A 2 km zone has been defined around the Wandoan township as shown on Figure 6-3-SV1.3. Mining will not take place within this zone during the early years of the Project. Mining of this zone was considered in the EIS Volume 1, Chapter 16 Vibration, section 16.5. The areas of the pit that lie outside this zone will be mined using excavators and trucks with the northern area mined in Years 3 to 5 and the southern area mined in Years 6 to 10 of the Project.

### Wubagul Pit

An additional pit, Wubagul, has been defined in the south-east corner of MLA 50230. Operations in Wubagul Pit are scheduled to take place in Years 3 to 5 of the Project after which the pit will become dormant for some time. Operations will then resume in Years 25 to 30 of the Project schedule.

Mining will begin with a dragline box cut parallel to the Leichhardt Highway on the eastern side of the pit and progress in a series of strips towards the south west. The depth of the box cut will range from 20 m to 25 m. Similar depths will be experienced on the northern and southern ends of the pit during the early years of mining. The depth of cover in the centre of the strips will increase to 30 m by Year 5 of the Project and interburden thicknesses of this order will develop on the southern side of the pit. Overburden thicknesses vary between 30 m and 53 m in the later strips which will be mined in the final years of the Project.

## 16.4.1 MINING METHOD

The mining method for the revised mine layout is consistent with the EIS Volume 1, Chapter 16 section 16.4.1.

## 16.4.2 BLASTING OPERATIONS

Blasting operations for the revised mine layout are consistent with the EIS Volume 1, Chapter 16 section 16.4.2.

## 16.4.3 BLAST DESIGNS

The blast designs for the revised mine layout are consistent with the EIS Volume 1, Chapter 16 section 16.4.3. As stated in section 16.4.3, blasting of coal seams and minor partings within the coal zone is not expected.

# 16.5 POTENTIAL IMPACTS

## 16.5.1 CONSTRUCTION

Potential impacts from the construction related to the mine plan are consistent with the EIS Volume 1, Chapter 16 Vibration, section 16.5.1.

## 16.5.2 OPERATIONS

### Ground vibration

Ground vibration in relation to the revised mine layout is consistent with the EIS Volume 1, Chapter 16 section 16.5.2.

### Airblast overpressure

Airblast overpressure in relation to the revised mine layout is consistent with the EIS Volume 1, Chapter 16 section 16.5.2.

### Blasting impacts

Further to the potential impacts described in the EIS Chapter 16 Vibration, the following outlines the potential impacts resulting from the refinements/modifications to the Project relevant to blasting and vibration.

#### *Wandoan township*

Potential impacts from the mining activities were assessed by modelling based on site specific and Project specific information as discussed in Volume 1, Chapter 16 Vibration, section 16.2.2, and was conducted using predictive formulae for vibration modelling drawn from the Australian Standard 2187.2 Explosives — Storage and Use, Part 2: Use of explosives (2006). The modelling provides adequate guidance as to the blasting practices that will be required to meet the criteria recommended in the Blasting Guideline. The airblast overpressure levels in Wandoan township are shown on Figure 16-4-SV1.3 and show that airblast overpressure within Wandoan are within the criteria of the Blasting Guideline, that is, less than 115 dBl.

Given the mitigation measures stated in the EIS, the revised mine plan provided in this Supplementary EIS, the Wandoan township lies outside the potentially affected area for vibration impacts as a nuisance to persons. The Blasting Guideline criteria for nuisance to persons is more stringent than for structures, therefore the potential impact on structures from ground vibration and airblast overpressure within Wandoan township is negligible.

#### *Wandoan Cemetery*

Potential impacts to the Wandoan Cemetery are as discussed in the EIS, Volume 1, Chapter 16 Vibration, section 16.5.2.

#### *Houses and associated infrastructure*

Figure 16-4-SV1.3 identifies houses and farm facilities lying outside the MLA area that may experience airblast overpressure greater than 115 dB(linear). Table 16-1 updates the table provided in section 16.5.2 of the EIS as a result of the changes made to the mine plan.

The mine plan changes have resulted in receptor MLA-520 now being located in an area that may experience airblast overpressure greater than 115 dBl, in relation to the mining of Frank Creek Pit. Mitigation measures in relation to this property are discussed in section 16.6.2. The mining of Wubagul Pit does not result in any sensitive receptors experiencing airblast overpressure greater than EPA (2006) limits. Two sensitive receptors that were potentially to be impacted by mining in Wubagul Pit (sensitive receptors MLA-427 and MLA-570), have been purchased by the WJV.

Table 16-1: Sensitive receptors potentially impacted by Project blasting operations

| Receptor number | Receptor type | Distance to closes Project blasting area (m) | Years affected |
|---|---|---|---|
| MLA-374 and MLA-367 | A house and shed complex | Approx 1,000 m north of the Austinvale North Pit | Receptor under negotiations or purchased by the WJV, so no longer a sensitive receptor |
| MLA-520 | A house | Approx 1,700 m east of the Frank Creek Pit | Years 3 to 5 |
| MLA-595 and MLA-596 | A house and shed complex | Approx 900 m south west of the Turkey Hill Pit | Years 9 and 10 |
| MLA-355 (current) | A house | Approx 1,500 m south of the Mud Creek Pit | No longer a sensitive receptor, as MLA-355 being moved to new location, shown as MLA-355 (proposed) |
| MLA-361 | A house | Approx 2,000 m south of the Mud Creek Pit | Years 26 to 30 |
| MLA-309, MLA-298, MLA-301 and MLA-303 | A house and three shed complex | Approx 1,500 m west of the Woleebee Creek Pit | Receptor purchased by the WJV, so no longer a sensitive receptor |
| MLA-552 and MLA-551 | A house and shed complex | Approx 1,900 m south west of the Woleebee Creek Pit | Receptor purchased by the WJV, so no longer a sensitive receptor |
| MLA 531, MLA 541, MLA 548 and MLA 554 | Four sheds (feedlot) | Approx 900 m south west of the Woleebee South Pit | No longer affected |
| MLA 505 and MLA 578 | A house and shed complex | Approx 500 m south east of the Woleebee South Pit | No longer affected |

### *Abattoir*

The abattoir has been purchased by the WJV, and as such is no longer a sensitive receptor.

### *Feedlot*

The EIS Volume 1, Chapter 16 Vibration, and the associated technical report, discussed the feedlot under sensitive receptors MLA-531, MLA-541, MLA-548 and MLA-554, being located south west of the proposed Woleebee South Pit.

The Woleebee South Pit is no longer proposed to be mined within the current approval period, and as shown on Figure 15-4-SV1.3, the feedlot will not be impacted by blasting or vibration as the result of the Project.

### *Accommodation facilities*

Analyses indicate that blasting operations in the north western end of the Austinvale North Pit may impose ground vibration levels up to 8 mm/s at the nearest boundary of the accommodation facilities. Airblast levels up 124 dBl may also be experienced. These levels drop to 4.6 mm/s and 120 dBl in the centre of the accommodation facilities area. It should be noted that these figures represent the 90$^{th}$ percentile of the range of vibration and airblast levels likely to be experienced, with the majority of blasts expected to generate lower values.

The levels predicted for the southern boundary of the accommodation facilities area exceed the *Guideline Noise and Vibration from Blasting* (EPA 2006) (Blasting Guideline) limits of 5 mm/s and 115 dBl respectively, but are well below the levels required to cause physical damage. The blast effects may be noticed as a mild vibration from either the ground vibration directly or the airblast interacting with accommodation facility structures.

The blast locations where environmental impacts at the accommodation facilities may exceed the guideline limits are shown on Figure 16-4-SV1.3. This area will be mined very early in the Project life. Operations in this area should be completed in a matter of months and involve a small number of individual blasts.

#### *Mine Infrastructure Area, powerlines, pipelines, railway and bores*

The potential impact on farm, community or other groundwater bores was discussed in Volume 1, Chapter 16, section 16.5.2 of the EIS. This section of the EIS indicates that existing bores are not particularly vulnerable to damage from nearby blasting. The EPA criteria are based on nuisance to persons and not damage to structures or services. Damage to structures occurs at higher vibration levels than nuisance to persons. Studies have found that physical damage to common structures, including groundwater bores, is highly unlikely for blast vibration levels below 50 mm/s. This is 10 times the Blasting Guideline limit for 9 out of 10 mine blasts. An extensive literature survey found no evidence of groundwater bores being damaged by mine blasts including bores in close proximity to blasting.

Blasting is regularly conducted on mine sites within close proximity to water storage dams, and as such water storage dams outside the MLA and outside the blasting exclusion zone are highly unlikely to be damaged from blasting activities.

#### *Telstra communications tower*

The environmental impacts on the existing Telstra communications tower from blasts in the revised Frank Creek Pit operations will be below the *Blasting Guideline* recommended limits.

### Fly-rock

Parts of the accommodation facilities and other site infrastructure will fall within the exclusion zone required to protect personnel from the effects of fly-rock for some blasts early in the Project.

The current mine plans include dragline strips in the northern half of the Frank Creek Pit approaching within 600 m of the Leichhardt Highway. The eastern boundary of the Wubagul Pit is 500 m from the Leichhardt Highway. This means that the fly-rock exclusion zone required for blasts in the box cut and the first mining strip, at a distance between 500 m and 600 m from the highway, will extend beyond the highway.

## 16.6 MITIGATION MEASURES

### 16.6.2 OPERATIONS

### Triggers for management actions

The EIS Volume 1, Chapter 16 Vibration, section 16.6.2 states that where monitoring indicates airblast overpressures levels are likely to exceed 115 dBl, a trigger action response protocol (TARP) will be implemented, including a review of blast procedures and other operational controls. Changes to blast procedures and operational controls could include items such as the timing of blasts, changing the bench height and size/number of blasts, or other measures as contained in the EIS Volume 1, Technical Report TR16-1-V1.5.

If blasting impacts at a sensitive receptor cannot be mitigated to comply with the Environmental Authority conditions, future mitigating measures or suitable arrangements will be undertaken by the WJV, in consultation with the sensitive receptor owners.

As discussed in Volume 1, Chapter 16 Vibration, section 16.3.2, sensitive receptors in relation to blasting include houses, sheds, groundwater bores, power lines and other infrastructure that have the potential to be impacted by blasting. As such, any non-mining related infrastructure outside the MLA areas that has the potential to be impacted by blasting is considered a sensitive receptor, and will have management measures implemented as per Chapter 16 of the EIS and Supplementary EIS. As stated in section 16.5.2 above, the blasting criteria are based on nuisance to persons. Members of the public will not be permitted within a distance at which they can be adversely affected during blasting operations, which will generally be the 600 m exclusion zone related to management of fly-rock.

The EIS and Supplementary EIS Volume 1, Chapter 16 Vibration, section 16.6.2, and Chapter 28, section on Vibration Chapter 16, outline the commitments and mitigation measures that will be undertaken as part of blast and vibration management for the Project. As discussed in EIS and Supplementary EIS section 16.5.2, potential impact on structures from ground vibration and airblast overpressure within Wandoan township is negligible. Monitoring programs are described in the EIS which would identify potentially damaging vibration levels, further limiting the potential for structural damage. As part of identifying any potential issues for structures, the WJV will undertake, with the cooperation of landowners, condition surveys of buildings and structures within 2 km of blasting activities prior to commencing blasting operations. These surveys will be conducted prior to blasting activities occurring within 2 km of a building or structure, and will be arranged by and paid for by the WJV. The reference to buildings and structures includes public buildings and structures such as the health centre, tennis courts, community culture centre and Juandah Gardens retirement village. However, with the establishment of a 2 km zone around the Wandoan township, blasting is not planned within 2 km of these facilities. Subject to the findings of the condition surveys, the WJV may implement specific mitigation measures for potentially affected structures.

## Airblast overpressure

### *Housing and associated infrastructure*

The number of sensitive receptors affected by blasting operations has been reduced as a result of the changes to the mine plan, and properties being purchased or under negotiation to purchase by the WJV. Measures for the remaining affected sensitive receptors are:

- negotiations to purchase the property on which sensitive receptors MLA-367 and MLA-374 are located are being undertaken by WJV. Sensitive receptors will be unlikely to experience airblast overpressure greater than 115 dBl
- negotiations will take place with the owners of a house (MLA-520) east of the Leichhardt Highway, north of Wandoan regarding the potential for modest airblast effects during the development of the northern half of the Frank Creek Pit. The sensitive receptor may experience up to 116 dBl during Years 3 to 5 of the Project for one blast in ten, which is within EPA Guideline (2006) limits
- potential impacts on the house (MLA-595) and shed (MLA-596) approximately 900 m south west of the Turkey Hill Pit will likely be managed by acquisition or negotiation prior to mining approaching the property in Year 9 of the Project. If not acquired, the sensitive receptors may experience up to 120 dBl during Years 9 and 10 of the Project for one blast in ten, which is within EPA Guideline (2006) limits
- the house (MLA-355 existing) is 1,500 m south of Mud Creek Pit, and the WJV is negotiating the relocation of this sensitive receptor, denoted as MLA-355 (proposed)
- the house (MLA-361) is 2,000 m south of the Mud Creek Pit will likely be managed by acquisition or negotiation prior to mining approaching the property in Years 26 to 30 of the Project. If not acquired, the sensitive receptors may experience up to 117 dBl during Years 26 to 30 of the Project for one blast in ten, which is within EPA Guideline (2006) limits.

### *Wandoan township*

The township of Wandoan should not experience ground vibration or airblast levels above the EPA Guideline recommendations as a result of blasting operations outside the 2 km zone defined around the town. The impact of any operations undertaken within this zone will be assessed, based on monitored performance of mining operations, before mining activities are undertaken in this zone.

### *The cemetery*

Volume 1, Chapter 16 Vibration, sections 16.5.2 and 16.6.2 stated various mitigation measures, including that:

- blasting will be scheduled not to interfere with the operations of funeral services, with the WJV liaising with the Cemetery manager and other relevant parties for all funeral services conducted

- the WJV will liaise with the managers of the Cemetery and seek community feedback via the Community Reference Group to manage the nuisance impact of blasts to those visiting the cemetery at times other than funeral services.

#### *Telstra communications tower*

The Telstra communications tower will not experience ground vibration or airblast levels above the EPA Guideline recommendations as a result of blasting operations outside the 2 km zone defined around the town. The impact of any operations undertaken within this zone will be assessed, based on monitored performance of mining operations, before mining activities are undertaken in this zone.

#### *Accommodation facilities*

The impact of blasting operations on the accommodation facilities will be well below the levels required to cause physical damage. However:

- personnel in the area will be informed about blasting times so that the resulting disturbance is not a surprise
- blasts will be scheduled for times when people are not sleeping or resting, but engaged on routine activities; for instance, 8 am or 4 pm might be suitable times for blasts.

### Fly-rock

#### *Accommodation facilities*

Parts of the accommodation facilities and other site infrastructure will fall within the exclusion zone required to protect personnel from the effects of fly-rock for some blasts early in the Project. Procedures will be developed to evacuate these areas during blasting operations.

#### *Leichhardt Highway*

The current mine plans include dragline strips in the northern half of the Frank Creek Pit approaching within 600 m of the Leichhardt Highway. The Wubagul Pit box cut is also located within 600 m of the Highway. As stated in section 16.6.2, the recommended exclusion zone for persons around these blast areas is 600 m, with suitable mitigation measures to manage these impacts from fly rock being:

- re-define the eastern boundary of these pits to be 600 m from the highway; or
- free-dig the material within 600 m of the highway so that blasts are not required; or
- establish a procedure for temporarily closing the highway in consultation with the Department of Transport and Main Roads (formerly the Department of Main Roads) and Western Downs Regional Council, while the exclusion zone for blasts extends beyond the highway.

## 16.7 RESIDUAL IMPACTS

The mitigating measures described in this chapter will manage the fly-rock hazard at the accommodation facilities, and the Leichhardt Highway adjacent to the Frank Creek Pit and Wubagul Pit. The ground vibration and airblast impacts on the accommodation facilities should be acceptable to the occupants if the mitigation measures in this chapter are implemented.

## 16.8 REFERENCES

Australian Standard 2187.2 – 2006, *Explosives — Storage and Use, Part 2: Use of explosives*, Standards Australia.

Environmental Protection Agency (EPA) 2006, *Guideline Noise and vibration from blasting*, Queensland Government, Brisbane.