

- ❑ sequential clearing and rehabilitation of the quarry as extraction of the hardrock material proceeds;
- ❑ regular monitoring of sediment control dams and the creek downstream of the site; and
- ❑ the regular maintenance of erosion and sediment control structures, particularly after rainfall, to ensure their efficiency.

ii. Asphalt Plant, Pugmill and Pre-coating Operations

Additional actions to mitigate potential impacts on water quality and runoff from the asphalt plant, pugmill and pre-coating operations will include the following:

- ❑ the asphalt plant to be situated on a hardstand pad;
- ❑ the pugmill and pre-coating facility to be situated on a concrete pad;
- ❑ runoff from the asphalt plant pad to be diverted to sediment/evaporation ponds for treatment;
- ❑ runoff from the pre-coating area to be directed through a grease trap;
- ❑ a wet scrubber inground lined interceptor pit to be constructed to trap scrubber particulates and recycle water back through the asphalt plant. Solids from the pit will be bioremediated on-site in a clay lined area. The water recycling pit will have a minimum capacity to serve daily usage water and will be kept separate from the general site runoff. Water from these activities will be directed into settling ponds where aggregates will be given time to settle out;
- ❑ when either of the asphalt plant, pugmill or pre-coating facilities are in operation, the site facility sediment dam (being downstream of these operations) will be monitored regularly for the following analytes:
 - pH;
 - total dissolved solids;
 - total suspended solids;
 - total petroleum hydrocarbons;
 - polynuclear aromatic hydrocarbons;
 - mononuclear aromatic hydrocarbons; and
 - biochemical oxygen demand.

- additives, fuels, chemicals or oils will be stored in a roofed and bunded area sized to contain spillage of at least 110% of the largest liquid storage container;
- specialist absorbent material will be kept on-site for rapid clean-up of spills. Soiled material is then stored on-site in drums prior to disposal by a licensed contractor; and
- regular inspection and monitoring of the bunded areas would be undertaken to ensure proper maintenance of tanks and containment of any spills.

4.4 AIR QUALITY

A detailed air quality assessment is presented in *Appendix K*. A summary of the assessment is provided below.

4.4.1 Air Quality Criteria

The effects of dust on health and amenity were assessed by comparing dust deposition rates and dust concentrations with recognised air quality criteria. To include the full range of potential impacts, reference was made to criteria for long-term (annual average) and short-term (24 hour) periods, and to different particle sizes. The following sections detail appropriate criteria.

i. Dust Deposition

Dust deposition criteria developed by the NSW Environment Protection Authority (NSW EPA) are given in *Table 4.3*. These set maximum increases above existing levels. For example, in residential areas with existing annual average deposition of between zero and two g/m²/month, an increase of up to two g/m²/month would be permitted.

Table 4.3 ASSESSMENT CRITERIA FOR DUST DEPOSITION

Existing Deposition (g/m ² /month)	Maximum Acceptable Increase (g/m ² /month annual average)	
	Residential Suburban Land Use	Rural, Semi-Rural Urban, Commercial & Industrial Land Uses
2	2	2
3	1	2
4	0	1

Based on these criteria and average deposition rates recorded at three locations around the quarry property boundary the permissible increase at properties around the quarry will be as shown in Table 4.4.

Table 4.4 GUIDELINES FOR INCREASES IN DUST DEPOSITION

Site	Annual Average Deposition for 1996 – 1997 (g/m ² /month)	Permissible increase in deposition (g/m ² /month)
1	1.90	2.0
2	1.76	2.0
3	2.62	2.0

ii. Dust Concentration

Concentration criteria for long-term annual averages and short-term 24 hour periods were considered. Two size ranges were also addressed: total solid particulate matter (TSP) or particles less than 50 microns (one millionth of a metre) and particles smaller than 10 microns (PM₁₀).

PM₁₀ particle concentrations are of interest because they can reach the lower parts of the respiratory system and may have health as well as amenity impacts. Most PM₁₀ particles are caused by combustion from motor vehicles, bushfires and industrial processes. Some PM₁₀ particles are generated by evaporation of sea spray and from vegetation. Most quarrying dust consists of coarser particles which have amenity rather than health effects.

The assessment criteria are as follows.

a. Short-term Criteria

Based on United States Environmental Protection Agency (USEPA) standards, the NSW EPA adopts a 24 hour concentration criterion of $150 \mu\text{g}/\text{m}^3$ for PM_{10} which should not be exceeded more than once per year.

b. Long-term Criteria

The National Health and Medical Research Council of Australia (NHMRC) recommends a maximum annual concentration of $90 \mu\text{g}/\text{m}^3$ total suspended particulate in a residential environment, which is referred to in the absence of a more suitable standard. For particles smaller than 10 microns, the NSW EPA adopts the USEPA PM_{10} standard of $50 \mu\text{g}/\text{m}^3$ annual average.

4.4.2 Dust Dispersion Modelling

The ISC dispersion model was chosen to predict dust deposition rates and airborne concentrations of respirable (PM_{10}) and inhalable (TSP) dust resulting from dust emissions. Calculated dust deposition rates were compared against available monitored data in the locality to validate the model's result. No measured values were available for TSP and PM_{10} concentrations in the locality.

Based on the verified model, levels of dust deposition and dust concentrations were predicted. Air quality impacts due to proposed quarry operations were determined by comparing the predicted levels with relevant criteria.

The amount of dust generated has been calculated by applying emission factors for the various processes. Emission factors have been obtained from published data by the former State Pollution Control Commission of New South Wales (SPCC), now the NSW EPA. Emission factors for activities not listed in the SPCC report were taken from United States Environment Protection Agency (USEPA) studies.

4.4.3 Dust Impact Assessment

Stage 2 development has not been modelled separately because it is in effect an intermediate stage between 1 and 3. Stage 1 has been modelled as the westernmost point of extraction, and Stage 3 has been modelled as the eastern and northern most point of extraction, with emissions from the pit originating closer to the surface than during Stage 4. It was necessary to model Stage 4 because of the increase in haulage emissions (approximately $5,000 \text{ kg/yr}$ more than Stage 3).

All of the regular quarry activities have been included in the model. Emissions relating to blasting and drilling have not been included due to the short duration of impacts and their episodic nature.

Contours of the highest 24 hour PM_{10} dust concentrations due to quarry operations (excluding drilling and blasting) are shown in *Figures 4.6 to 4.9*. Contours of averaging periods longer than this are not supplied due to the relatively lower impacts of the longer term (ie. annual) averaging periods. TSP 24 hour contours are not provided, as there are no applicable criteria for TSP over short-term averaging periods.

4.4.4 Discussion

i. Dust Deposition

The concentrations of dust deposition predicted by the model for Stages 1,3 and 4 show that concentrations will not significantly change. Dust deposition will not exceed EPA criteria under the conditions modelled. All discrete receptors will have a maximum increase of less than $1.1 \text{ kg/m}^2/\text{month}$, well below guideline criteria for air quality amenity, $2 \text{ g/m}^2/\text{month}$.

ii. Dust Concentration Due To Normal Quarry Operations

a. PM_{10}

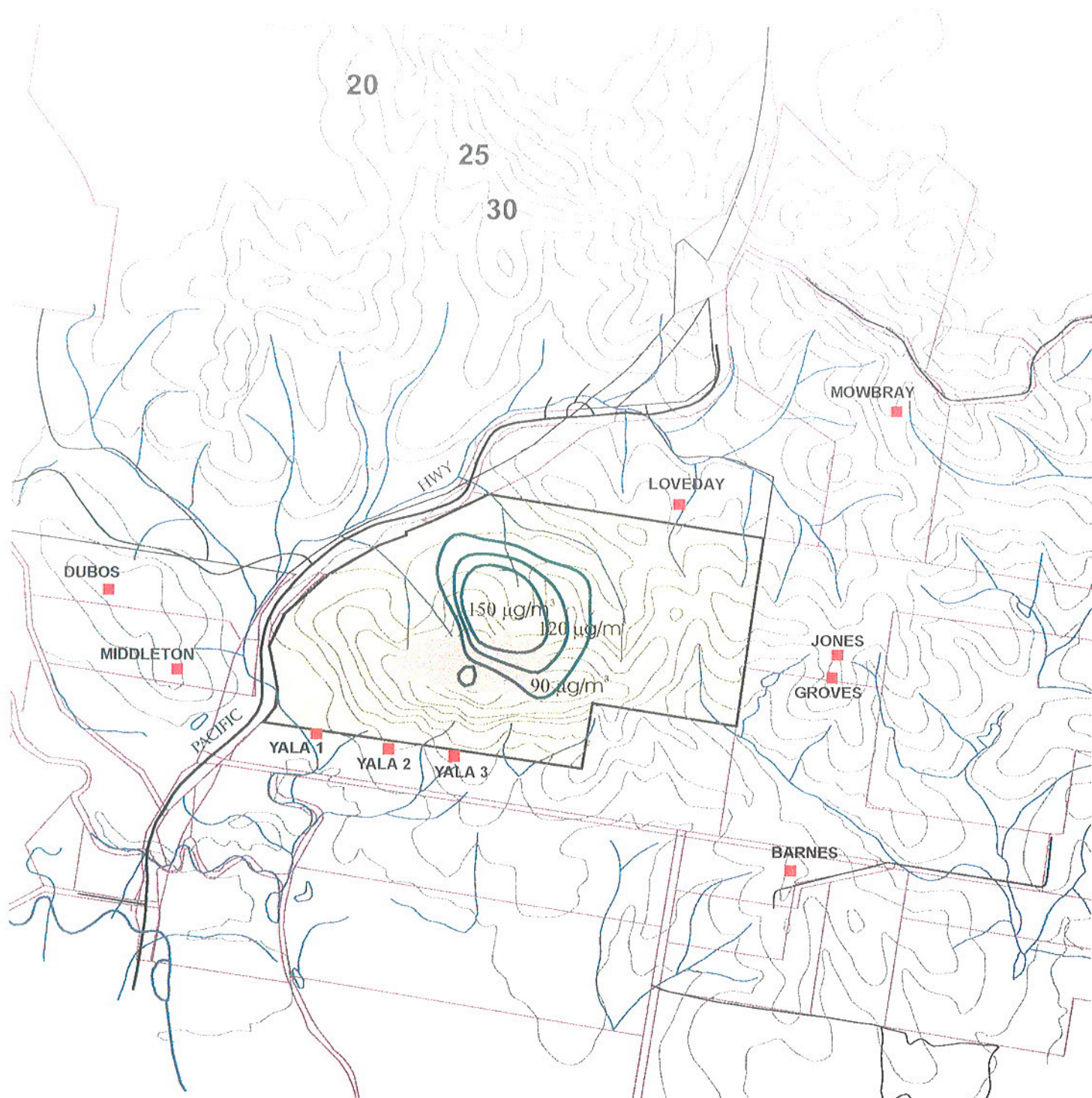
☐ 24 hour Average

Modelled PM_{10} concentrations are highest at the nearest residence to the south ($69.76 \mu\text{g}/\text{m}^3$), still well below the NSW EPA adopted USEPA guideline level of $150 \mu\text{g}/\text{m}^3$ for a 24 hour concentration.

The concentrations predicted at discrete receptors for all stages are primarily due to area emissions which do not emanate from the actual quarry pit.

☐ Annual Average

Modelled PM_{10} concentrations taken as an annual average are also well below the NSW EPA adopted USEPA criteria of $50 \mu\text{g}/\text{m}^3$. The highest concentrations calculated at the nearest residence to the south were below $2 \mu\text{g}/\text{m}^3$. It is not expected that impacts from the proposed increase in quarry area will have a significant effect on amenity or health relating to PM_{10} dust concentrations.



■ RESIDENCE/NOISE RECEPTOR

□ CSR PROPERTY BOUNDARY

150 µg/m³ PM₁₀ DUST CONTOUR

□ CADASTRAL BOUNDARIES

□ STAGE 1 QUARRYING

SOURCE: CMA 1:25,000 TOPO NABIAK SHEET

57106/38070 APP 5-4.7.dwt1.CDR



Figure 4.7

MAXIMUM 24 HOUR PM₁₀ DUST CONTOURS -
STAGE 1 QUARRYING





■ RESIDENCE/NOISE RECEPTOR

□ CSR PROPERTY BOUNDARY

150 µg/m³ PM₁₀ DUST CONTOUR

▤ CADASTRAL BOUNDARIES

STAGE 3 QUARRYING

SOURCE: CMA 1:25,000 TOPO NABIAK SHEET

57106380704PP54.8dcs43.CDR



Figure 4.8

MAXIMUM 24 HOUR PM₁₀ DUST CONTOURS -
STAGE 3 QUARRYING





■ RESIDENCE/NOISE RECEPTOR

150 µg/m³ PM₁₀ DUST CONTOUR

CSR PROPERTY BOUNDARY

CADASTRAL BOUNDARIES

STAGE 4 QUARRYING

SOURCE: CMA 1:25,000 TOPO NABLAC SHEET

5710638070A.PP/54.94444 CDR



Figure 4.9

MAXIMUM 24 HOUR PM₁₀ DUST CONTOURS -
STAGE 4 QUARRYING



0 400m

b. Total Suspended Particulate

For total suspended particulate (TSP) the NSW EPA adopt only an annual criteria being the National Health and Medical Research Council's recommended maximum annual concentration of 90 $\mu\text{g}/\text{m}^3$. The predicted concentrations for TSP between each of the proposed quarry stages also do not vary significantly and are well below this criteria. As for PM_{10} the highest concentrations calculated were at the nearest residence to the south (less than 3.2 $\mu\text{g}/\text{m}^3$). It is not expected that impacts from the proposed increase in quarry area will have a significant effect on amenity or health relating to TSP dust concentrations.

iii. Episodic Impacts

Episodic impacts relate to drilling and blasting as emission sources. Due to their nature it is difficult to accurately assess their impact with the ISC model. These impacts relate only to emissions which will typically occur around once or twice a month.

Impacts from drilling and blasting can be reduced through standard blasting and drilling mitigation measures as outlined below and implementation of CSR's guidelines '*Drilling and Blasting Procedures for Jandra Quarry*' provided as *Appendix H*. Primarily, it is important to consider the meteorological conditions, in particular wind speed and direction and any inversion layer before conducting drilling and blasting. Consideration must be made with all available meteorological information before each session occurs. Particular attention is required when blasting near the southern and eastern extent of the quarry where blast locations are close to the property border and some nearby residences.

Depending on the meteorological conditions at the time of the blast, the volume of dust emanated may settle in the surrounding area in a very short time, travel via 'plug flow' downwind or in high wind conditions may be dispersed rapidly. As the duration of the blast is extremely short, these factors can be assessed on-site and significant impacts off-site can be avoided.

As a precursor to minimising the impact of the dust generated, drill rigs are fitted with dust extractors and blast holes can be capped with stemming, which restricts the upward emission of dust. In addition, shot rock is moistened by water sprays prior to loading into dump trucks.

Therefore, as long as standard drilling and blasting practices are followed it is anticipated that blasting and drilling will not have a significant impact on dust levels at nearby residences.

4.4.5 Odour Assessment

i. Odour Sources

It is anticipated that most activities at the quarry will not produce odours that may have off-site effects. This is because of the relatively low concentrations of odour produced combined with the large area for dispersion to occur. The exception to this is the asphalt plant, which has the potential to cause off-site effects.

ii. Asphalt Plant

A mobile asphalt plant is to be located on-site on an as needs basis, based on market demand. The plant will be capable of producing approximately 100 to 200 tonnes an hour. Air emissions from the asphalt plant will be directed through a wet scrubber to remove both particulate and odour emissions. The plant will be fitted with a wet scrubber flow meter with an audible and visual alarm. Lime or flyash will be contained in a filler silo reducing the potential for fugitive air emissions from these process inputs.

The process of producing hot mix asphalt involves drying and heating the aggregate before addition of the bitumen. The drying process involves the aggregate moving through a rotating, slightly inclined, direct fired drum drier. After drying the aggregate is generally heated to temperatures ranging from 150°C - 200°C and then coated with bitumen. Odour emissions from this process are associated with volatile organic compounds (VOC's) from the bitumen.

A number of process modifications such as drum rearrangement, adjustment of the asphalt injection point and optimising the combustion process will reduce the VOC's and therefore odour.

Fugitive VOC emissions from the asphalt tanks will be routed back to the combustion unit which will serve as an afterburner reducing the concentration of fugitive VOC's to atmosphere.

In addition to these mitigation measures, the exhaust stack will ensure that adequate dispersion of the emission plume takes place. It is expected that with the distance to the nearest receptor from the proposed asphalt plant site being approximately 600 metres, adequate dispersion will occur. Plume dispersion will be enhanced by the heavily vegetated nature of the area.

Plume dispersion in conjunction with the appropriate control technologies will ensure that odour emissions from the asphalt plant will not have a significant impact on nearby discrete receptors.

4.4.6 Mitigation Measures

As part of CSR's standard quarrying practices mitigation measures are conducted during daily activities. These have been developed through CSR's long association with quarrying. Mitigation measures to control air quality at the quarry include:

- monitoring of dust deposition on property boundaries to verify dust deposition rates and monitor the effectiveness of control procedures;
- regular watering of haul roads and stockpiles;
- limiting speeds of vehicles on unsealed surfaces to 40 kph;
- minimising vehicle kilometres travelled on unpaved roads;
- rehabilitating disturbed areas;
- where practical/possible conduct drilling and blasting during suitable meteorological conditions (ie. not during high winds or temperature inversions);
- adequate stemming of drill holes;
- dust extraction units on drill rigs and crushing and screening plants to be well maintained;
- seals and mist sprays on crushing and screening plant to be well maintained;
- dust displaced during silo filling to be controlled by an appropriate filter (i.e. a reverse pulse silo filling filter or equivalent);
- wet scrubber on asphalt plant to be maintained regularly including the regular servicing of the recycling interceptor trap; and
- stack emissions from the asphalt plant to be monitored for:
 - VOCs;
 - semi VOCs;
 - CH₄, H₂, N₂, CO, CO₂ and O₂;
 - particulate;
 - Stack gas moisture, velocity and temperature; and
 - mass flow rate of exhaust gases, water, particulates, N₂, CO, CO₂ & O₂.

4.5 BUSHFIRE

4.5.1 Methodology

The Department of Bushfire Services approach in *Planning for Bushfire Protection* (1992) considers both basic risks and additional factors related to human intervention, including:

- (i) *Are bushfires known to occur in the area and if so, to what size and extent?*
- (ii) *Do the shrubs and grasses that form the understorey of the vegetation communities and hence the fuel bed, regularly dry out and burn readily?*
- (iii) *Is the vegetation pattern such that extensive (rather than localised) native forests, woodlands or grasslands are found in the area (i.e. is it continuous?);*
- (iv) *Are any gaps in native vegetation filled with pine plantations or crops? Will these crops burn in the bushfire season? If so, with more or less intensity and with greater or lesser resistance to control than the native vegetation they have replaced?*
- (v) *Has recent development had little effect on the existing bushfire pattern?*
- (vi) *Where the general fuel loadings are low or locally discontinuous, are aspect and slope likely to worsen the behaviour of any resultant bushfire? (DBS 1991).*

This method does not attempt to assign degrees of risk, rather it directs emphasis towards the overall effect of fire behaviour and site characteristics.

4.5.2 Risk Assessment

The multi-factorial approach described above has been used to determine the risk to bushfire of the proposed quarry operations. Information relating to fire history and characteristics of the area have been obtained from Council's Fire Control Officer.

The relevant factors under the multi-factorial approach are discussed below:

i. Bushfire History

During typical bushfire weather, winds with a coastal influence cause the most problems. These are typically north-easterly and south-westerly winds. The study area is largely protected from these winds as a result of the ridges that exist on-site.

There is ample evidence of periodic, but apparently not severe, past bush fires in the area of the quarry (Davies, 1984). Timber cover removal as a pre-requisite to quarry operations should lessen the intensity of any wild fire entering from adjoining areas.

Known ignition sources in the region include private agricultural land to the south and east, as well as the Pacific Highway to the west where fires escape into the timbered parts of the area. The temporary asphalt plant is the only potential ignition source in the area of the quarry itself. The asphalt plant will be located on a cleared hardstand pad within the site facilities area.

Accessibility to the timbered areas surrounding the study area is good, with access to the quarry able to be gained from at least three points from the Pacific Highway. There are a high number of roads and tracks within the perimeter of the quarry property which could be used for emergency fire purposes.

ii. Vegetation

The vegetation of the study area and surrounding properties consists of dry open (sclerophyll) forest. To the south, south-east, south-west and north-east lies cleared agricultural land. Extensive forest areas lie to the north-west, with fragmented forests occurring to the north, south and east.

Within the forested communities of the study area, the dominant plant species in the overstorey are spotted gum (*Corymbia maculata*), white mahogany (*Eucalyptus acmenoides*), broad-leaved white mahogany (*E. umbra*), tallowwood (*E. microcorys*), and grey gum (*E. propinqua*). Within the mid and under storey, forest she-oak (*Allocasuarina torulosa*), Acacia species, spurge (*Phyllanthus gunnii*), narrow leaved geebung (*Persoonia linearis*), lantana (*Lantana camara*) and blackberry (*Rubus hillii*) are common species. Whisky grass (*Andropogon virginicus*) and kangaroo grass (*Themeda australis*) are a common ground cover species.

iii. Surrounding Land Uses

The study area forms a remnant of bushland which has been highly fragmented as a result of clearing for forestry and agricultural purposes as well as the construction of the old and new sections of the Pacific Highway. The overall fragmented nature of the locality has reduced the bushfire risk of the study area. However, the close proximity of a large contiguous tract of native vegetation to the north-west (Kiwarrak State Forest) poses a potential external risk of fire to the quarry.

4.5.3 Bushfire Hazard and Mitigation Measures

The discontinuous nature of native vegetation surrounding the study area, particularly the cleared agricultural land to the south and east has reduced the bushfire risk. Good access to the site, the presence of numerous water supply dams on site and the low history of bushfires in the immediate area indicate that the area is of relatively low risk to bushfire.

The dams located in the quarry working areas will provide a source of water to fight bushfire in the locality. In addition, the dust suppression water cart and other pumping systems could be used to prevent the spreading of fire from quarry working areas to surrounding bushland, if necessary.

No additional mitigation measures are considered necessary to protect surrounding bushland or the quarry from the occurrence of bushfires.

JANDRA QUARRY E X T E N S I O N



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SOLUTIONS

5 INTERACTIONS WITH THE BIOLOGICAL
ENVIRONMENT

INTERACTIONS WITH THE BIOLOGICAL ENVIRONMENT

5.1 INTRODUCTION

Ecological investigations undertaken as part of this EIS involved review of relevant literature, search of applicable National Parks and Wildlife Service databases and field surveys. Ecological investigations aimed to map and describe flora, fauna and fauna habitat existing on the site and to identify the likelihood of any threatened species occurring on the site. From this an assessment of potential impacts has been undertaken and mitigation measures have been recommended.

Methodology and results of ecological investigations are provided below and detailed in *Appendix I*.

5.2 METHODOLOGY

Field investigations were conducted on 19 and 20 January and on 11 March, 1999. The weather conditions experienced were favourable for the undertaking of the survey, being mild to warm with little wind and no rain. Field surveys were undertaken for flora, fauna habitats and terrestrial and aquatic fauna species. A further flora survey was undertaken in early spring (20 September 1999) to enable identification of additional species during flowering.

5.2.1 Flora

The random meander technique was used for qualitative flora field surveys. This technique involved walking in a random manner through the study area to identify and classify plant species, vegetation communities and habitats. Targeted searches were also made for significant flora species potentially occurring on the site. The conservation status of all identified communities was determined.

5.2.2 Fauna Habitats

Field investigations were undertaken to identify the type and quality of fauna habitats occurring within the study area. Assessment of habitat suitability was based on a qualitative assessment of the following factors:

- dominant vegetation type;
- structural vegetation characteristics;
- presence and abundance of hollow-bearing trees;
- level of disturbance;
- density of ground litter; and
- presence of standing or flowing water.

The field survey included a search for the presence of potential and core koala habitat as defined in State Environmental Planning Policy No. 44 - Koala Habitat Protection, described below.

i. SEPP 44 - Koala Habitat Protection

The field survey included a search for the presence of '*potential koala habitat*' and '*core koala habitat*' as defined in State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44). In SEPP 44 '*potential koala habitat*' is defined as '*areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15 percent of the total number of trees in the upper or lower strata of the tree component*'. In addition to tree species listed in Schedule 2 it is also necessary to consider tree species that are recognised to be locally significant as feeding resources to koalas. For the purpose of this study the locally preferred koala food trees included the primary koala food trees identified in Evans and Fitzpatrick (1996).

The methodology used for detecting '*potential koala habitat*' was based on that used by the Australian Koala Foundation, described in *Appendix 1.* If '*potential koala habitat*' was identified then further investigations were conducted to assess the presence of '*core koala habitat*'.

In SEPP 44 '*core koala habitat*' means '*an area of land with a resident population of koalas evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*'. Further investigations to assess the presence of '*core koala habitat*' consisted of searching each potential koala food tree for koalas, koala scratches and scats within two metres of each tree bole. In addition,

scats and scratch marks were also searched for while undertaking other fieldwork activities.

5.2.3 Terrestrial Fauna

Field surveys were undertaken to identify fauna species occurring on the site and determine their distribution and abundance. The following methods were used:

- ❑ spotlighting to determine the assemblage of arboreal mammals occupying the site;
- ❑ avifaunal surveys to detect key diurnal bird species;
- ❑ anabat detection to detect key bat species;
- ❑ hairtube sampling;
- ❑ amphibian and reptile surveys; and
- ❑ opportunistic fauna surveys during flora surveys including searches for evidence of mammals, birds reptiles and amphibians;

5.2.4 Aquatic Fauna

The impact of the proposed development on aquatic habitats is regarded as minor because it would not:

- ❑ create barriers to fish passage;
- ❑ significantly change physical properties of water;
- ❑ have chemical effects on water quality; or
- ❑ have biological effects on the aquatic environment, such as the introduction of new species.

As a consequence of the expected low impact of the proposed development, field surveys of aquatic fauna were limited to descriptive assessment of the habitats available at each potential impact site. Habitat components documented during the field survey include:

- ❑ type of waterbody (permanent or ephemeral);
- ❑ presence of a pool/riffle sequence;

- ❑ dominant substratum type (rock, gravel, silt, sand, organic material);
- ❑ abundance of snags;
- ❑ presence of and area of water surface covered by aquatic macrophytes;
- ❑ species of aquatic plants present;
- ❑ water depth range;
- ❑ width of waterbody;
- ❑ whether the stream was flowing or not; and
- ❑ presence of deep pools.

The ephemeral watercourses occurring in the study area were then graded to assess the availability of fish habitat.

5.3 RESULTS

5.3.1 Flora

Based on structural characteristics and floristic composition, two plant communities were identified within the study area, as described below. A full list of plant species identified in the study area is provided in *Appendix L*. No flora species of conservation significance were recorded during the ecological investigations. The extent and distribution of each vegetation community is illustrated in *Figure 5.1*.

The flora survey was as comprehensive as possible, however due to seasonality, some plant species could not be identified due to a lack of flowering or fruiting bodies. Therefore, the species list is unlikely to be exhaustive.

i. Corymbia maculata/Eucalyptus acmenoides very tall open forest

This is the dominant plant community in the study area, extending from the ridgetop to the midslope on all aspects. A full description of this plant community is provided in *Appendix L*.

This community is dissected by a number of tracks and roads. It appears to have been extensively logged in the past and possibly subject to recent fires. Weed species including lantana, prickly pear, wild tobacco bush, blackberry and scotch thistle are relatively common. A number of garden varieties of trees have been



Figure 5.1 DISTRIBUTION AND EXTENT OF VEGETATION COMMUNITIES WITHIN THE STUDY AREA

planted on the periphery of this community including jacaranda, frangipani and pine trees. This plant community within the study area is in relatively poor condition, and is unlikely to be worthy of conservation due to previous disturbances.

In terms of conservation significance, this forest type is considered to be widespread throughout the coastal districts of NSW (Forestry Commission of NSW, 1989) but poorly conserved in the north coast region. Extensive forest areas have been added to the NPWS estate since 1994. An accurate assessment of the plant community's conservation status cannot be determined until the representativeness of this plant community in new reserve areas has been determined.

ii. *Eucalyptus acmenoides*/*E. umbra*/*E. microcorys* very tall open forest;

This open forest type occurs predominantly on the sheltered lower slopes and valley in the study area. A full description of this plant community is provided in *Appendix L*. This community is dissected by a number of tracks and roads. Limited evidence exists of recent low intensity burning. Weeds species are common and include bracken fern, purple top, fireweed and balloon cotton plant.

In terms of conservation significance, this forest type resembles State Forest Type No. 60, which is found in the North Coast and Central Coast regions (Forestry Commission of NSW, 1989), but is inadequately conserved throughout its range. Extensive forest areas have been added to the NPWS estate since 1994. Hence an accurate assessment of the plant community's conservation status cannot be determined at this stage.

iii. *Grassland*

The extent of this vegetation community is limited to the powerline easement and the edges of access roads and the area in the south-east portion of the site. The community is dominated by a variety of native and introduced grasses, including wallaby grass, kangaroo grass and whisky grass. It is in a state of disclimax due to previous clearing activities and regular maintenance slashing. Therefore, it is considered to have low conservation value.

5.3.2 *Fauna Habitat*

Four main terrestrial habitat types were found within the study area. These consist of dry open forest, moist open forest, aquatic habitats (dams) and grassland. Each of these habitat types are described in *Appendix L* according to their habitat elements and degree of naturalness.

i. Dry Open Forest

Vegetation communities comprise *Corymbia maculata*/*Eucalyptus acmenoides* very tall open forest. The *Eucalyptus* and *Corymbia* species in the canopy of this habitat type, as well as the *Acacia* species in the understorey would provide a seasonal resource of flowers for nectivorous fauna. The results of the SEPP 44 investigation indicate that there are few suitable foraging resources for koalas in this habitat type. The presence of *Allocasuarina* species may provide a suitable food resource for glossy black cockatoos, although no signs of feeding by this species were observed.

The study area contains a moderate abundance of leaf litter that may provide suitable shelter for reptiles, as well as suitable foraging habitat for ground-dwelling birds. Rocks and fallen logs are sparse in this habitat type, hence there are minimal sheltering resources for small ground-dwelling mammals and reptiles. The sparse understorey strata would provide limited suitable habitat for small passerine birds. Mature trees with hollows are generally absent, hence there is limited roosting habitat for large hollow-roosting avifauna and arboreal mammals. Nevertheless, the presence of small hollows and decorticated bark may provide suitable roosting resources for microchiropteran bats, small hollow-roosting avifauna and arboreal mammals able to utilise small hollows (e.g. squirrel gliders, sugar gliders and eastern pygmy-possums). There is unlikely to be any suitable foraging or breeding resources in this habitat type for amphibians due to a lack of permanent or ephemeral waterbodies in the vicinity.

This habitat type has been disturbed by previous logging and quarrying practices. Access tracks associated with the powerline and residential dwellings along the ridgeline are common within this habitat type. Weeds are common throughout.

ii. Moist Open Forest

Vegetation communities comprise *Eucalyptus acmenoides*/*E. umbra*/*E. microcorys* very tall open forest

The *Eucalyptus*, *Syncarpia*, *Lophostemon*, *Melaleuca* and *Callistemon* species in the canopy and midstorey of this habitat type would provide a seasonal resource of flowers for nectivorous fauna. The SEPP 44 investigation revealed some areas of potential koala habitat within this habitat type. However, despite a thorough search for scats and scratches, there was no evidence of this species' presence in the study area.

This habitat type contains a moderate abundance of leaf litter that may provide suitable shelter for amphibians and reptiles, as well as suitable foraging habitat for ground-dwelling birds. There is a moderate abundance of small to medium sized

fallen logs that may provide suitable shelter for small ground-dwelling mammals and reptiles. The sparse understorey vegetation would provide limited suitable habitat for small passerine birds. Mature trees with hollows are generally absent, however, the presence of small hollows and decorticated bark may provide suitable roosting resources for microchiropteran bats, small hollow-roosting avifauna and arboreal mammals able to utilise small hollows (e.g. squirrel gliders, sugar gliders and eastern pygmy-possums). There are two ephemeral drainage lines that run through this habitat type that would provide suitable foraging and breeding habitat for several amphibian species.

This habitat has been impacted on previously by logging practices and road construction activities. One of the ephemeral creeks has been dammed. Past logging has resulted in canopy thinning and reduction in the density and abundance of hollow logs. Weeds are common on the forest fringe.

iii. Aquatic Habitats

Of the five main dams within the study area, two contain abundant emergent and floating vegetation that provide suitable habitat for a variety of amphibian species. These dams may also provide suitable foraging habitat for a variety of waterbird species.

Ephemeral drainage lines were investigated for potential aquatic fauna habitat. It was found that the ephemeral drainage lines on the southern side of the ridgeline represent only minimal fish habitat, while the two ephemeral drainage lines in the northern section of the study area could potentially represent intermittent fish habitat. However, only the drainage line in the north-eastern section of the study area appears to retain pools along the watercourse for any sustained time period. These pools could also provide suitable breeding and foraging habitat for amphibian species. The rocky substrate within the ephemeral drainage lines may also provide suitable shelter for a variety of reptile and amphibian species. The results of the aquatic habitat assessment are provided in *Appendix L*.

5.3.3 SEPP 44 - Koala Habitat Survey

The koala habitat assessment results indicate that the moist open forest habitat in the study area contains '*potential koala habitat*' as outlined by Clause 7 of SEPP 44. This is based on the percentage of koala food trees found in the upper and lower canopy as detailed in *Appendix L*.

Although the study area contains areas of '*potential koala habitat*' under SEPP 44, no koala scats were found during fieldwork exercises. No scratches resembling those of

koalas were identified. Evidence from the fieldwork undertaken for the core koala habitat assessment indicates that the study area does not contain 'core koala habitat'. Nevertheless, koalas have been recorded within five kilometres of the study area in Kiwarra State Forest.

5.3.4 Terrestrial Fauna

Table 5.1 provides terrestrial fauna species that were identified through field surveys.

Table 5.1 TERRESTRIAL FAUNA SURVEY RESULTS

Method	Native Species Found	Significance of Native Species
Spotlighting	<ul style="list-style-type: none"> • common brush-tailed possum • common ringtail possum • grey headed flying fox • fox (feral species) • cat (feral species) 	common ¹
Avifaunal Surveys	<ul style="list-style-type: none"> • 31 species - see <i>Appendix L</i> 	no species of conservation significance recorded
Bat Detection	<ul style="list-style-type: none"> • gould's wattled bat • chocolate wattled bat • eastern broadnosed bat • <i>Vespadelus</i> sp. • eastern falsistrelle 	eastern falsistrelle is vulnerable on Schedule 2 of the TSC Act
Hairtube Sampling	<ul style="list-style-type: none"> • common brushtail possum 	common ¹
Amphibian Survey	<ul style="list-style-type: none"> • 9 species - see <i>Appendix L</i> 	common ¹
Reptile Survey	<ul style="list-style-type: none"> • lace monitor • skinks • eastern brown snake² • red-bellied black snake² 	common ¹

Notes: 1. Species not listed on the schedules of the TSC Act
2. Anecdotal evidence only through discussions with site manager

5.3.5 Threatened Species

The eastern falsistrelle (*Falsistrellus tasmaniensis*) was the only threatened species recorded (tentatively) during the field surveys, as shown in *Table 5.1*. In addition, potential habitat exists within the study area for a variety of threatened species. *Appendix L* outlines the threatened species found to potentially occur in the study area based on the presence of suitable habitat and for some species previous records in the locality.

5.4 EIGHT PART TESTS

The Threatened Species Conservation Act 1995 (TSC Act) made substantial amendments to the EP&A Act. Section 5A of the EP&A Act sets out eight factors to be considered in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats.

A number of flora and fauna species have been considered in an Eight Part Test undertaken as part of this assessment. *Appendix L* sets out species considered and the results of eight part tests. Overall, it has been found that the extent of proposed habitat removal associated with proposed quarry development is unlikely to significantly impact on threatened species likely to occur on-site.

In regard to aquatic ecology, an Eight Part Test as defined in Section 5A of the EP&A Act was undertaken to assess the likelihood of significant impact on threatened fish species, populations or ecological communities or their habitats that may occur in the study area. Based on the eight factors considered, as set out in *Appendix L*, it is highly unlikely that the proposed development would cause any adverse effect on the threatened fish species, populations or habitats.

5.5 IMPACT ASSESSMENT

The proposed development may have a variety of direct impacts upon threatened flora and fauna that potentially occur in the study area. These impacts documented below include consideration of the cumulative and indirect impact and likely contribution of the proposal to the threatening processes acting on existing species in the locality. The impact assessment also takes into account existing impacts on the study area, particularly those arising from the existing quarry operations and other activities which have altered the composition of vegetation communities and fauna habitats and ultimately, the composition of flora and fauna within the study area. Further details are provided in *Appendix L*.

5.5.1 *Habitat Loss or Modification*

The direct effect of the quarry extension is the destruction and modification of wildlife habitats. Approximately 14 hectares of dry open forest and 2 hectares of moist open forest would be removed from the study area. Potential impacts of habitat modification and fragmentation on each terrestrial vertebrate class are discussed below.

i. Amphibians and Reptiles

The proposed quarry expansion would remove approximately eight hectares from the catchment area of Bungwahl Creek (ie. four hectares removed from the two northern ephemeral creeks) which is likely to be suitable habitat for amphibians. One small artificial dam within the existing quarry area which may be currently suitable habitat for amphibians would also be removed.

The proposed quarry extension is expected to cause rapid displacement of a variety of common reptile species within the 2 hectares of forest to be cleared for the asphalt plant and expanded stockpile area. Reptile species would also be progressively displaced from the remainder of the quarry expansion area over a 66 year period (minimum expected life span of the quarry).

ii. Avifauna

A relatively small loss of habitat for most bird species known to occur on the site is expected. Some small hollow resources would be lost for those bird species capable of using them. A relatively small extension of edge effect influences into previously unaffected forest areas may lead to changes in bird species composition by creating habitats that favour species capable of invading and colonising disturbed habitats (Goosem & Marsh, 1997; Laurance, 1997; Andrews, 1990).

iii. Non-flying Mammals

The proposed quarry extension would remove nectar resources for arboreal species, and tree and ground hollow resources for those species capable of using them. Very few large hollows would be removed.

The development is also likely to displace some small terrestrial mammal species with relatively small home ranges. However, proposed revegetation east of the study area would most likely provide some compensatory habitat for these species.

The encroachment of edge effects (degradation due to weeds, rubbish, sedimentation etc.) into previously undisturbed forest areas may cause permanent displacement of some forest species by more competitive edge specialist species. However, due to the current level of disturbance and open nature of the vegetation communities in the study area such effects are not expected to be significant.

iv. Megachiropteran and Microchiropteran Bats

All habitats within the study area are likely to represent foraging habitat for bats, particularly microchiropteran species. The proposed quarry extension has the potential to cause a slight reduction in foraging resources for open forest/woodland foragers.

The open forest types in the study area contain a moderate abundance of small tree hollows and bark shedding tree species. The proposed quarry extension would result in the loss of sheltering habitat for those species that utilise tree hollows and shedding bark for roosting purposes.

5.5.2 Interference with Fauna Movement

A potential wildlife corridor currently extends in a north to south direction between the existing quarry area and the semi-cleared farmland in the east of the study area. The proposed development would progressively remove a proportion of this potential wildlife corridor over a minimum 66 year period. Fauna movement between these areas would then be restricted to either semi-cleared vegetation east of the study area, or to a relatively long narrow strip of remnant vegetation between the quarry and the Pacific Highway.

Therefore, in order to minimise the loss of wildlife corridor function in this area, the strip of semi-cleared vegetation retained in the east of the study area would be revegetated (minimum width 220 metres). The first stage of the quarry expansion would be in the western portion of the subject site, hence the revegetation program would be at an advanced stage prior to the existing potential habitat corridor being reduced in size.

5.5.3 Road Strike

The roads within the existing quarry site are unlikely to have a significant impact on the major fauna groups due to the low speed of traffic using the roads and limited operating hours of the quarry. No new roads would be constructed within the study area. The following potential impacts associated with roads on-site have been identified:

- ❑ Bats and most bird species are highly mobile and can usually cross roads with minimal chance of injury from moving vehicles. The incidence of road strike is unlikely to significantly increase due to the proposal;
- ❑ A few bird mortalities could potentially result from individuals being attracted to additional food sources associated with the roads (e.g. seeding grasses) (Bennett, 1991);
- ❑ Arboreal mammal species that do not travel on the ground would still be capable of crossing roads in forests within the study area due to narrow road widths, retention of mature trees and limited hours of quarry operation resulting in no night traffic;
- ❑ High rates of amphibian mortality have been recorded when local populations are isolated from breeding sites by roads (Gibbs, 1998). The proposed quarry expansion would not result in further isolation of potential breeding sites within the study area; and
- ❑ Due to the low speed of quarry traffic and limited hours of operation very few medium to large terrestrial mammals are likely to be struck on the quarry roads.

5.5.4 Noise

Noise associated with the existing quarry operation, mainly from the use of machinery, may cause a significant reduction in habitat use and foraging times for feeding in the immediate vicinity of the quarry by shy individuals or species. The effects of noise on habitats further away are possibly of a more temporary nature due to species becoming habituated to background noises.

The proposed quarry expansion would result in increased noise levels due to the operation of machinery and blasting within previously undisturbed areas. However, such increases are unlikely to cause a significant disruption to the life cycle of any species utilising habitats within the study area as this area currently experiences noise impacts from the existing operations.

5.5.5 Water Quality

Quarry operations will meet the current EPA requirements for creek sediment loads. Consequently, no impact on aquatic ecosystems is anticipated from the proposed development.

Water quality monitoring results collected downstream of the quarry generally complies with EPA requirements. As part of the proposed quarry expansion, additional measures will be implemented to maintain required water quality standards. Proposed measures would include the construction of a sump in the floor of the quarry to catch all water from the quarry pit, an increase in the size (retention time) of the main sediment control dam and construction of an additional sediment control dam. Water overflows from the site will comply with current EPA requirements. No impacts associated with water overflows are anticipated.

5.6 MITIGATION MEASURES

The following mitigation measures have been developed to reduce potential impacts of the proposed development on flora, fauna and habitats.

i. General

- ❑ revegetation of the quarry which will be undertaken progressively wherever possible to minimise the impact of loss of habitat;
- ❑ speed limits of 40 kilometres per hour are to be imposed on internal roads;
- ❑ wildlife crossing signs are to be erected to alert drivers that fauna may be crossing the road;
- ❑ as part of the proposed development, the company is applying to extend general operating hours to 6.00 am to 6.00 p.m. Monday to Friday and 6.00 am to 3.00 p.m. on Saturdays. Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6.00 am and 9.00 p.m. Monday to Saturday. Operation should be limited to these hours to reduce impact on fauna;
- ❑ timed clearing will be implemented to reduce direct mortality of hollow-dependant fauna;
- ❑ to minimise the loss of existing wildlife corridor function, the strip of semi-cleared vegetation retained on the farmland in the east of the study area should be revegetated (approximate width 220 metres) as well as the relatively long narrow strip of remnant vegetation between the quarry and the Pacific Highway. A detailed description of the revegetation program would be provided in the site's Environmental Management Plan. The first stage of the quarry expansion would be in the western portion of the subject

site, hence the revegetation program in the east would be at an advanced stage prior to the potential habitat corridor being reduced in size;

- ❑ to maintain wildlife corridors, during revegetation suitable sheltering resources should be placed within the proposed revegetated corridor to encourage recolonisation by displaced individuals;
- ❑ habitat enhancement involving such measures as fencing off semi cleared areas undergoing revegetation, baiting programs for feral animals and the provision of nest boxes will be undertaken to increase the capacity of bushland remaining in the study area; and
- ❑ a monitoring program will be included in the quarry EMP to determine the effectiveness of mitigation measures and the suitability of revegetation techniques.

ii. Sediment Control

A series of mitigation measures to address sediment control would be implemented. These mitigation measures are detailed in section 3.10.3 and include:

- ❑ installation of erosion and sediment controls prior to any soil disturbance, including clean water diversion drains and sediment dams downstream of disturbed areas;
- ❑ installation of erosion and sediment controls around the overburden stockpile area; and
- ❑ the stockpiling of vegetation removed during construction activities for later use in erosion control and stabilisation of disturbed areas.

JANDRA QUARRY E X T E N S I O N



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6 INTERACTIONS WITH THE HUMAN
ENVIRONMENT

INTERACTIONS WITH THE HUMAN ENVIRONMENT

6.1 NOISE AND BLASTING

A noise and blasting impact assessment has been undertaken for the proposed quarry extension and provided as *Appendix M*. A summary of the assessment is provided below.

6.1.1 Noise Assessment Methodology

For the acoustic assessment undertaken as part of this EIS, the following study methodology was adopted:

- existing background levels were determined using continuous noise logging at three locations surrounding the quarry. Correlation of atmospheric parameters and measured noise levels was made using weather data from Taree Airport;
- equipment sound power data was obtained from measurements of existing or similar equipment used at the quarry. This allowed predictive noise modelling;
- noise level modelling was undertaken for existing operations and proposed development Stage 1 and Stage 3 with equipment located in the worst case scenario locations and operated simultaneously at maximum power. The EPA approval Environmental Noise Model (ENM) was used. Topographical information was used to prepare noise contours around the quarry and single point calculations at the ten nearest residences to the quarry;
- weather data supplied from the Bureau of Meteorology for Taree Radio Station 2RE was used to assess general wind characteristics of the area and noise levels under adverse weather conditions; and
- predicted noise levels were compared to EPA noise criteria, specifically the "intrusiveness criterion" set out in the Environmental Noise Control Manual (EPA, 1994) and Draft Stationary Noise Source Policy (EPA, 1998).

EPA guidelines were followed in all stages of the acoustical assessment. Assessment of temperature inversions was not undertaken as no night time operations are proposed.

Traffic noise due to quarry transport trucks, staff vehicles and other site traffic was not assessed as the quarry directly accesses the Pacific Highway which carries significantly higher volumes of heavy and light vehicle traffic. The access road is not utilised by the public and does not pass close to any residence not associated with the quarry.

6.1.2 Noise Criteria

i. Neutral Atmospheric Conditions

Noise emissions from the proposed development are compared to criteria determined using the Environment Protection Authority's *Environmental Noise Control Manual* (ENCM) (EPA, 1994). Criteria described in the Environment Protection Authority's recently-released Draft Stationary Noise Source Policy (EPA, 1998) are also considered.

The EPA lists objectives for environmental noise in its Environmental Noise Control Manual (EPA, 1994). These are that:

- noise from any single source should not intrude greatly above the prevailing background noise level, generally by more than 5 dB; and
- background noise should not exceed an appropriate level for the particular locality and land use. Similarly, the Draft Policy discusses maintaining noise level amenity in the long-term.

The "intrusiveness criterion" is designed to achieve the first objective, and is expressed as:

$$L_{A10,15\text{minute}} \leq (*L_{90}) + 5$$

where $L_{A10,15\text{minute}}$ is the L_{10} noise level from the source, measured over a 15-minute period and $*L_{90}$ is the minimum repeatable background level.

To satisfy the second EPA objective, background noise levels should be kept within the "maximum acceptable" noise levels suggested in the EPA's Environmental Noise Control Manual. For residences in a rural area these are a night-time background noise level of 35 dB(A) and a daytime level of 45 dB(A).

Similarly, the Draft Policy (EPA, 1998) states that total L_{eq} noise levels from stationary sources should be kept within the "amenity criteria". For residences in a rural area these are L_{eq} levels of 50, 45 and 40 dB(A) for day, evening and night periods respectively.

ii. Adverse Weather Conditions

The "intrusiveness" noise criterion has traditionally been applied under still-isothermal (SI) conditions. Experience indicates that if the criterion is met under these conditions, noise under more adverse conditions is generally (but not always) acceptable.

Experience in similar rural areas such as the Hunter Valley, demonstrates that people become more noise sensitive if night-time noise levels exceed about 40 dB(A) on a regular basis. This is 5 dB above the level which would be set as a noise criterion under SI atmospheric conditions. Hence, one possible formulation for additional criteria would be that noise should not exceed the SI criterion by more than 5 dB on more than ten per cent of occasions throughout a year. This goal would relate to all meteorological conditions.

For this proposal, the following procedure has been used to provide an assessment under the complete range of meteorological conditions, which supplements the assessment under SI conditions:

- an additional "intrusiveness" criterion is used, that under prevailing meteorological conditions, noise levels should not exceed the standard intrusiveness criterion by more than 5 dB(A) for more than 10 per cent of the operating period during a year; and
- additional calculations are performed to define the probability of occurrence of various noise levels accounting for the range of wind speeds and wind directions (and the interactions between these parameters) which are found at the site.

The production of "tenth percentile" noise levels involves detailed and complex noise level calculations. However, this level of detail of the likely noise environment provides regulatory bodies and residents with a more comprehensive and representative understanding of the extent and level of potential noise impacts from the development. This assessment describes the range of noise levels at each potentially affected residence under prevailing meteorological conditions, as well as graphically indicating the tenth percentile noise level.

Using the probability of occurrence of wind speed and wind direction requires more calculation than would a procedure involving a single set of meteorological parameters. This method of assessment represents best available technology and is among the most comprehensive methods to estimate actual noise levels received at a receptor as a percentage of time accounting for atmospheric effects.

6.1.3 Noise Results

i. Adopted Noise Criteria for Jandra Quarry Operations

Results of background noise measurements and adopted intrusiveness criteria are shown in Table 6.1.

Table 6.1 BACKGROUND NOISE LEVELS AND INTRUSIVENESS CRITERIA			
	Location	Minimum Repeatable	"Intrusiveness" Noise
		L ₉₀	Criteria, L ₁₀
		dB(A)	dB(A)
	YALA 3	37.0	42.0
	Loveday	36.8	41.8
	Jones	35.0	40.0

ii. Neutral Atmospheric Conditions

Results of modelling, provided in *Appendix M*, indicate that there are no exceedences of the adopted intrusiveness noise criteria at any residence during any stage of the quarry development. This is due to natural topographic shielding and distance attenuation.

Operations during the existing operations and Stages 1 and 3 of the proposed development represent worst case noise exposures for surrounding residences. Noise calculations were not performed for Stage 4 as this stage is primarily the lowering of the pit floor that will increase barrier attenuation for workface equipment. Stage 2 was also not modelled because in Stage 3, equipment is located at the most eastern extremity of extraction resulting in worst case noise exposures for residence to the east.

L₁₀ noise contours (noise level which is exceeded for 10 percent of the time and is approximately the average of maximum noise levels) for existing operations and for Stage 1 and 3 have been calculated. These are mapped in *Figure 6.1*, *Figure 6.2* and *Figure 6.3*.

iii. *Adverse Atmospheric Conditions*

Modelling of noise levels with wind data supplied by the Bureau of Meteorology was used to determine the percentage of time that a given noise level is exceeded. Calculations were based on neighbouring residences. Modelling was undertaken only for existing operations, Stage 1 and Stage 3 development for the reasons outlined above. Results are outlined below and provided graphically in *Appendix M*.

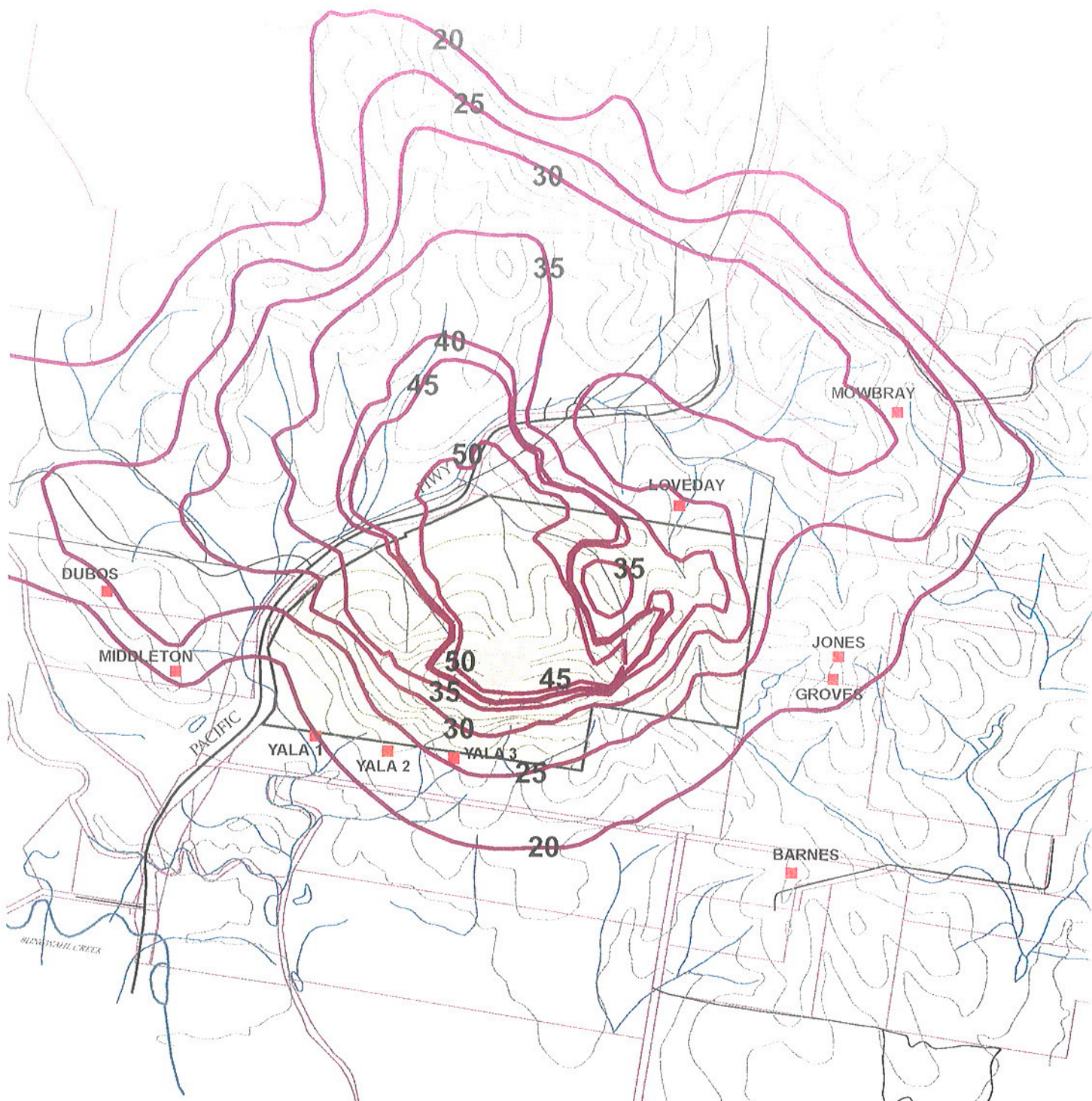
- existing noise levels are within the EPA criteria of 10 percent of the time;
- noise levels for Stage 1 are within the criteria with no exceedences of the adopted criteria at the 10 percent of the time level at any residence; and
- noise levels for Stage 3 exceed the criteria level by two dB(A) at two residences located east of the site for the worst case scenario modelled;

In regard to equipment use during Stage 3, analysis of the relative contribution to total noise indicates that the D8 dozer removing topsoil is dominant. The dozer is used periodically and is not permanently on-site. Removal of the dozer from modelling results in noise levels in compliance at all stages. Use of the dozer will therefore need to be co-ordinated with wind conditions to minimise the likelihood of excessive noise being generated.

6.1.4 *Blasting Assessment Background*

The overpressure and ground vibration assessment resulting from blasting is provided in *Appendix M*.

Noise and vibration criteria for blasting are proposed in the EPA's Environmental Noise Control Manual. However, the EPA has indicated that these have been superseded by values from the Australian and New Zealand Environment Conservation Council's (ANZECC) "*Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration*" (ANZECC, 1990). The ANZECC guidelines are the same as the Environmental Noise Control Manual except for blasting times. Blast overpressure levels should not exceed 115 dB(Lin) at any residence not associated with the quarry, and ground vibration levels should not exceed five millimetres per second (5 mm/s) peak particle velocity. However, it is accepted that some limited exceedance of the criteria may occur on infrequent



■ RESIDENCE/NOISE RECEPTOR

30 L_{10} NOISE CONTOUR

□ CSR PROPERTY BOUNDARY

□ CADASTRAL BOUNDARIES

EXISTING QUARRY

SOURCE: CMA 1:25,000 TOPOGRAPHIC SHEET

57106/38070/jg6.1.mca.CDR

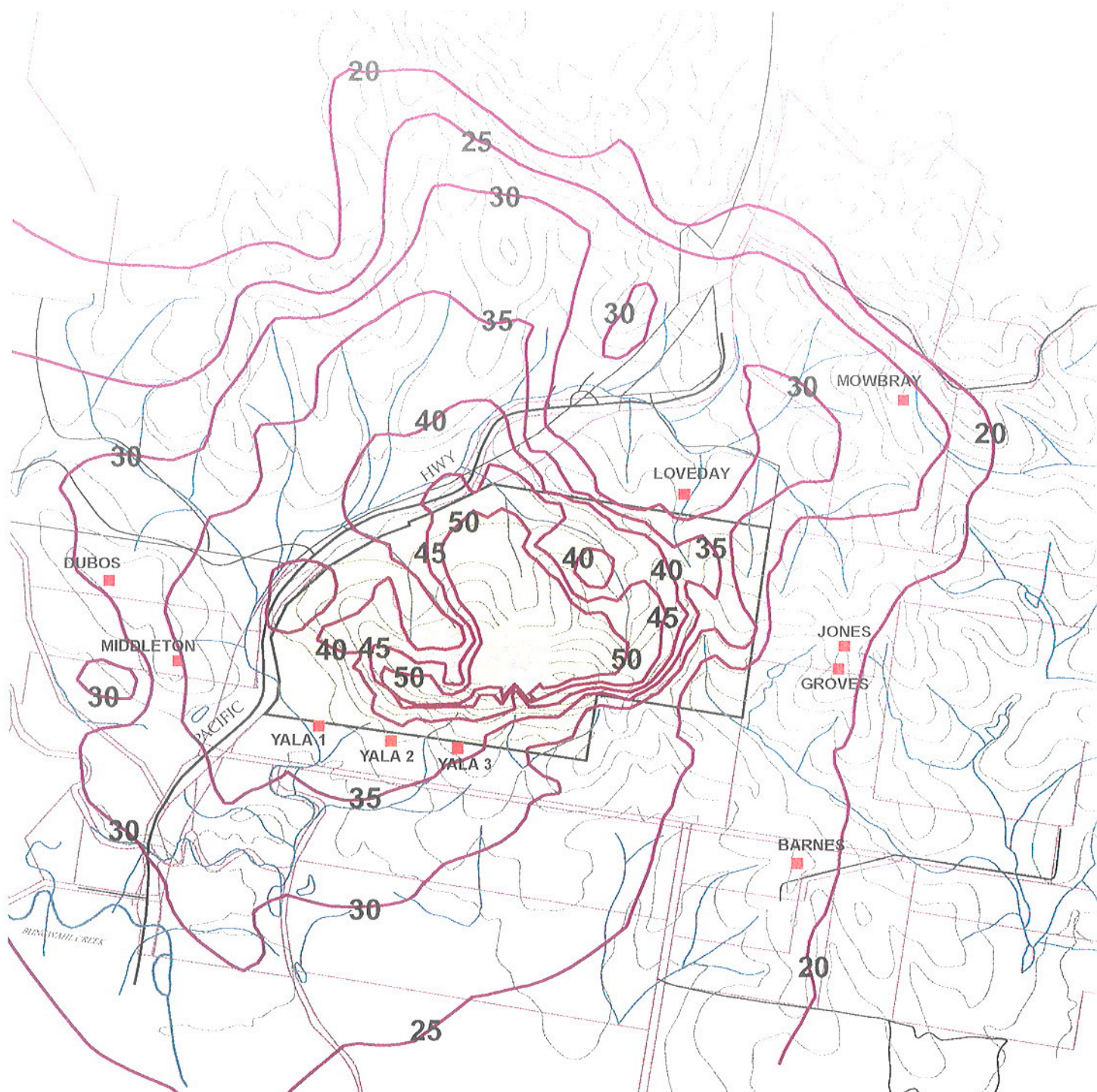


Figure 6.1

STABLE ISOOTHERMAL L_{10} NOISE CONTOURS -
EXISTING QUARRY



400m



■ RESIDENCE/NOISE RECEPTOR

30 L_{10} NOISE CONTOUR

□ CSR PROPERTY BOUNDARY

□ CADASTRAL BOUNDARIES

STAGE 1 QUARRYING

SOURCE: CMA 1:25,000 TOPO NABIA SHEET

57106/38070/56.2.mst1.CDR

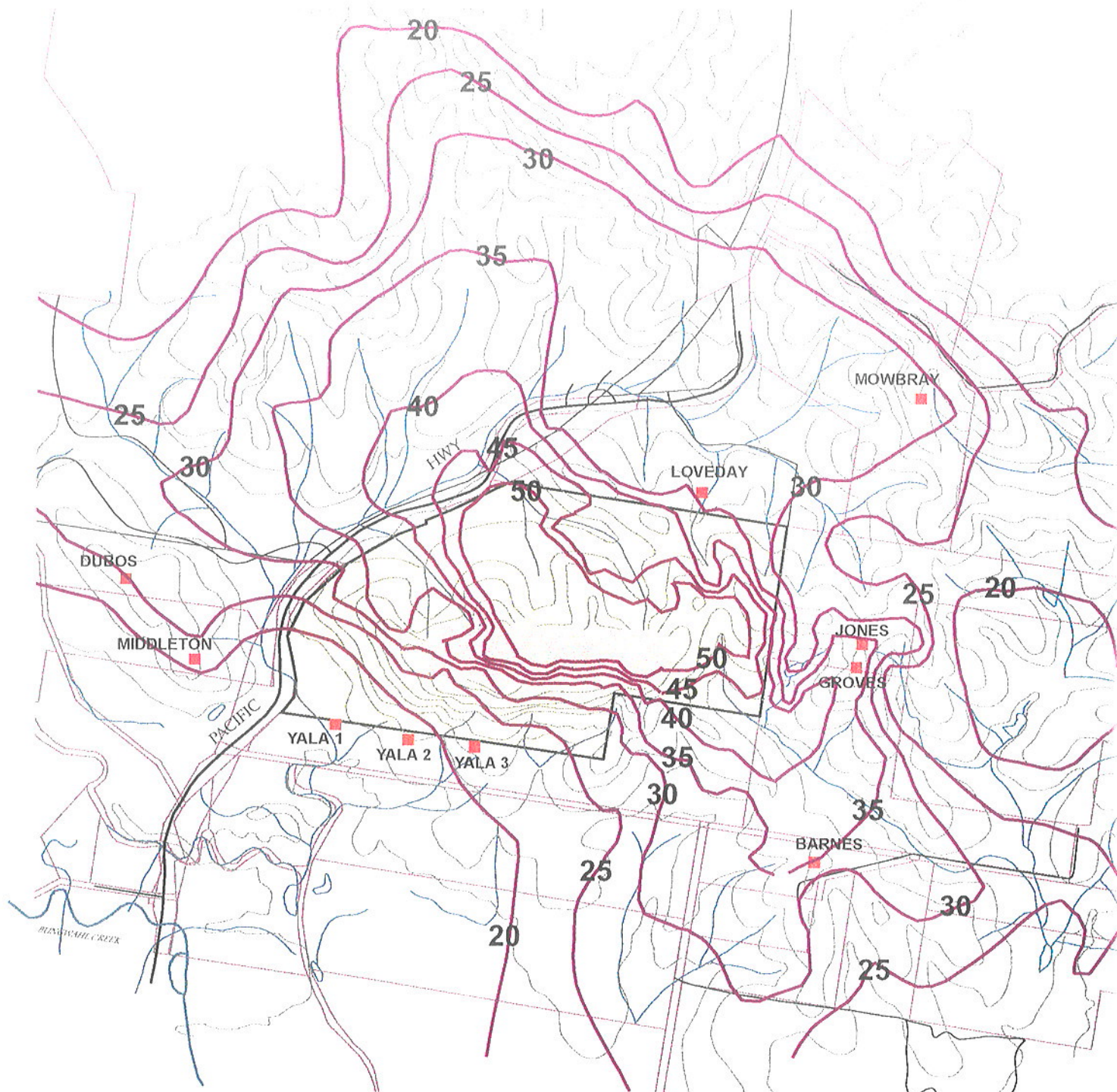


Figure 6.2

STABLE ISOOTHERMAL L_{10} NOISE CONTOURS -
STAGE 1 QUARRYING



400m



■ RESIDENCE/NOISE RECEPTOR

30 L₁₀ NOISE CONTOUR

□ CSR PROPERTY BOUNDARY

□ CADASTRAL BOUNDARIES

STAGE 3 QUARRYING

5710638070jc.3.mst3.CDR

SOURCE: CMA 1:25,000 TOPO NABIAIC SHEET



Figure 6.3

STABLE ISOOTHERMAL L₁₀ NOISE CONTOURS -
STAGE 3 QUARRYING



400m

occasions. This should be limited to not more than 5 per cent of the total number of blasts, and should not exceed 120 dB(Lin) overpressure and 10 mm/s peak particle velocity at any time.

The ANZECC guidelines recommend that blasting should occur only between 9 am and 5 p.m., Monday to Saturday, and there should be no blasting on Sundays and public holidays. In addition, it is recommended that blasting occur not more than once a day (Note: occasionally more than one blast per day may be required, for instance, the need for a 'corrective shot').

For this assessment, a number of blasts at the site were analysed. Where no blast data was available, standard calculation coefficients and formulae were used to calculate likely vibration and overpressure levels. Preliminary results indicated that actual blast impacts are less than those predicted using the standard methods.

6.1.5 Blasting Impacts

Five recent blasts have been monitored on both the open face side of the quarry (at the site office) and behind the face, on the other side of the southern ridge line, at the nearest residence to any potential blast site (YALA 3). The monitoring data given in *Table 6.2* shows the intervening ridge attenuates blast overpressure to YALA 3 by an average 12 dB. This attenuation is likely to increase for blasts located on the proposed benches below RL 50

Although only five blasts have been monitored to date, the results indicate that vibration is likely to be the limiting criteria for determining a suitable design for blasts located along the southern face of the quarry near the YALA residences. The results indicate that blasts at the southern face close to YALA 3 using current blast designs do not exceed the relevant criteria.

Table 6.2 RECENT BLAST MONITORING DATA

Date	Distance metres	Peak particle velocity millimetres per second	Overpressure dB(Lin)
19/04/99	300 shielded side (YALA 3)	4.58	106.1
07/05/99	300 open side (site office)	2.02	118.0
	300 shielded side (YALA 3)	4.65	101.0
15/06/99	300 open side (site office)	4.33	116.9
	300 shielded side (YALA 3)	4.88	108.9
9/08/99	300 open side (site office)	4.9	114.5
30/08/99	300 shielded side (YALA 3)	1.5	97.8
13/10/99	300 open side (site office)	2.25	99.5
	300 shielded side (YALA 3)	1.69	83.2

Note: The site office is not a residence and being associated with the quarry EPA criteria is not applicable.

Predicted vibration and overpressure levels for most residences using standard formulae for the proposed typical blast MICs are below the criteria of 115 dB(Lin) and 5 mm/s respectively. These calculations are for unshielded blasts (i.e. line of sight between blast and receptor) using a conservative methodology. The criteria is predicted to be exceeded at the nearest residences located on the YALA property which are actually shielded from quarry faces by the ridge line running along the southern boundary of the site. However, as shown by the monitoring data provided in Table 6.2 above, specific blast designs can be formulated to ensure EPA criteria is not exceeded when blasting close to the YALA residences.

The proposed quarry plans indicate that potential blast locations cover an estimated area of approximately 900 m by 250 m with distances of up to 900 m from the YALA 3 residence. With significant variations in distances to receptors it is extremely inefficient to limit blasts to a specific MIC. It is CSR's intention to monitor several blasts at multiple locations to gather data sufficient for confident impact predictions. The design of blasts nearest the YALA residences can then be optimised to limit the possibility of criteria exceedences and preferred blast designs can be used for blast locations with adequate distances to residences.

CSR has developed a specific set of standard procedures to control blasting at Jandra blasting (CSR Construction Materials, 1999). These procedures are amended by CSR to reflect best management practices as they arise. It should be noted that there will be no secondary blasting.

The primary measure to ensure blast impacts are within acceptable limits is through good design and accurate monitoring. Use of specific blast MIC is only one of a number of tools used in the design process. CSR's experience indicates that current practices such as undertaking face surveys and borehole deviation measurements are an even more important component of the design process. This allows optimisation of blast loading and control of vibration and overpressure.

All blasts will be monitored for both overpressure and vibration levels to ensure statutory limits are not exceeded. If blast overpressure and vibration are found to be in exceedance the cause will be identified and blast design or control procedures modified to prevent recurrence.

6.1.6 Mitigation Measures

The blasting impact assessment indicates that the quarry can effectively undertake blasting operations such that blasting impacts at nearby receptors will meet ANZECC guideline limits. The following mitigation measures will be implemented to control blasting activities:

- all blasting to be undertaken in accordance with Department of Mineral Resources regulations;
- whenever possible, blasting to be limited between 9 am and 5 p.m., Monday to Friday and 9.00 am to 3.00 p.m. Saturday, with no blasting on Sundays and public holidays;
- all blasts to be monitored to ensure that at the closest residence EPA overpressure and ground vibration criteria are not exceeded. Blast design to be modified if criteria are exceeded;
- blasting to be avoided in adverse meteorological conditions (ie. not during high winds or temperature inversions); and
- nearby residents on Lot 10 DP 790056 (currently YALA) and Lot 4 DP 790058 (currently Loveday) to be advised verbally (or by other mutually agreed method) of specific blast times.

6.2 VISUAL IMPACTS

A study of the existing visual catchment of the quarry and a visual assessment of potential impacts associated with the proposed quarry development has been undertaken as part of this EIS. The study has been based on qualitative analysis of

photographs at sensitive viewpoints of the existing site and assessment of visual changes that will occur at each viewpoint. Viewpoints considered in the assessment were from nearby houses, nearby tourist destinations and the perspective of road travellers. The objectives of the visual assessment were as follows:

- to assess the impact of the proposed development on the landscape character of the locality;
- to assess the visual impacts of the proposed development from sensitive view points outside the quarry boundary; and
- to determine a landscape strategy to mitigate significant impacts and to integrate the proposed quarry development into the existing landscape.

The visual assessment report is provided in *Appendix N*.

6.2.1 Existing Visual Environment

Topography of the site area is generally undulating with rolling hills and plains. The existing quarry is cut into the northern face of the hillside and extends from the ridgeline in a north-easterly direction. The existing working face is visible, however equipment and structures associated with current quarry operations are not visible from surrounding areas. The existing quarry is a dominant visual element within the landscape.

The visual exposure of the quarry to motorists passing was increased as a result of realignment of the Pacific Highway in 1991. The realignment directed motorists' views to the cut faces which have since been excavated close to their maximum capacity. The existing quarry is clearly visible from the Highway to motorists travelling in a south westerly direction from Taree.

In regard to tourist destinations, the Taree Lookout facility and Fire Tower is located approximately five kilometres north west of the quarry at an elevation of 299 metres. Jandra Quarry is visible from the lookout, however due to its distance, the quarry blends with the surrounding environment and does not disrupt views from this location.

Land surrounding the quarry is well vegetated to the perimeter of the property. Beyond this, the landscape is modified with the following features contributing to the visual quality of the area:

- cleared farming land to the south and east of the site;

- ❑ Pacific Highway west of the site and other minor roads that provide access to surrounding properties;
- ❑ transmission easements on the around the site that have required vegetation clearing; and
- ❑ residential houses located within an approximate radius of two kilometres from the site perimeter, as described below.

Dense vegetation remains to the south-east and north of the site.

i. Residential Properties

Residential properties are located north, north-east, east, south and west of the quarry site. Generally views to the quarry are shielded by dense vegetation, natural topography and ridgelines. The existing visual environment from these residences are as follows:

- ❑ three residential properties located east of the site are well shielded from views of the quarry by vegetation and natural topography;
- ❑ one residential house located north of the site is well shielded from the quarry as it is situated within dense bushland;
- ❑ one residence is located north-east of the site. Views from this property are filtered by foreground vegetation so that the quarry is barely visible;
- ❑ three residential properties are located south of the site. Views from the closest of these (YALA dwellings) are effectively screened from the quarry due to the separating ridgeline which is heavily vegetated. Existing quarry operations are not visible from any of the southern properties as excavation works are restricted to the northern face of the hill below the ridgeline; and
- ❑ three properties are located west of the site. The existing quarry is not visible from these properties as excavation works are limited to the eastern face of the western ridgeline.

6.2.2 Visual Impact

The proposed quarry extension will encroach on the remaining natural landscape and expand the current view. Works will significantly alter the existing landform due to excavation of the hillside in an easterly and westerly direction. Excavation would be primarily located on the northern face of the hill below the ridgeline and

would not be wider than the existing pit. In some areas, the southern face of the quarry would extend marginally over the ridgeline. Visual changes associated with the proposed extension would be primarily viewed by a small number of nearby residents and motorists travelling in a southerly direction from Taree.

Potential visual impacts in relation to these viewpoints are set out below.

i. Residential Housing

Minor impacts have been identified to existing residential properties as a result of the proposed quarry development, as follows. Further details and photographs are provided in *Appendix N*.

Three residential properties lie east of the site. The greatest visual impact (from the Groves residence) will be exposure of approximately five metres of cut face at the highpoint of the ridgeline of approximately 50 metres width. Although this cut face will be excavated during Stage 1 of the quarry plan, it will be exposed only once an intervening ridgeline is excavated during Stage 3 at least 40 years later, a long enough period for vegetation screening of rock faces to be effective. In the context of the existing modified environment, the degree of this visual impact is considered minimal.

One residential house located north of the site will not be visually impacted by the proposed quarry extension as it is well shielded within dense bushland.

The Mowbray residence is located north-east of the site. The proposed quarry development will have a minimal visual impact when viewed from this site due to screening by existing foreground vegetation.

The quarry is currently visible from an access track to the north of the Mowbray residence. Proposed quarry expansion in an east west direction will increase this visibility from the access track. However, the access track is used predominantly by only a small number of residents and the visual impact to these users is considered low.

To the south, the proposed quarry development will not impact on the YALA property due to the angle of view and close proximity of vegetation on the northern property boundary. Only a minor impact will result from modification to the hill ridgeline when viewed from properties further south (Smith and Barnes properties). Approximately two metres will be cut from the top of the ridge, however the new curvature will be such that the skyline will reflect the natural curvature of the hill. This impact will be minor.

The proposed quarry development will involve modification to the ridgeline when viewed from properties to the west. Excavation of the northern face of the hill will expose the top 20 metres of face, at a width of 100 metres when viewed from the Dubos property. This equates to less than 4.76 degrees of the field of view. Lesser impact will occur from the other western properties (Middleton and Stennett properties). The majority of the cut face will be screened by the ridgeline in the foreground. Excavations will not be visible from the dwellings due to dense vegetation screening these views. However, views to the quarry extension from other areas within the properties will be more apparent. As these areas of largest potential impact are not frequented as regularly, and the degree of visual change is relatively small, the impact is considered not significant.

ii. Major Roads

The proposed development will increase the exposure of the quarry face when viewed from vehicles travelling in a southerly direction along the Pacific Highway. The quarry will be visible for only a short period. This impact is considered minor as the quarry expansion does not alter the character of the existing view which is dominated by the quarry.

iii. Tourist Destinations

The proposed quarry expansion will have negligible visual impact from the Taree lookout facility and Fire Tower. The distance of the viewpoint from the quarry will allow exposed rock faces to be absorbed within the landscape.

6.2.3 Mitigation Measures

The following specific mitigation measures are recommended to ameliorate visual impacts associated with the proposed quarry extension.

- ❑ retention of vegetation at the top of cut faces;
- ❑ immediate revegetation of exposed benches at the high point of the ridgeline to ensure effective screening is in place prior to excavations exposing the quarry to residents to the east and west. This is proposed by the excavation of 'slots' as discussed in Section 3.6 of this EIS; and
- ❑ subject to consultation with relevant land owners, provide supplementary planting;

- in the foreground of the Mowbray and Dubos residences, within the Dubos and Middleton properties and along the Pacific Highway near the intersection with Blackbutt Road; and
- along the southern boundary of the road reserve of the access track linking the Mowbray property (and other properties to the north-east) to the Pacific Highway.

6.3 LAND USE

The occupied land in the area of Jandra Quarry is primarily cleared rural land on the lower slopes. Whilst the surrounding hilly country is primarily moderately to heavily timbered private rural land. Residences are located north, north-east, south, east and west of the site. Rural activities in the locality are mainly cattle grazing and hobby farming.

CSR own the quarry site including the area proposed for expansion. The quarry is bounded by privately owned land to the south, north and east. To the west lies the Pacific Highway. A power transmission line and easement is located on the quarry site, which will be relocated to give way to quarry expansion.

Once extraction has been completed, the quarry will be rehabilitated. Benches of the lower quarry void will be stabilised. Rehabilitation of the upper quarry area will provide similar vegetation communities and fauna habitats, as previously occurred over the site. The establishment of a dense shrub understorey in the quarry area will be planned to function as a sustainable ecosystem which reflects the natural ecology of the area.

Opportunities to develop the quarry area for more intensive agricultural uses are limited by the agricultural suitability of the land. In the Agricultural Land Suitability Study prepared for GTCC by the Department of Agriculture (1982), the quarry site has been described as Class IV land, in a grading of Class I to Class V (Class V is of poorer agricultural quality than Class IV). Class IV being land suitable for grazing but not suitable for cultivation.

The nearest urban residential development area is the village of Nahiack which has a population of approximately 450 and is located approximately 8 km to the south-west of the quarry. The village is screened from the quarry by the ridgelines located at Possum Brush as well as other topographical features.

The properties that have the potential to be directly impacted by quarry activities are all located within the buffer area identified in Greater Taree Development Control Plan 1995. This buffer ensures that any proposed development that is permissible

under the provisions of LEP 1995 is required to consider the impacts that the quarry will have upon the development and that the development would have on the resources that exist in the Jandra Quarry by ensuring that land use conflicts do not occur as a result of new development.

The neighbouring property to the south is owned by Youth Care and Life Style Centre Incorporated (YALA) who have recently obtained development consent to commence youth care and life style programs which include the construction of two additional dwellings, outdoor adventure and personnel development programs which will be conducted at various locations on the property including the area close to the southern boundary of the quarry site. A formal agreement between CSR and YALA restricting activities on the adjoining land during blasting is currently being negotiated. There will be no additional adverse impacts upon surrounding land uses as a result of extended quarry operations.

6.4 SOCIO-ECONOMIC ISSUES

6.4.1 *Population*

The quarry supplies aggregate south beyond Bulahdelah and north into Kempsey shire. Market information in the coastal region from Johns River to Bulahdelah indicates the demand for quarry product will be related largely to the main markets for hardrock quarry products. These are roadbase, asphalt aggregate, spray-seal aggregate and concrete aggregate.

The Hunter Coastal Urban Settlement Strategy (Department of Planning, 1994) identifies projected growth trends within the Hunter Region. The Greater Taree Local Government Area (LGA) is located in the upper part of the coastal area of the Hunter region. The Strategy notes that the coastal area is the strongest growing part of the region. The improvements in transport accessibility to the Sydney Region such as the Pacific Highway upgrading and perceived lifestyle advantages are predicted to result in continued strong growth trends.

Population growth projections for the coastal area of the Hunter Region are shown in *Table 6.3*.

Table 6.3 POPULATION PROJECTIONS FOR THE HUNTER REGION

	1991 ERP ²	2016 Medium	2016 High	Range of Increase 1991 to 2016
Greater Taree	41,620	60,300	64,200	18,700 to 22,600
Great Lakes	25,500	49,200	51,400	23,700 to 25,900
Port Stephens	45,130	79,200	82,900	34,100 to 37,800
Newcastle	136,170	144,000	150,600	7,800 to 14,400
Lake Macquarie	169,710	202,600	211,900	32,900 to 42,200
TOTAL	418,180	535,300	561,000	117,200 to 142,900

Notes: 1. Source: Hunter Coastal Urban Settlement Strategy 1995
2. Estimated Resident Population

As indicated in Table 6.3 substantial population growth is expected in the Greater Taree LGA over the next 17 years. Such a population growth will result in demand for infrastructure that will require quarry products.

Greater Taree LGA experiences large seasonal increases in population. The demand for tourist development and its associated infrastructure will create greater demand for extractive resources than is reflected in resident population growth statistics.

6.4.2 Employment

Employment in the Greater Taree LGA is dominated by the Manufacturing, Retail/Wholesale and Community Services industries. These account for 53 percent of total employment. It is expected that these industries will continue to dominate as Taree establishes itself as a regional centre providing a diverse range of services and facilities. Traditional areas of employment in the rural sector have diminished substantially with a swing towards secondary and tertiary industry (GTCC, 1996).

Upgrading of the Pacific Highway and development of the tourism industry will significantly benefit the local government economy through direct employment of people from the area and use of associated industries. The quarry will support construction industries by providing essential construction materials. In addition the quarry will employ nine full time employees.

6.5 HERITAGE AND CULTURAL ISSUES

An archaeological and heritage assessment of the proposed works has been undertaken as part of this EIS. A detailed report of the investigations is provided in *Appendix O*. The study aimed to assess potential impacts on existing archaeological and heritage sites in the study area. Identification of archaeological sites required survey of the study area based on existing records of archaeological patterns within the broader area and use of subsurface probes where necessary. Work was in conjunction with the appropriate Aboriginal community representatives.

Archaeology and heritage investigations involved a review of previous archaeological investigations in the region, followed by field surveys. From this an assessment of potential impacts has been undertaken and mitigation measures have been recommended.

6.5.1 *Background*

Review of previous archaeological investigations indicated that ridgelines, saddles, spurs adjacent to water and river terraces are areas likely to contain material of Aboriginal cultural heritage. Within the study area, small sites such as small artefact scatters may occur along the ridgelines and within the saddles. Other heritage items relating to the timber cutting industry and banana farm phase of past land use may also be found. As the site is predominantly a ridgeline, the survey concentrated on the ridgetops, crests, spurs and saddles. The slopes in the study area are considered too steep to have been suitable for camp sites.

6.5.2 *Methodology*

Field work was undertaken in conjunction with Taree-Purfleet Local Aboriginal Land Council and Forster Local Aboriginal Land Council. The study area was examined on foot along the ridgelines. Other vehicles tracks were also inspected by vehicle and re-inspected where reasonable exposure was found. In addition, the surrounds of the two houses on-site were inspected. One of these had been partly demolished at the time of the field work.

Visibility on site ranged from 80 percent near saddles and ridgetop down to between ten and fifty percent on the slopes. This in addition to the high impact of quarry operations was recognised as 'limited visibility'. The assessment also used the current understanding of the nature of Aboriginal land use in relation to topography in the Hastings Region.

A preliminary research permit was granted by NPWS for the conducting of subsurface probes to test the areas of insufficient surface visibility considered to

have archaeological potential and which would be subject to destruction by the proposed development (test areas shown in *Figure 6.4*). Both ridgeline and slope landforms were tested.

6.5.3 Study Results

A total of seven sites were recorded during the initial field survey (see *Figure 6.4*). Sites J1 - J5 contained artefacts. Sites J1, J3 and J5 are small open artefact scatters, site J2 contained potential midden material and J4 is a historic scared tree. Sites J6 and J7 were identified as potential archaeological deposits (PADs).

Sites were located in all landforms other than steeper slopes. It was noted that although no sites were found on the level area of the spur, heavily grassed areas have potential to retain material under the layers of imported soil associated with the houses and soil moved down slope from the spur shoulder.

All the sites located were disturbed to a degree which reduces the potential significance of the material.

Three areas, including PAD1, were selected for the installation of subsurface probes. Five small artefacts were found at PAD1 (site J6). PAD2 (site J7) remained untested as it will not be disturbed by the proposed extension.

6.5.4 Archaeological and Heritage Significance

The seven sites identified through field investigations have been assessed for significance according to *The Australian International Council on Monuments and Sites (ICOMOS) Charter for the Conservation of Places of Cultural Significance; The Burra Charter* and its associated guidelines. Significance is based upon several criteria including scientific or archaeological significance, significance to Aboriginal people, aesthetic value and value as an educational resource. Sites are also assessed for their cultural or historical importance and whether they are rare, representative or characteristic, or whether they exhibit historic or cultural connections.

Given the disturbed nature of sites, it is considered unlikely that they would contribute to the scientific records and that they would retain little or no integrity. The small artefact scatters are unlikely to be rare. Significance of the sites has been assessed as follows:

- the sites have limited scientific value to the general community due to poor visibility. Three identified sites can be conserved for educational purposes (site J6, site J4 and site J7 PAD 2);

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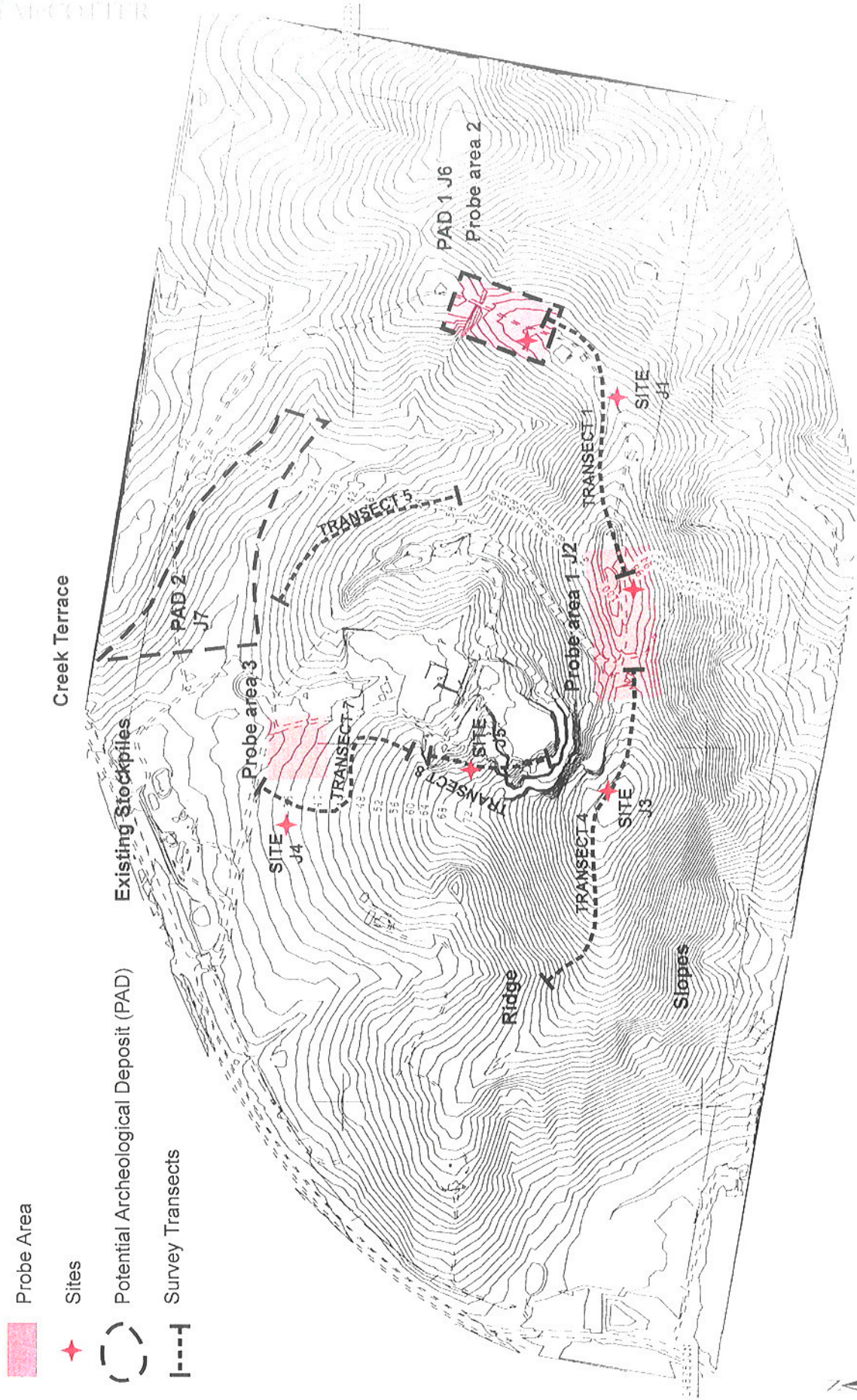


Figure 6.4 AREA SURVEYED AND IDENTIFIED SITES

- all sites are of cultural significance to the Aboriginal people, however it has been recognised that they will be eventually impacted by quarry development. They should be conserved where possible; and
- site significance for each identified site has been rated as low or medium in *Appendix O*. None of the sites have been rated as having high site significance.

6.5.5 Mitigation Measures

Management and mitigation measures have been recommended based on relevant legislation, results of field survey and assessment of significance of each site. The National Parks and Wildlife Act 1974 states that it is an offence to damage or destroy any Aboriginal relic without the written consent of the Director.

Management measures are as follows:

- consent to destroy permits should be obtained for sites J1, J2, J3 and J5 with the support of Taree-Purfleet and Forster Local Aboriginal Land Councils;
- site J6 (PAD1) was found to contain archaeological material and can be conserved for educational purposes until the quarry void is extended into the site in at least 40 years time. At this time, a consent to destroy should be obtained; and
- sites J4 and J7 (PAD2) should be protected from unintentional damage throughout the life of the quarry. Awareness of their presence by staff is considered adequate protection as these sites are located away from the main quarry areas and have remained unharmed to date. It should be noted that site J4 is protected under the Heritage Act 1977 and site J7 is protected under the National Parks and Wildlife Act 1974.

6.6 TRAFFIC AND TRANSPORT

6.6.1 Background

Access to the quarry is currently provided from the Pacific Highway via an access road. The existing intersection design generates safety concerns regarding heavy vehicle turning movements from the access road onto the highway.

These safety concerns result from a lack of sight distance along the highway for vehicles exiting the quarry. Sight distances in both directions are reduced by the grade of the highway and the bends in the highway alignment.

An alternative intersection design has been formulated as part of the proposed quarry development. The purpose of this section is to assess the existing and alternative intersection design with regard to safety concerns.

6.6.2 Existing Traffic Environment

i. Intersection Design

The quarry access road intersects with the Pacific Highway forming a T-intersection. At the intersection the highway is a dual carriage way, with a substantial median strip. From the intersection, the highway inclines to the north along a short straight section of road prior to a bend. The existing speed limit in the area on the highway is 110 kilometres per hour.

The quarry access is a sealed local road with a single lane in each direction. Vehicles exiting the access road turn right towards the north and left towards the south onto the Pacific Highway. Sight distance for vehicles exiting the access road is restricted, primarily to the south by the curvature and grade of the Pacific Highway. The sight distances are approximately 380 metres to the north and 175 metres to the south.

Due to restricted sight distance to the south, the intersection effectively operates as a two stage crossing. Vehicles turning right out of the quarry cross the southbound traffic flow, stop or slow in the median where the sight distance to the south is improved and wait for a gap in the traffic stream. This causes safety concerns as the median width is only 17 metres which requires the larger heavy vehicles to store in the median such that they do not protrude into the traffic stream.

Deceleration lanes are provided along the highway at the intersection for vehicles turning into the quarry from both directions. The right turn deceleration lane is approximately 100 metres in length, including taper. The left turn deceleration lane is approximately 80 metres in length, including taper.

Observations of the intersection indicated that heavy vehicles turning into the access road from either deceleration lane do not experience problems exiting the traffic stream at speed and decelerating to turn.

An acceleration lane of 45 metres which is tapered is provided for vehicles turning left from the access road onto the Pacific Highway (heading south). No acceleration lane is provided for vehicles turning right from the access road (heading north).

ii. Existing Traffic Volumes

The published RTA traffic surveys (1995) provides a traffic count along the highway approximately 15 kilometres north of the quarry. This count would represent a relatively accurate representation of traffic flows past the quarry as the Forster turn-off is the only major intersection between the counting station and the quarry access road. Historical growth and a breakdown of recent traffic flows from this data is shown in Table 6.4 and Table 6.5.

Table 6.4 PACIFIC HIGHWAY HISTORICAL DAILY TRAFFIC FLOWS					
1988	1990	1992	1995	Average Growth (pa) 1988-1995	Average Growth (pa) 1992-1995
8,701	9,376	12,506	13,833	6.9 percent	3.4 percent

Source: RTA Traffic Volume Data for the Northern Region (1995) Station 09.109

Table 6.5 PACIFIC HIGHWAY DAILY TRAFFIC FLOW - 1995			
	Northbound (veh/day)	Southbound (veh/day)	Combined (veh/day)
Average Daily Traffic	6,882	6,951	13,833
Average Week Day Traffic	7,252	7,162	14,414
Average Weekend Day Traffic	5,931	6,348	12,279
Average Public Holiday Traffic	7,525	8,032	15,557

Source: RTA Traffic Volume Data for the Northern Region (1995) Station 09.109

Peak hour flows were estimated using a typical rate of eight per cent of daily traffic during the peak hour. Peak hour flows along the highway are approximately 550 vehicles per hour northbound and 570 vehicles per hour southbound.

iii. Quarry Traffic Generation

Small trucks, rigid trucks, truck and dog and semi trailers are used by the quarry. The typical direction for future daily heavy vehicle movement is estimated as 50 percent left (south bound), and 50 percent right (northbound). During peak production periods the quarry will generate approximately 100 heavy vehicle movements per day (50 in and 50 out).

During peak production, the quarry currently generates 20 vehicle movements per hour (10 in and 10 out). Peak hour vehicle generation will not increase as a result of

the proposed development, however, these peaks will be achieved over longer periods.

6.6.3 Proposed Improvement of Intersection Design

A seagull intersection design has been proposed to address the safety concerns at the quarry access intersection. The proposed intersection design is shown in *Figure 6.5*. A seagull intersection design will address safety concerns by providing:

- ❑ a formalised two stage crossing operation;
- ❑ adequate storage area in the median for large quarry vehicles;
- ❑ an acceleration lane to the north to allow heavy vehicles exiting the quarry to achieve a safe merge speed prior to merging with the through traffic; and
- ❑ improved sight distances to the south for quarry traffic turning right at the merge point with north bound traffic.

The proposed intersection has been designed to satisfy turning requirements for heavy vehicles.

The length of the proposed right turn acceleration lane (northbound) is 150 metres including a 50 metre taper, with a width of 4.5 metres.

The existing deceleration lane for vehicles turning right into the quarry would not change. The deceleration lane for vehicles turning left into the quarry would increase from 80 metres to 100 metres long including taper.

6.6.4 Assessment of Proposed Intersection Design

The key issues of intersection design that need to be assessed are impact of quarry generated traffic on through traffic flow on the highway and the ability of the heavy vehicles to turn right safely from the quarry access road and merge with northbound traffic along the highway.

i. Impact on Through Traffic Flow

Existing peak traffic volume along the highway (section 6.6.2) in the vicinity of the quarry access intersection has been estimated to be 550 vehicles per hour to the north and 570 vehicles per hour to the south. Heavy vehicles generated by the quarry peak at 20 movements per hour (10 in and 10 out).

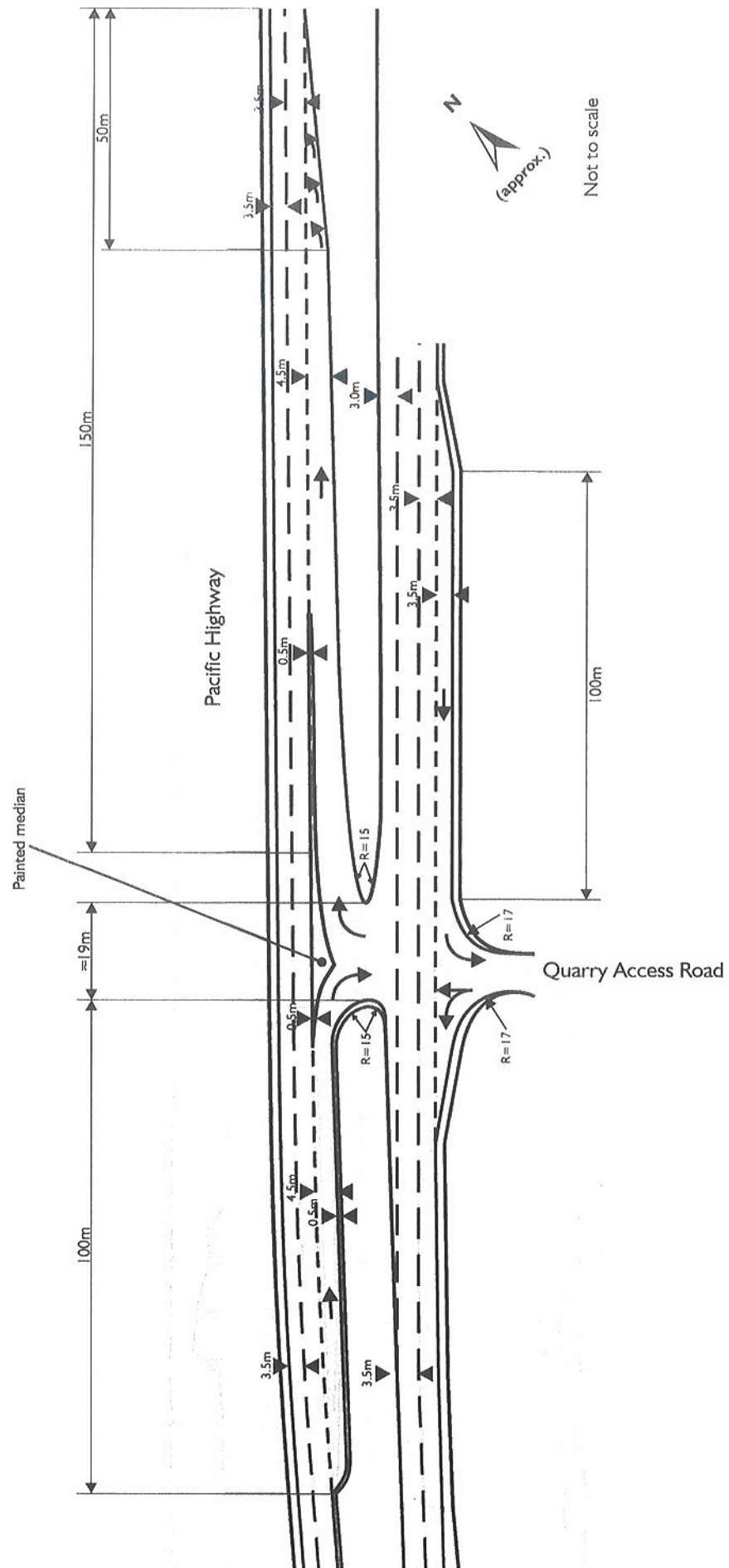


Figure 6.5

IMPROVED INTERSECTION DESIGN

The ability of heavy vehicles to exit the quarry and merge with the main traffic flow along the highway during peak conditions has been examined using gap acceptance techniques. Gap acceptance provides an indication of the number of vehicles that can enter the major traffic flow from a minor road based upon traffic volumes, traffic speed and the resulting probability of gaps available in the major traffic flow.

The analysis indicated that there would more than sufficient gaps in the northbound and southbound highway traffic flows to allow heavy vehicles to turn out of the quarry and merge with highway traffic during peak periods.

ii. *Safe Heavy Vehicle Manoeuvres*

The proposed seagull intersection layout has been designed to satisfy turning requirements for heavy vehicles.

a. *Acceleration/Deceleration lane(s) Northbound*

The existing deceleration lane is satisfactory for safe vehicle manoeuvres turning off the highway into the quarry access road.

There is no existing acceleration lane turning right from the quarry access road onto the highway. An acceleration lane has been proposed with a length of 150 metres including a 50 metre taper. This allows the heavy vehicles to accelerate to a safe merging speed, and to merge while still on the flat and prior to the incline and the curve. This will significantly improve the existing safety and operation of the intersection by removing the need for quarry traffic to wait in the median.

b. *Acceleration/Deceleration lane(s) Southbound*

The existing acceleration lane turning left onto the highway from the access road is satisfactory. The sight distance to the north satisfies RTA (1991) Road Design Safe Intersection Sight Distance criteria.

With the proposed sea-gull arrangement, the deceleration lane for vehicles turning left into the quarry would be extended to 100 metres. This will significantly improve the ability of heavy vehicles to exit the traffic stream at speed and decelerate to turn without affecting through traffic flows.

iii. *Sight Distance*

The RTA Road Design Guide (1991) requires an entering sight distance (ESD) of 500 metres and a safe intersection sight distance (SISD) of 310 metres, for a rural freeway type road with a design speed of 110 kilometres per hour. The existing sight

distances are estimated to be 380 metres to the north and 175 metres to the south. Therefore, the current intersection design does not satisfy the minimum requirement (SISD) for the right turn movement out of the quarry due to the restricted sight distance towards the south.

A seagull intersection layout would greatly improve the sight distance towards the south for the right turn movement out of the quarry. The point where turning vehicles merge with northbound through traffic is further along the highway due to the acceleration lane, hence increasing the sight distance towards the south. The sight distance at this point would satisfy the SISD criteria.

iv. Recommendation

The current intersection design of quarry access onto the Pacific Highway generates several potential safety concerns. To alleviate these concerns the construction of a seagull intersection design is proposed. A sea-gull design will significantly improve the level of safety and operational efficiency of the intersection without effecting through traffic flows along the highway. An appropriate concept design has been prepared as part of this traffic impact assessment.

JANDRA QUARRY E X T E N S I O N



ENVIRONMENTAL
RECORD
MANAGEMENT

7 ENVIRONMENTAL PROTECTION AND MITIGATION
MEASURES

ENVIRONMENTAL PROTECTION AND MITIGATION MEASURES

7.1 SUMMARY OF MITIGATION MEASURES

A substantial component of the justification of the project involves the application of mitigation measures which have been identified throughout the EIS. These mitigation measures are summarised in *Table 7.1* below.

Table 7.1 SUMMARY OF MITIGATION MEASURES

SURFACE WATER QUALITY

An erosion and sedimentation control plan to be implemented for the proposal. The plan will describe all erosion control measures and sediment control structures, both temporary and permanent, and will include:

- the use of sediment control dams;
- minimisation of disturbed areas. Quarry and ancillary area boundaries will be marked and no activity permitted outside designated areas;
- diversion of clean water from undisturbed areas around working areas;
- the installation of temporary erosion and sediment controls, such as geofabric filter devices, prior to commencement of topsoil and overburden removal;
- sequential clearing and rehabilitation of the quarry as extraction of the hardrock material proceeds;
- regular water quality monitoring of sediment control dams and downstream watercourses; and
- the regular maintenance of erosion and sediment control structures, particularly after rainfall, to ensure their efficiency.

Additional actions to mitigate potential impacts on water quality and runoff from the asphalt plant, pugmill and pre-coating operations will include the following:

- the asphalt plant to be situated on a hardstand pad;
 - the pugmill and pre-coating facility to be situated on a concrete pad;
 - runoff from the asphalt plant pad to be diverted to sediment/evaporation ponds for treatment;
 - runoff from the pre-coating area to be directed through a grease trap;
 - a wet scrubber inground lined interceptor pit to be constructed to trap scrubber particulates
-

Table 7.1 SUMMARY OF MITIGATION MEASURES

- and recycle water back through the asphalt plant. Solids from the pit will be bioremediated on-site in a clay lined area. The water recycling pit will have a minimum capacity to serve daily usage water and will be kept separate from the general site runoff. Water from these activities will be directed into settling ponds where aggregates will be given time to settle out;
- when either of the asphalt batching plant, pugmill or pre-coating facilities are in operation, the new site facility sediment dam (being downstream of these operations) will be monitored regularly for the following analytes:
 - pH;
 - total dissolved solids;
 - total suspended solids;
 - total petroleum hydrocarbons;
 - polynuclear aromatic hydrocarbons;
 - mononuclear aromatic hydrocarbons; and
 - biochemical oxygen demand.
 - additives, fuels, chemicals or oils will be stored in a roofed and bunded area sized to contain spillage of at least 110% of the largest liquid storage container;
 - specialist absorbent material will be kept on-site for rapid clean-up of spills. Soiled material is then stored on-site in drums prior to disposal by a licensed contractor; and
 - regular inspection and monitoring of the bunded areas would be undertaken to ensure proper maintenance of tanks and containment of any spills.

AIR QUALITY

Mitigation measures to control air quality at the quarry include:

- monitoring of dust deposition on property boundaries to verify dust deposition rates and monitor the effectiveness of control procedures;
- regular watering of haul roads and stockpiles;
- limiting speeds of vehicles on unsealed surfaces to 40 kph;
- minimising vehicle kilometres travelled on unpaved roads;
- rehabilitating disturbed areas;
- where practical/possible conducting drilling and blasting during suitable meteorological conditions (ie. not during high winds or temperature inversions);
- adequate stemming of drill holes;
- dust extraction units on drill rigs and crushing and screening plants to be well maintained;
- seals and mist sprays on quarry equipment to be well maintained;
- dust displaced during silo filling to be controlled by an appropriate filter (i.e. a reverse pulse silo filling filter or equivalent);
- wet scrubber on asphalt bathing plant to be maintained regularly including the regular

Table 7.1 SUMMARY OF MITIGATION MEASURES

- servicing of the recycling interceptor trap; and
 - stack emissions from the asphalt batching plant to be monitored for:
 - VOCs;
 - semi VOCs;
 - CH₄, H₂, N₂, CO, CO₂ and O₂;
 - particulate;
 - Stack gas moisture, velocity and temperature; and
 - mass flow rate of exhaust gases, water, particulate, N₂, CO, CO₂ & O₂.
-

NOISE AND BLASTING

The following mitigation measures will be implemented to control general noise emissions:

- use of residential class mufflers on all relevant equipment; and
- use of dozer on quarry rim to be co-ordinated with wind conditions to minimise the likelihood of excessive noise impacts at residences to the east.

The following mitigation measures will be implemented to control blasting activities:

- all blasting to be undertaken in accordance with Department of Mineral Resources regulations;
 - whenever possible, blasting to be limited between 9 am and 5 p.m., Monday to Friday and 9.00 am to 3.00 p.m. Saturday, with no blasting on Sundays and public holidays;
 - all blasts to be monitored to ensure that EPA overpressure and ground vibration criteria are not exceeded. Blast design to be modified if criteria are exceeded;
 - blasting to be avoided in adverse meteorological conditions (ie. Not during high winds or temperature inversions); and
 - nearby residents on Lot 10 DP 790056 (currently YALA) and Lot 4 DP 790058 (currently Loveday) to be advised verbally (or by other mutually agreed method) of specific blast times.
-

CULTURAL HERITAGE

- the four identified Aboriginal artefacts to be impacted by the development to be collected under the auspices of a NPWS Consent to Destroy and Permit to Salvage;
 - no further archaeological investigation would be necessary before commencement of the development; however, if archaeological remains of any kind are located during the development, works must cease in that area immediately and a qualified archaeologist must be engaged to assess the remains and liaise with the LALC and NSW NPWS. Written permission from the Director of NPWS is required before such items can be disturbed/removed by the proposed development; and
 - mark the location of sites J4 and J7 and ensure these sites are not disturbed by quarry activity.
-

Table 7.1 SUMMARY OF MITIGATION MEASURES

FLORA AND FAUNA

The following mitigation measures have been developed to reduce potential impacts of the proposed development on flora, fauna and habitats.

General

- revegetation of the quarry which will be undertaken progressively wherever possible to minimise the impact of loss of habitat;
- speed limits of 40 kilometres per hour are to be imposed on internal roads;
- wildlife crossing signs are to be erected to alert drivers that fauna may be crossing the road;
- as part of the proposed development, the company is applying to extend general operating hours to 6.00 am to 6.00 p.m. Monday to Friday and 6.00 am to 3.00 p.m. on Saturdays. Ancillary operations such as refuelling, servicing and maintaining plant will be undertaken between 6.00 am and 9.00 p.m. Monday to Saturday. Operation should be limited to these hours to reduce impact on fauna.
- timed clearing will be implemented to reduce direct mortality of hollow-dependant fauna;
- to minimise the loss of existing wildlife corridor function, the strip of semi-cleared vegetation retained on the farmland in the east of the study area should be revegetated (approximate width 220 metres) as well as the relatively long narrow strip of remnant vegetation between the quarry and the Pacific Highway. A detailed description of the revegetation program would be provided in the site's Environmental Management Plan. The first stage of the quarry expansion would be in the western portion of the subject site, hence the revegetation program in the east would be at an advanced stage prior to the potential habitat corridor being reduced in size;
- to maintain wildlife corridors, during revegetation suitable sheltering resources should be placed within the proposed revegetated corridor to encourage recolonisation by displaced individuals;
- habitat enhancement involving such measures as fencing off semi cleared areas undergoing revegetation, baiting programs for feral animals and the provision of nest boxes will be undertaken to increase the capacity of bushland remaining in the study area; and
- a monitoring program will be included in the quarry EMP to determine the effectiveness of mitigation measures and the suitability of revegetation techniques.

Sediment Control

A series of mitigation measures to address sediment control would be implemented. These mitigation measures are detailed under Surface Water Quality above.

Table 7.1 SUMMARY OF MITIGATION MEASURES

VISUAL

The following specific mitigation measures are recommended to ameliorate visual impacts associated with the proposed quarry extension.

- retention of vegetation at the top of cut faces;
 - immediate revegetation of exposed benches at the high point of the ridgeline to ensure effective screening is in place prior to excavations exposing the quarry to residents to the east and west. This is proposed by the excavation of 'slots' as discussed in Section 3.6 of this EIS; and
 - subject to consultation with relevant land owners, provide supplementary planting:
 - in the foreground of the Mowbray and Dubos residences, within the Dubos and Middleton properties and along the Pacific Highway near the intersection with Blackbutt Road; and
 - along the southern boundary of the road reserve of the access track linking the Mowbray property (and other properties to the north-east) to the Pacific Highway.
-

TRAFFIC

A seagull intersection design will address safety concerns at the intersection of the quarry access road and the Pacific Highway by providing:

- a formalised two stage crossing operation;
- adequate storage area in the median for large quarry vehicles;
- an acceleration lane to the north to allow heavy vehicles exiting the quarry to achieve a safe merge speed prior to merging with the through traffic; and
- improved site distances to the south for quarry traffic turning right at the merge point with north bound traffic.

The proposed intersection has been designed to satisfy turning requirements for heavy vehicles.

SAFETY

The following safety factors will be continued during the operation of the quarry:

- visitors to the quarry will be required to participate in a site safety induction;
 - employees will receive safety inductions, ongoing job training and work instructions;
 - a safety fence will be installed along the ridge top to prevent access to the top of quarry faces;
 - safety signs will be displayed where required providing instructions to staff on safety procedures. These will also indicate the requirement for personal protective equipment in specific site areas;
- handrails and proper stairways are currently in position at the plant. These will be fully maintained for the life of the plant;
-

Table 7.1 SUMMARY OF MITIGATION MEASURES

- ❑ traffic management procedures have been set out in the Safety Manual and visually displayed on site. These include marked lanes and signage where vehicles use is permitted, associated pedestrian areas and areas of restricted access;
- ❑ safety aspects of blasting will be set out in the Safety Manual. These will include requirements for notifying site personnel and neighbouring sites, and emergency response procedures; and
- ❑ rock being quarried has approximately 25 percent free silica. Testing of dust generated during crushing has shown that constant exposure to high dust levels could cause silicosis. Current dust control measures are keeping the exposure of site personnel to below the level where there is a potential for the disease to develop. Efforts to reduce the already acceptable dust exposure levels, in the form of greater water application via fine misting sprays and other engineering controls are continually in progress.

A formal coexistence agreement with the owner of Lot 10 DP 790056 (currently YALA) restricting activities on the land adjacent to the eastern section of the southern boundary of the quarry site to ensure safety during blasting to be formally ratified by YALA and CSR.

7.2 ENVIRONMENTAL MANAGEMENT PLAN

7.2.1 Plan Outline

An Environmental Management Plan (EMP) would be developed and implemented for the quarry extension. The EMP would aim to ensure that all activities carried out for this proposal comply with the environmental objectives set out in the EIS.

The principal purpose of the EMP is to act as environmental operations manual for the use by quarry management. It would detail how environmental safeguards are to be implemented, when they are to be implemented and who is responsible for their implementation.

The environmental management plan would be prepared prior to commencement of extension works and would include:

- ❑ a detailed quarry plan;
- ❑ a detailed soil and water management plan;
- ❑ a detailed landscape and rehabilitation plan;

- ❑ effluent treatment and disposal methods;
- ❑ fuel and lubricant storage and maintenance procedures and proposed safeguards including management procedures for the containment of spillages;
- ❑ details of noise and air quality controls;
- ❑ details of the blast design procedures to ensure compliance with EPA overpressure and ground vibration criteria at all neighbouring residences;
- ❑ details of measures to protect the visual amenity of neighbouring residents and Pacific Highway users;
- ❑ community consultation procedures especially in regard to residences potentially affected by blasting and visual impacts;
- ❑ procedures for the application for consent to destroy Aboriginal sites, protection of retained Aboriginal and heritage sites and in the event of uncovering items of potential Aboriginal archaeological significance; and
- ❑ an environmental monitoring and reporting program.

An important consideration in the Plan's preparation would be the need for flexibility to respond to changing environmental conditions, community needs and government and Council regulations. The plan would be reviewed and updated as is necessary over the life of the quarry. The need for revisions would be identified by consultations with relevant government authorities who would suggest reporting arrangements between CSR, community and government authorities.

7.2.2 Environmental Monitoring

A component of the management plan would be a monitoring program. It would:

- ❑ record the environmental effects of the quarrying operation;
- ❑ determine the adequacy of environmental controls; and
- ❑ identify any need for additional control measures.

The following factors would be monitored:

- ❑ establishment of the enhanced wildlife corridor to required specifications;
- ❑ areas under rehabilitation;

- ❑ all quarry blasts;
- ❑ asphalt plant stack emissions;
- ❑ efficiency of asphalt plant wet scrubber and interceptor pit;
- ❑ dust deposition rates at property boundaries;
- ❑ water quality of sedimentation dams and downstream watercourses;
- ❑ additional water quality parameters in the site facilities sediment control dam during asphalt production, pugmill or pre-coating operations; and
- ❑ integrity of erosion and sedimentation controls and bunded areas.

JANDRA QUARRY E X T E N S I O N



CSN

ENVIRONMENTAL

IMPACT

ASSESSMENT

2011-2012

PROJECT JUSTIFICATION

8.1 ALTERNATIVES TO THE PROPOSAL

Section 1.2 of this report states that geological investigations of the Jandra site has shown that there are some 16.5 million tonnes of fresh rock available for extraction in addition to 3.6 million tonnes of weathered rock which is suitable for roadbase products.

The products of the Jandra Quarry are of high quality and are suitable for road construction including road base, and aggregate for road sealing.

The market for hardrock quarry products of this type is calculated at 640,000 tonnes per annum for the foreseeable future (*see Table 3.4*). This product is produced by nine quarries in 1999. Output is planned to continue at this level into the future. The CSR component of 220,000 tonnes will continue after the closure of the Taree River Gravel quarry in 2000 by the proposed increased output from the Jandra Quarry.

A major use of the product of these quarries is for the supply of aggregates for concrete production, local road works and the upgrade of the Pacific Highway. The works on the Pacific Highway which involve a major upgrade from Hexham to the Queensland border are placing major demands on quarries in the Tea Gardens to Taree region. The main alternative to this proposal is the continued extension of gravel from the Manning River. This alternative is not favoured as applications for the extension of the existing extraction lease may have difficulty meeting DLWC and NSW Fisheries approval requirements. In addition, consolidation of CSR's Jandra and Manning River operations will result in efficiency and operational advantages that will ensure the long-term viability of CSR's presence in the area. It is generally recognised that a hardrock quarry is a more stable, less dynamic operation than river extraction, with greater control over impacts and mitigation measures

8.2 CONSEQUENCES OF NOT PROCEEDING

The consequences of the Jandra Quarry extension not proceeding will relate to CSR's ability to service its internal concrete market, the supply of materials for local road works and the Pacific Highway upgrading and to the life of the Jandra Quarry itself.

Demand for hardrock products in the region from Johns River to Bulahdelah amounts to 640,000 tonnes per annum for the foreseeable future. In addition, future production levels are likely to be higher due to the significant demand for extractive materials in the region resulting from potential overlapping of six major upgrades of the Pacific Highway to be undertaken over the next five years, being the sections:

- Karuah to Bulahdelah;
- Coolongolook to Wang Wauk;
- Bundacree Creek to Possum Brush;
- Cundletown to Coopernook;
- Coopernook By-pass; and
- Coopernook to Mooreland.

A portion of the existing supply, 90,000 tonnes, comes from the CSR river gravel operation at Taree. CSR plan to close the river based operation, and continue this component of gravel supply from the expanded Jandra operation. In the event that the Jandra expansion did not proceed this option would not be available, possibly leading to a shortage in supply following the closure of the river quarry. The closure of the Manning River operation will enable the release of land suitable for at least 80 residential lots in Taree West.

It is anticipated that at present rates of production the remaining resource in the existing Jandra Quarry will last for just over four years.

The consequences of the Jandra extension not proceeding would mean:

- in six months time CSR would not be able to maintain the supply of product currently provided by the Manning River operation to its local market including CSR's four concrete plants;
- the current restriction on production at Jandra Quarry of 150,000 tpa in addition to the closure of the Manning River operation could result a short-fall in the current supply of extractive materials in the region, especially when considering the potential significant demands from the Pacific Highway upgrades.
- in four years time the cessation of operations at Jandra Quarry would result in a significant short-fall of available extractive materials in the region including concrete aggregates and materials for available Pacific Highway upgrades.

In addition, the closure of the Jandra Quarry would impact on up to 11 direct jobs on site and possibly impact on several others (e.g. truck drivers) associated with the development of this resource.

The Jandra Quarry has been identified as a *Regionally Significant* existing extraction site on the NSW North Coast (identified by Department of Urban Affairs and Planning and North Coast Extractive Industries Standing Committee).

Characteristics of *Regionally Significant* operations are as follows:

- | | | |
|----|----------------------|---|
| 1. | Size | Total available or potential resource greater than the annual demand for the commodity in the North Coast region. |
| 2. | Production | Annual production greater than 5% of the total regional demand for the commodity. |
| 3. | Market | An important source for more than one significant part of the North Coast region. |
| 4. | Site Characteristics | Location, ownership, deposit type, scarcity of alternatives or other specific factors which warrant classification as regionally significant. |

The major consequence of the project not proceeding would be the loss of this regionally significant resource within four to five years.

8.3 CUMULATIVE IMPACTS

The original Jandra quarry was approved by the Land and Environment Court in 1985 and applied to a site area of approximately five hectares. Since that time, annual production has measured from 50,000 tonnes per annum of processable rock to 150,000 tonnes per annum with a weekly demand rate of 10,000 tonnes.

The proposed quarry expansion will expand the quarry pit over an additional 14.3 hectares.

The impact assessments conducted in association with the preparation of this EIS have addressed the likely environmental impacts which will be generated by this

project. Implementation of the recommended mitigation measures will ensure that the quarry extension satisfies all relevant environmental criteria.

Cumulative impacts relate to a combination of on-site impacts and off-site, possibly pre-existing impacts which together produce an impact not entirely caused by the project.

An examination of flora and fauna characteristics on the site and on land adjacent to the site has revealed that vegetation removal could disrupt existing wildlife corridors. The subject land is substantially vegetated due to the quarry occupying a small proportion of the total area. Elsewhere on site disruption has occurred due to road and dam construction, and some clearing for agriculture, however the majority of the site is substantially vegetated.

To the west of the site, the Pacific Highway which is constructed to dual carriageway standard forms a barrier to fauna movement. Land to the north and south-east is forested, while land to the east and south has been substantially cleared for agriculture.

As a result of the previous land use activity in the vicinity, the subject land forms a potential corridor for fauna moving in a north/south direction.

The clearing proposed for the quarry expansion has the potential to reduce a wildlife corridor across the land, and accordingly replacement plantings to recreate the wildlife corridor to the east of the site has been recommended. Details of this mitigation measure are in Chapter 5.

This impact on fauna movement is the major cumulative impact identified in the assessment process.

8.4 PROJECT JUSTIFICATION

8.4.1 *Biophysical Considerations*

To assess the likely impacts of the quarry extension, an eight part test was undertaken pursuant to the provisions of Section 5A of the Environmental Planning and Assessment Act. The eight part test is used to determine whether there is likely to be a significant effect on threatened species, populations or ecological communities or their habitats.

The overall finding is that the extent of proposed habitat removal associated with the proposed quarry development is unlikely to significantly impact on threatened species likely to occur on site.

An eight part test was also undertaken in respect of aquatic ecology. The conclusion of this assessment was also that it is highly unlikely that the proposed development will cause any adverse effect on threatened fish species, populations or habitats.

i. Water Management

Quarry operations create the potential for erosion and sedimentation to impact on the natural environment. To protect the natural environment it is important that adequate mitigation measures are used. Measures recommended in association with the extended quarry operation include:

- ❑ an adequate erosion and sediment control plan;
- ❑ use of sedimentation dams;
- ❑ minimisation of disturbed areas;
- ❑ installation of temporary erosion and sediment controls prior to topsoil and overburden removal;
- ❑ sequential clearing and rehabilitation of the quarry working areas;
- ❑ regular maintenance of erosion and sediment control structures; and
- ❑ construction of three additional permanent sediment control dams.

In addition, specific mitigation measures are proposed when the mobile asphalt plant, pugmill and pre-coating facility are in operation.

ii. Air Quality Management

Assessment of air quality has been undertaken having regard to the various processes to be employed at the extended quarry. These include blasting, crushing and screening, operation of an asphalt plant and a pugmill, and general site activities.

The assessment includes an analyses of the processes involved, the level of impacts generated and the mitigation measures recommended.

Regarding the blasting process, the main finding is that potential impacts are only episodic and as long as standard drilling and blasting procedures are followed it is anticipated that these processes will not have a significant impact on dust levels at nearby residences.

Dust emissions from crushing and screening operations are to be mitigated by water sprays, which will mean that dust emissions will be insignificant under normal conditions.

A number of mitigation measures have been recommended for the asphalt plant, including control of emissions from the exhaust stack. These mitigation measures will ensure that odour emissions from the plant will not have a significant impact on nearby receptors.

The pugmill will not be in regular operation at the site. Emissions of dust or odour are not expected to be significant.

The overall conclusion on air quality is that all potential emissions have been identified, quantified and appropriate mitigation measures recommended as appropriate.

8.4.2 Economic Considerations

Economic considerations relating to the proposed operation concern the need for this product to support economic growth in the region, and the value of the activity as an employment generator.

The quarry supplies rock products which support the road and building construction activities in the region. The current demand for stone products associated with these industries is estimated at 640,000 tonnes per annum, of which an estimated 220,000 to 250,000 tonnes will be supplied from the Jandra quarry.

This product is used in the processes of road and building construction which are major industries in the region. The largest road construction project is the Pacific Highway upgrade between Hexham and the Queensland border. The upgraded highway is essential to support the continued growth in interstate and intrastate traffic movements.

The growth projections for the five Local Government Areas in the vicinity of Jandra - Greater Taree, Great Lakes, Port Stephens, Newcastle and Lake Macquarie over the period 1991 to 2016 are between 28% and 34% (range 535,300 to 561,000, from an existing population of 418,180 in 1991). An adequate supply of rock products for use in concrete production is essential to support this growth.

The expanded quarry operations will assist the employment created through the road and building construction industries and will itself maintain employment for 11 full-time employees.

8.4.3 Social Considerations

The proposed quarry extension has the potential for impacts on the human environment in the areas of noise, vibration and dust generation. In addition it has the opportunity to create employment through its own operations and in supporting industries which use quarry products.

i. Noise Assessment

A noise assessment was undertaken of the existing quarry operation and Stages 1 and 3 of the proposed development representing noise exposures for surrounding residences. These stages were identified as representing the worst case scenarios. The results of the assessment are:

- existing noise levels are within the EPA criteria of 10% of the time;
- noise levels for Stage 1 are within the criteria with no exceedences for the adopted criteria at the 10% of the time criteria at any residence; and
- noise levels for Stage 3 exceed the criteria by two 2 dB(A) at two residences located east of the site for the worst case scenario modelled.

The identified noise exceedance for Stage 3 is due to the operation of a D8 dozer undertaking land clearing activities. The problem can be mitigated as follows:

- operation of the D8 dozer only in non-adverse meteorological conditions; and
- limited use of equipment simultaneously on high or exposed benches.

ii. Vibration

It is anticipated that to win material, one or two blasts per month on average will be required following the method explained in Section 3.7.2 of this report.

Blasting will conform to EPA guidelines and no specific mitigation measures are required to reduce noise or overpressure levels.

iii. *Dust*

Issues of impact of dust generation have been addressed under 8.4.1 ii - *Air Quality Management*.

iv. *Employment*

The expanded quarry will employ nine full time employees and will provide an important source of raw material to the road and building construction industries.

8.4.4 *Principles of Ecologically Sustainable Development*

As the proposed development is designated development as defined under Schedule 3 of the Environmental Planning and Assessment Regulation 1994, the definition of the Principles of ESD which applies in this case, is that found in Schedule 2 of the Regulation.

"

8. *For the purposes of this Schedule, the principles of ecologically sustainable development are as follows:*

- (a) *The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

In addition, the application of the precautionary principle, public and private decisions should be guided by:

- (i) *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
- (ii) *an assessment of the risk-weighted consequences of various options.*
- (b) *Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.*
- (c) *Conservation of biological diversity and ecological integrity - namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*
- (d) *Improved valuation, pricing and incentive mechanisms - namely, that environmental factors should be included in the valuation of assets and services, such as:*

- (i) *polluter pays - that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
- (ii) *the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste, and*
- (iii) *environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

.....”

The regulations do not prescribe guidelines for the application of the principles of ESD in the assessment of a designated development.

A draft set of guidelines has been produced by the NSW Department of Urban Affairs and Planning (DUAP, 1995) and these have been applied in the following analysis of the Jandra Quarry extension. The checklist used is taken from Table 5 “Factors to Consider in Deciding the Acceptability of the Proposal based on ESD Principles”.

Table 5: Factors To Consider In Deciding The Acceptability Of The Proposal Based On ESD Principles

Considering biodiversity and ecological integrity issues	Would the implementation of the proposal:	
	• prevent or not increase the loss of or unacceptable risk to species or important habitat;	Yes
	• improve or not reduce the capacity for continued evolution of species;	Yes
	• result in effective conservation and management of vegetation communities or habitat of high conservation value;	None identified
	• rehabilitate degraded areas to meet specified minimum standards;	Yes - rehabilitation plan included to mitigate visual impact.
	• result in the sustainable use of biological resources;	N/A
	• improve knowledge of natural resources and management of threats;	No - quarrying of hardrock is a well understood and managed industry.
	• improve or not reduce the opportunity of conservation of	Yes

	<p>ecosystems in NSW, Australia or overseas;</p> <ul style="list-style-type: none"> • improve or not affect important ecological processes; • not increase or reduce the concentrations of "greenhouse" gases; • not increase or reduce the use of ozone depletion gases; • prevent erosion, conserve top soil or fertility and structural integrity of soils; • not increase the levels of nutrients or salts in soil beyond a certain level; • reduce the rate or reverse the process of salinisation or acidification; • not increase or reduce the levels of toxic chemicals or heavy metal concentrations in soil, air or water; • not deplete aquifers or fluvial environmental flow below certain levels; • improve or not reduce water quality levels (both groundwater and surface water); • not increase the noise, vibration, dust or odour levels beyond certain levels; <p>• not result in bioaccumulation of substances beyond certain levels which would be likely to be harmful to biodiversity;</p> <p>• comply with existing standards, strategic planning performance indicators or parameters, international agreements or conventions?</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>N/A</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes with application of mitigation measures.</p> <p>Yes</p> <p>Yes</p>
<p>Considering social equity (Inter and Intra generational) issues</p>	<p>Would the implementation of the proposal:</p> <ul style="list-style-type: none"> • not foreclose on options for future generations with regard to the use of natural resources; • develop substitutes for non-renewable resources; • use resources as efficiently as practicable given best available technology; • efficiently recycle resources in an environmentally sound manner; • utilise renewable or recycled resources as substitutes to 	<p>Hardrock is a non renewable resource. Its use is to benefit current and future generations. No however it is a common resource and will have an indefinite life span in concrete constructions and road use.</p> <p>Yes</p> <p>No. Quarrying does not involve recycling.</p> <p>No</p>

	<p>non-renewable resources;</p> <ul style="list-style-type: none"> • contribute to societies knowledge base to improve the efficiency of use or recycling of resources or to manage the disposal of waste in a sustainable manner; • not result in or present a significant risk of environmental damage that can only be repaired by future generations; • not exceed the assimilative capacity of the environment; • not lose or present a significant risk of loss of natural resources including biodiversity and ecological integrity; • improve the overall social equity. for instance, result in a fairer distribution of benefits and costs within the community, region or state and with the less well off sectors less disadvantaged; <p>• respond to the concerns expressed by the community during public consultation;</p> <p>• not result in heritage values or other special values of society or sections of the community being degraded or depleted;</p> <p>• not result in loss of community integrity?</p>	<p>No</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>The development of the resource will benefit the region and the state by contributing to a safe highway and affordable construction materials.</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Considering improved valuation issues	<p>Would the implementation of the proposal:</p> <ul style="list-style-type: none"> • result in no 'free' use of any aspects of the environment with an appropriate valuation of the resources to be used or affected by the proposal being fully costs and considered; • result in the costs of any pollution or environmental degradation being internalised and appropriate monitor, training and management regimes being established; • result in the applicant being willing to pay the costs of compliance, compensation for non-compliance and a performance bond as guarantee; <p>• result in energy, water and other resources savings and the use of renewable sources being maximised;</p> <p>• result in maximising recycling of material when it is resource efficient;</p> <p>• result in maximising output from the proposal per unit of</p>	<p>Yes</p> <p>Yes</p> <p>Yes - except for performance bond. This is not covered by legislation and is considered unnecessary.</p> <p>No</p> <p>No</p> <p>Yes - operations most</p>

	energy inputs	modern efficient quarrying methods available.
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i. Conclusion

The above checklist in *Ecologically Sustainable Development in Environmental Impact Assessment* (DUAP, 1995) is useful as a set of checklists for proposals. It is in draft form and appears to not be totally suitable for assessment of extractive industries. Extractive industries are only a component of other industries including road construction and building construction.

Quarrying deals with a resource which is relatively commonly available. It is not generally concerned with recycling or renewable resources, though CSR recycles minor volumes for quarry rehabilitation and maximises the potential use of extracted material. The overall assessment of the project demonstrates that it satisfies the principles of ecologically sustainable development to a very high level.

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