- 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 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.

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).

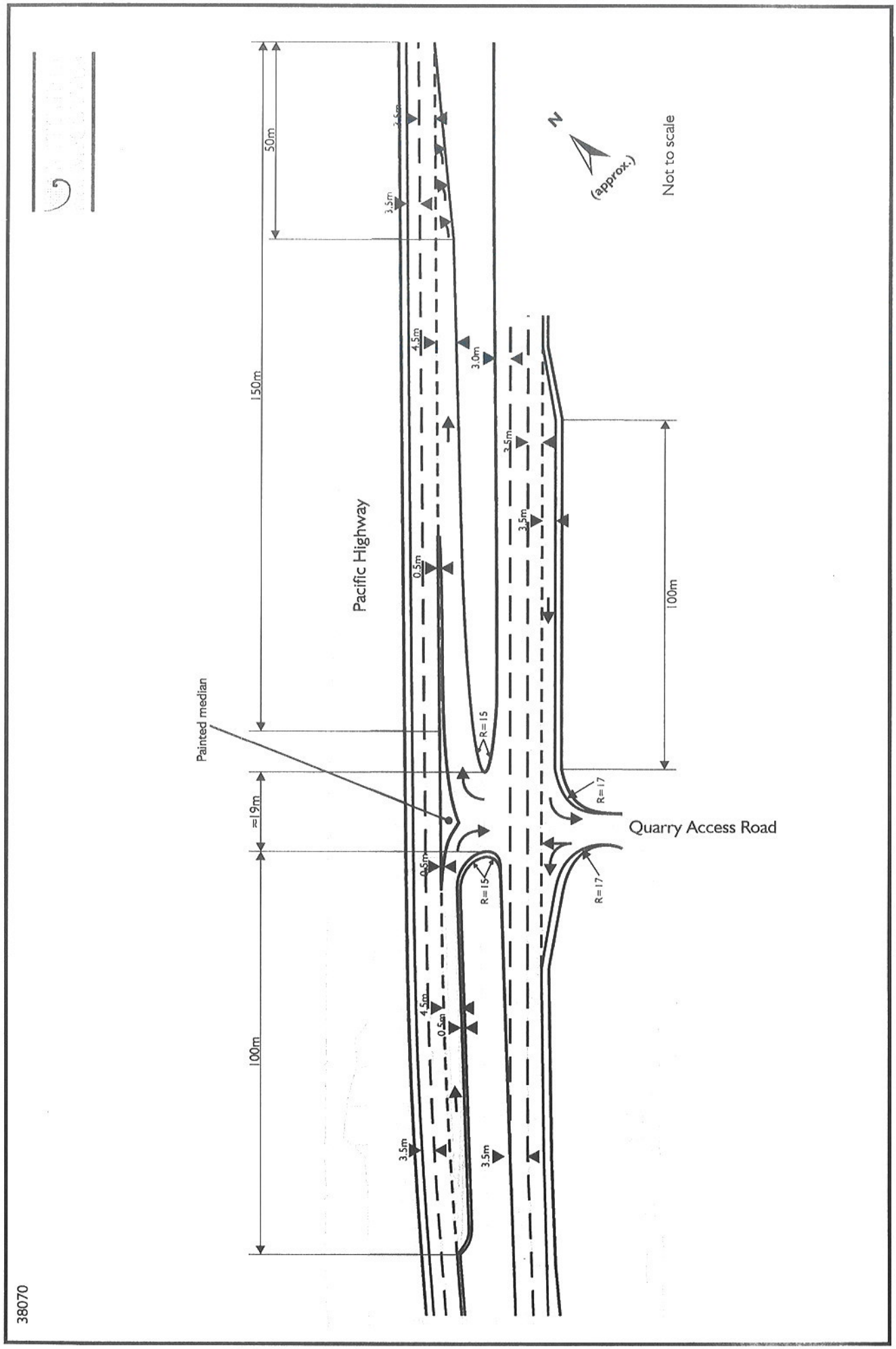

Figure 6.5 IMPROVED INTERSECTION DESIGN

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.

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7 ENVIRONMENTAL PROTECTION AND MITIGATION MEASURES

Chapter 7

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

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;
  - CH_4, H_2, N_2, CO, CO_2 and O_2;
  - particulate;
  - Stack gas moisture, velocity and temperature; and
  - mass flow rate of exhaust gases, water, particulate, N_2, CO, CO_2 & O_2.

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.

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8 PROJECT JUSTIFICATION

Chapter 8

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 his 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

	ecosystems in NSW, Australia or overseas; • 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; • not result in bioaccumulation of substances beyond certain levels which would be likely to be harmful to biodiversity; • comply with existing standards, strategic planning performance indicators or parameters, international agreements or conventions?	 Yes Yes Yes Yes Yes N/A Yes Yes Yes Yes with application of mitigation measures. Yes Yes
Considering social equity (Inter and Intra generational) issues	Would the implementation of the proposal: • 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	 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. Yes No. Quarrying does not involve recycling. No

	non-renewable resources; • 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; • respond to the concerns expressed by the community during public consultation; • not result in heritage values or other special values of society or sections of the community being degraded or depleted; • not result in loss of community integrity?	No Yes Yes Yes The development of the resource will benefit the region and the state by contributing to a safe highway and affordable construction materials. Yes Yes Yes
Considering improved valuation issues	Would the implementation of the proposal: • 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; • result in energy, water and other resources savings and the use of renewable sources being maximised; • result in maximising recycling of material when it is resource efficient; • result in maximising output from the proposal per unit of	Yes Yes Yes - except for performance bond. This is not covered by legislation and is considered unnecessary. No No Yes - operations most

	energy inputs	modern efficient quarrying methods available.

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.

REFERENCES

Andrews A, 1990
Fragmentation of Habitat by Roads and Utility Corridors: a Review. In *Australian Zoologist*, 26, 130-141

ANZECC, 1990
Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration

Bennett AF, 1991
Roads, Roadsides and Wildlife Conservation: a Review. In *Nature Conservation 2: The Role of Corridors*. 99-118

CSR Construction Materials, 1999
Drilling and Blasting Procedures for Jandra Quarry

CSR Construction Materials, 1999
Jandra Quarry Quarry Development Plans - April 1999

Davies C, 1984
Environmental Impact Statement Proposed Extractive Industry at Possum Brush, NSW. For Jandra Blue Metal Quarries P/L

Department of Bushfire Services, 1992
Planning for Bushfire Protection

Department of Planning, 1994
Hunter Coastal Urban Settlement Strategy

DUAP, 1995
Practice Guidelines: Draft for Discussion ESD in EIA (unpublished)

DUAP, 1999
Extractive Industries and Minerals on the North Coast

EPA, 1994
Environmental Noise Control Manual

EPA, 1998
Draft Stationary Noise Source Policy

Evans T and Fitzpatrick T, 1996
Taree and Environs Koala Habitat Study - A Resource Study of the Natural Vegetation within the Taree Koala Management Area. Greater Taree City Council, Taree

Forestry Commission of NSW, 1989
Forest Types in New South Wales - Research Note No. 17

Gibbs JP, 1998
Amphibian Movements in Response to Forest Edges, Roads and Streambeds in Southern New England. In *Journal of Wildlife Management*, 62, 584-589

Goosem M & Marsh H, 1997
Fragmentation of a Small-mammal Community by a Powerline Corridor through Tropical Rainforest. In *Wildlife Research*, 24, 613-629

GTCC, 1996
Community Profile

Laurance WF, 1997
Responses of Mammals to Rainforest Fragmentation in Tropical Queensland: a Review and Synthesis. In *Wildlife Research*, 24, 603-612

NSW Department of Housing, 1998
Managing Urban Stormwater - Soils and Construction

RTA, 1991
Road Design Guide

RTA, 1995
Traffic Volume Data for the Northern Region

Stenhouse I, 1997
Jandra Hard Rock Quarry Geological Investigation