Cleary Bros (Bombo) Pty Ltd

GERROA SAND QUARRY PROPOSED EXTENSION

Environmental Assessment

Perram & Partners

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Environmental Assessment

For: Cleary Bros (Bombo) Pty Ltd

Report 102R4
October 2006

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CERTIFICATION OF ENVIRONMENTAL ASSESSMENT

PREPARED PURSUANT TO PART 3A OF THE *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979*

ENVIRONMENTAL ASSESSMENT PREPARED BY

Name:	T W Perram
Qualifications:	BSc(Eng), MEngSc, DipEnvStud
Address:	Perram & Partners 12 Clanwilliam Street, EASTWOOD NSW 2122

in respect of:

PROJECT TO WHICH PART 3A APPLIES

Proponent Name:	Cleary Bros (Bombo) Pty Ltd
Proponent Address:	PO Box 210, PORT KEMBLA 2505
Land to be developed: Address	Berry Beach Road Gerroa
Lot No. DP/MPS, Vol/Fol etc.	Part of Lot A DP 185785 and part of the land in certificate of title Volume 5841 Folio 139
Proposed Development	Extend to the north an existing sand mining operation at Gerroa. The extension will incorporate an additional 7.5 hectares of land containing an estimated 660,000 cubic metres of sand resource.

ENVIRONMENTAL ASSESSMENT

An environmental assessment is attached

CERTIFICATION

I certify that I have prepared this environmental assessment and to the best of my knowledge:

- it has been prepared in accordance with Section 75E of the *Environmental Planning and Assessment Act 1979,*
- the information contained in the Environmental Assessment is neither false nor misleading.

Signature: _____

Name: T W Perram

Date: October 2006

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

Page No.

LIST OF FIGURES

LIST OF PHOTOGRAPHS

GLOSSARY

AHD	-	Australian Height Datum
ANZECC	-	Australian and New Zealand Environment Conservation Council
ARI	-	Average recurrence interval
AS	-	Australian Standard
ASS	-	Acid sulphate soil
ASSMP	-	Acid sulphate soil management plan
DEC	-	Department of Environment and Conservation
DOP	-	Department of Planning
DLEP	-	Draft local environmental plan
DPI	-	Department of Primary Industries
DNR	-	Department of Natural Resources
DP	-	Deposited plan
QEMP	-	Quarry environmental management plan
EP&A Act	-	Environmental Planning and Assessment Act 1979
EPBC Act	-	Environment Protection and Biodiversity Conservation Act 1999 (Cwealth)
LEP	-	Local environmental plan
PASS	-	Potential acid sulphate soil
POEO Act	-	Protection of the Environment Operations Act 1997
REP	-	Regional environmental plan
RTA	-	Roads and Traffic Authority
SEPP	-	State environmental planning policy

EXECUTIVE SUMMARY

Introduction

Cleary Bros (Bombo) Pty Ltd has operated a sand quarry in Berry Beach Road, Gerroa for about 50 years. Approval is now sought to extend the sand quarry to the north, incorporating some 660,000 tonnes of winnable sand.

The Minister for Planning has declared the sand quarry extension to be a "project" to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies. In accordance with Part 3A, the Minister's approval is required for the project to be carried out.

The Site

The land is owned by Bridon Pty Ltd, a member of the Cleary Bros group of companies. The existing sand quarry overlaps the boundary between Shoalhaven and Kiama local government areas. While the proposed extension is within Kiama, approval is sought for continued operations over the entire sand quarry, affecting both Council areas.

Illawarra Regional Environmental Plan identifies the sand resource as being of regional significance. The existing sand quarry is within a much larger rural property, most of which is cleared land. The sand quarry is located adjacent to an area of remnant bushland, a small portion of which is affected by the proposed extension.

Need

Sand extracted from the site is vital to the construction industry in the Illawarra area and for Cleary Bros' concrete business and engineering works. The sand resource currently approved for extraction is almost exhausted. Approval for the proposed extension is required to enable sand to continue to be extracted from the site.

Development

As the operation is already established on the site, development works for the extension are minimal, including:

- install an additional dust gauge and boreholes to monitor the extension area;
- progressively extend the existing vegetation screen along the road frontage of the site, assisted where practicable by earthen mounds;

- prepare and plant areas of the adjoining farmland identified for compensatory planting and nurture to maturity;
- extend the existing earthen mound where necessary to prevent external flood water entering the extraction area;
- extend internal vehicle access along the western edge of the extraction area, utilising the flood barrier where suitable;

Site development works will be ongoing as sand extraction proceeds to the north.

Operation

It is proposed to continue the current variable rate of extraction, whereby the company extracts sand from the Gerroa resource at sufficient rate to maintain its stockpiles to satisfy fluctuating market demand. No change is proposed to the method of operation or the current extraction limit of 80,000 tonnes per annum. Approval is sought to continue operations for up to 15 years.

Sand is extracted using a dredge to extend the pond into prepared land from which vegetation has been cleared and topsoil collected. Material dredged from the pond passes through a wet screen separating sand from material of other size classifications. Clay particles and other fines are washed through the screen and return to the pond. Stones are diverted to a separate pile. Sand and other materials are stockpiled for loading to delivery trucks using a front end loader.

Rehabilitation

The shoreline of the southern section of the dredge pond, from which extraction has been completed, has been stabilised with vegetation and returned to wildlife habitat. This work is continuing along the eastern side of the pond where extraction is complete. Rehabilitation will progress around the entire shoreline following sand extraction.

Planning Instruments

Under Part 3A of the Act the Minister may approve the project. Although existing environmental planning instruments have no application in the approval process, State environmental planning policies apply to the carrying out of a project approved under Part 3A.

The relevant provisions of the various environmental planning instruments that would otherwise control development on the site have been assessed and considered in this report.

Environmental Impact Assessment

Sand and Soil

The soil profile has been investigated with test drilling to confirm the extent of the sand resource. Of 69 collected samples, four reacted during tests to indicate potential acid sulphate soils. An acid sulphate soils management plan has been prepared to describe monitoring and contingency action. Sand extraction operations will be undertaken in accordance with the plan should acid sulphate conditions be encountered.

Hydrology and Water Quality

The sand quarry is a closed catchment, bunded to prevent surface water exchange with the surrounding land for all water levels up to the once in 100 year flood. The rural land external to the site drains via a system of man-made channels to Blue Angle Creek and then to the Crooked River.

Water quality in the dredge pond is generally of a higher standard than that in adjacent waterways. Records of pH measurements from the dredge pond and nearby groundwater bores indicate relatively benign conditions, within the natural range of groundwater.

Flora and Fauna

An extensive investigation of flora and fauna on the site has been undertaken over a number of years. The proposed extension includes about 1.7 hectares of previously logged forest, 1.6 hectares of modified forest, 0.3 hectares of planted trees and 3.9 hectares of cleared grassland.

There are three forest types of conservation significance in the area: Littoral Rainforest; Swamp Sclerophyll Forest on Coastal Floodplains; and Bangalay Sand Forest. All three are listed as endangered ecological communities in the *Threatened Species Conservation Act 1995*. Another forest type, Blackbutt Tall Forest is not of conservation significance and consists of relatively young trees left over from earlier logging.

The boundaries of the proposed extension have been drawn to avoid the most important forest type for fauna (Swamp Sclerophyll Forest) and preserve the more complete section of Littoral Rainforest. Previous clearing and grazing have heavily disturbed the Bangalay Sand Forest. The habitat value of the affected Blackbutt and Bangalay trees has been assessed based on the occurrence of hollows. A very low density of hollows was observed indicating the affected forest areas do not provide significant fauna habitat.

It is planned to undertake compensatory planting over 20 hectares of the broader rural property, more than five times the area of forest affected by the sand quarry extension. A draft vegetation management plan has been prepared to specify this work.

Archaeology and Heritage

Subsurface investigation for Aboriginal relics has been carried out across the extension area comprising 51 test pits. The archaeologist found shell midden material to be sparsely and spasmodically spread across the sand dune with artefacts even more sparsely spread. This is consistent with previous findings on other parts of the dune system already extracted. The archaeologist is of the opinion that there are no reasons from an archaeological perspective to prevent the sand quarry extension from proceeding. Limited salvage excavations will be undertaken from selected locations, as recommended by the archaeologist.

There are no listed items of European heritage likely to be affected by the sand quarry extension.

Landscape and Visual Characteristics

The existing sand quarry has been effectively screened from public view by a combination of earthen mound and screen planting along Crooked River Road. It is proposed to continue the planted screen along the remainder of the property's road frontage. Each incremental extension of the sand quarry will take place only when an effective screen has been established along the relevant section of road frontage.

Noise

A noise assessment has been carried out confirming that when sand mining moves into the extension area the operation will continue to comply with noise guidelines recommended by the Department of Environment and Conservation.

Air Quality

Dust deposition at two monitoring locations within the site has been lower than the annual average threshold for loss of residential amenity recommended by the Department of Environment and Conservation. Dust levels external to the site, including at the nearest residences would be expected to be lower again. In preparation for the northern extension, a new dust gauge will be installed at the northern end of the site.

Transport

The proposed sand quarry extension involves continuation of an existing operation. A traffic study carried out in 2001 found that the level of traffic generation does not provide any traffic engineering or capacity concerns and that vehicles associated with the sand quarry raised no particular concern in accident statistics for the surrounding road system. Examination of current traffic and accident data indicate that the conclusions of the 2001 report remain valid. Traffic generation from the site is controlled by the approved annual output which has not changed.

Heavy vehicles accessing the site will remain restricted to defined routes to the north and south.

Socio Economics

The sand deposit being mined at Gerroa has been identified as a regionally significant extractive resource. A previous application to extend the sand quarry was approved by the Minister as State significant development.

Continuation of sand mining is essential to provide a cost-controlled input for Cleary Bros' concrete business and engineering works. Independent economic analysis has shown a positive benefit-cost outcome for the sand quarry but forecasts serious economic consequences for the Illawarra region if the company's sand quarry were to close, including loss of $22 million annually in direct and indirect regional output and loss of 96 direct and indirect jobs.

Health and Hazards

The proposal will meet all occupational health and safety requirements and include safeguards aimed at ensuring no risk to persons on surrounding land. Emergency bushfire procedures are included in the quarry environmental management plan.

Justification

The proposal is considered justified because of the benefits to the Illawarra region of extracting a regionally significant sand resource and maintaining the regional income and employment resulting from Cleary Bros' operations. The existing sand quarry has continued on the property for decades without significant effect on the Gerroa community. Operational controls are well established and will be enhanced by implementing an acid sulphate soils management plan.

Mitigating measures are proposed for significant issues of the biophysical environment, including removal of a section of disturbed forest and preventing public views into the extractive workings. Disturbed forest removal will be compensated by planting and nurturing vegetation over approximately five times

the disturbed area and views will be restricted by extending the existing visual screen along the road frontage of the extension area.

Chapter 1

INTRODUCTION

1.1 BACKGROUND

Sand has been extracted from Cleary Bros' sand resource at Gerroa for approximately 50 years. Material is drawn from beneath the surface of a fresh water pond using a floating dredge and then washed through screens to recover high quality sand for use in concrete manufacture and construction works. The site is one of only a few sources of fine aggregate (sand) in the Illawarra region.

The sand resource currently approved for extraction has almost been exhausted. Consequently Cleary Bros is now seeking approval to extend the area from which sand extraction is permitted. The proposed extension is located to the north of the current extraction limit, within land owned by the Cleary Bros group.

The regional location of the property is shown on *Figure 1.1*. Details of the site are presented in section 2.

1.2 THE APPLICANT

Cleary Bros (Bombo) Pty Ltd is one of the companies within the Cleary Bros Group, a privately owned engineering enterprise based in the Illawarra Region. The Group is a successful independent operator in the construction and materials supply industries, having grown over a period of more than 80 years by diversifying and vertically integrating its operations.

From its beginnings associated with the transport and timber industries, Cleary Bros now operates a number of divisions including:

- earthmoving equipment hire and transport services through an extensive fleet of heavy equipment, trucks and mobile cranes;
- quarrying basalt, sandstone and sand from three extractive sites:
  - a sand extraction operation at Gerroa,
  - a sandstone extraction operation at Menangle; and
  - a hard rock quarry at Albion Park.

  Large mobile screening/crushing plants are used with pug mills for producing stabilised road base and other specialised products;
- pre-mixed concrete, manufactured by four concrete plants located in the Illawarra area;

- civil engineering consulting and construction, including project management, where an array of expertise has been developed in:
  - roadworks and drainage construction;
  - heavy earthworks;
  - project management; and
- environmental engineering and waste management services

Each of the divisional activities is supported by extensive service and repair facilities through a number of large workshops and specialised service vehicles. An ongoing policy of the group is to maximise the use of local resources to ensure the reliability of operations and to continue support for the Illawarra area.

The company has established a reputation for quality and reliability. Operations are conducted within an environmental management system compliant with AS/NZS/ISO 14001 and AS/NZS/ISO 9001.

Cleary Bros currently employs approximately 400 people, of which up to 10 are directly involved with dredging, processing and delivery of materials from Gerroa sand quarry. A much larger number of the group's employees are reliant upon the quarry's production. An economic evaluation has been carried out to determine the effects on regional employment provided by the group if sand extraction operations were to permanently cease at Gerroa (refer to section 5.10).

The Group maintains active involvement with many community organisations. Cleary Bros contributes significantly to the Illawarra community in the form of cash donations and work in kind. The Group also makes a number of senior executives available for assistance with committee work associated with community organisations.

1.3 DEVELOPMENT HISTORY

In recent times there have been two development approvals governing operations on the site. In 1990, the Land and Environment Court issued development consent to Bridon Pty Ltd, a member of the Cleary Bros group of companies, permitting the then existing extraction area to be extended to the north. This approval carried a time limit, which was twice extended by the court, eventually expiring in December 2003. The approved area was not fully extracted when this approval expired.

In September 2003, the Minister for Infrastructure and Planning issued development consent to Cleary Bros for extraction to continue within a further limited area of the site. The limitations arose from changes to the planning regime for the property that occurred during the currency of the 1990 consent:

- Kiama Local Environmental Plan 1996 came into force designating part of the Court-approved extraction area to be an "area of high conservation significance"; and
- the Threatened Species Conservation Act 1995 came into force including a listing of the *Sydney Coastal Estuary Swamp Forest in the Sydney Basin Bioregion* as an endangered ecological community. An area of Swamp Mahogany-Swamp Oak forest within the Court-approved extraction area is a sub-group of the endangered community.

Figure 1.2 shows the land approved for extraction by the Court's consent of 1990 and the Minister's consent of 2003 together with the extension area now sought. About 40 per cent of the extension area for which approval is now sought was previously approved for extraction by the court.

1.4 NEED FOR THE EXTENSION

The sand extraction area at Gerroa needs to be extended because sand resources within the area currently approved for extraction are almost exhausted. Remaining sand approved for extraction is located within the pond and beneath the processing area. The processing area is essential for continued operations at the sand quarry and will only be extracted as a final stage prior to termination of extractive activities on the site. *Figure 1.3* shows the location of the remaining sand currently approved for extraction.

There are proven sand resources on the property adjoining the area currently approved for extraction. Cleary Bros is not aware of any other extractive resource in the Illawarra area that is available for the company to extract sand to replace the output from the Gerroa operation.

Cleary Bros operates a successful business as an independent supplier of quarry products and batched concrete and undertakes civil engineering projects where company-supplied products are used. The continued competitiveness of Cleary Bros within these markets is dependent upon having a reliable supply of sand from an extractive operation controlled by the company. If the company were forced to purchase this fundamental resource from competitors, there would be no certainty for the long-term viability of its operations reliant on extractive materials.

Consequently, in order to secure the long-term supply of this raw material vital to its operations, Cleary Bros is compelled to seek approval to continue to extract sand from within the company's property beyond the area currently approved for extraction. Much of this area was previously approved for extraction in the 1990 decision of the Land & Environment Court.

1.5 OBJECTIVES

The objectives of the proposal examined in this assessment include:

- extend the Gerroa sand quarry in a northerly direction within Cleary Bros property;
- continue to extract sand from the site and to wash, screen and stockpile extractive products on the site within the area currently approved for operations;
- continue to load and transport sand and other products to the company's operations or to customers or permit collection by customers from the site;
- continue to bring other bulk materials to the site for sale, such as topsoil, blue metal, river stones, garden mulch and the like;
- operate the facility for sufficient duration to enable the resource to be fully extracted in an orderly manner with a varying rate according to market requirements;
- manage the facility to achieve environmental performance objectives derived from conditions of approval and consolidated in an environmental management and rehabilitation plan;
- rehabilitate the site to retain a fresh water pond with stable shoreline and appropriate native vegetation and access tracks consistent with its ongoing management as a rural property; and
- establish compensatory bushland elsewhere on the property in consideration of the effects of the proposal on vegetation.

1.6 DETERMINATION PROCEDURE

1.6.1 Purpose of this Assessment

The Minister for Planning has declared the proposed extension of Cleary Bros Gerroa sand quarry to be a "project" to which Part 3A of the *Environmental Planning and Assessment* (EP&A) *Act, 1979* applies. The Minister's approval is required to permit the project to be carried out.

This assessment has been prepared in accordance with requirements received from the Director-General of Planning dated 20 January 2006. A copy of the letter from the Director-General is included in *Appendix A*.

1.6.2 Exhibition and Determination

This environmental assessment is submitted to the Director-General and if accepted will be made publicly available for a period of at least 30 days. Copies of any submissions received are to be provided to the proponent (Cleary Bros) who may be required to submit responses to the submissions and if significant changes are proposed, a preferred project report.

The Director-General will then prepare a report for consideration by the Minister. Having considered the Director-General's report, the Minister may determine the application.

1.6.3 Subsequent Approvals

The Minister's determination obviates the need for the majority of subsequent approvals that might otherwise be required under other legislation. The Department of Environment and Conservation has advised that the existing environment protection licence for the site may not require alteration as the extension will be on the same property and involve no change in extraction rate.

1.7 CONSULTATION

1.7.1 Planning Focus Meeting

Cleary Bros hosted a planning focus meeting on 8 December 2004 to consider the proposed sand quarry extension at the request of the (then) Department of Infrastructure Planning and Natural Resources. At that stage application for Director-General's requirements for an EIS had been made. The purpose of the planning focus meeting was to give Government agencies an opportunity to have the proposal explained, to view the site and to ask questions of the proponent. The agencies subsequently provided written feedback to assist DIPNR in formulating Director-General's requirements.

The EIS process was put aside with the coming into force of amendments to the EP&A Act that enabled the proposal to be declared a project under Part 3A of the Act.

The following agencies attended the planning focus meeting:

- DIPNR (now Department of Planning);
- DIPNR (now Department of Natural Resources);
- Department of Environment and Conservation (former EPA);

- Department of Mineral Resources;
- Shoalhaven City Council; and
- Kiama Council.

The National Parks and Wildlife Service, then newly incorporated into the Department of Environment and Conservation, was invited to the planning focus meeting but was unable to be represented.

Copies of responses submitted by the authorities following the planning focus meeting are included in *Appendix B*. These responses have been considered in preparing this environmental assessment.

1.7.2 Further Authority Consultation

In April 2006, correspondence was sent to public authorities who had attended the planning focus meeting advising them that the proposal was now a project to be assessed under Part 3A of the Act. In each case a copy of the earlier response from the authority was attached with advice that the earlier response would be considered in preparing this assessment. Authorities were invited to respond if there were any additional matters they felt should be considered in preparing this environmental assessment.

Responses received from public authorities to this follow up approach are also included in *Appendix B* and have been considered in preparing this assessment.

1.7.3 Community Consultation

In April 2006, Cleary Bros produced an information leaflet for the purpose of advising the community about the proposed sand quarry extension and seeking comments to be considered in preparing this environmental assessment. A copy of the leaflet is included in *Appendix C*.

Copies of the leaflet were distributed to letterboxes within the village of Gerroa and to rural-residences within four kilometres of the site. The distribution occurred in the week before Easter providing an opportunity for non-resident owners who might visit the area during the holiday break to be informed of the proposal. Copies of the three responses received are included in *Appendix D*. One of the responses is anonymous and comprises a marked up copy of the information leaflet.

Contact was made directly with local community and business groups to explain the proposal and invite comment. Groups contacted include:

- Gerroa Environment Protection Society;
- Gerroa Community Association;
- Kiama & District Chamber of Commerce;

- Berry Chamber of Commerce;
- Jerrinja Local Aboriginal Land Council

A strong concern of the Gerroa Environment Protection Society (GEPS) is the effect of the proposal on flora and fauna. In this regard Cleary Bros endeavoured to arrange a meeting with the Society attended by the company's flora and fauna consultant, Dr Kevin Mills. Unfortunately a suitable time for a meeting could not be found during May 2006 prior to Dr Mills departing for an extended overseas trip. Instead the Society agreed to correspond in writing and forwarded by email an extensive list of concerns and matters to be considered in this assessment. A copy of the submission from the Society is included in *Appendix D* together with some of the preceding correspondence. Following the return of Dr Mills in June 2006 the company was able to meet with GEPS representatives to discuss the sand quarry proposal.

A meeting was held with the president of the Gerroa Community Association on Monday 22 May 2006. The president subsequently advised the Association of the briefing and responded in writing on behalf of the Association. A copy of the submission is included in *Appendix D*. Among other things, the submission raised concerns regarding the distribution of the information leaflet to Gerroa residents. Cleary Bros referred these concerns to the company responsible for distribution and received a written reply, included in *Appendix D*.

Cleary Bros representatives met with the Kiama & District and the Berry chambers of commerce to explain the proposal. A meeting was also held with the Mayor of Kiama on 22 May 2006.

A meeting was held between Cleary Bros representatives and four representatives of the Jerrinja Local Aboriginal Land Council on 28 June 2006. Matthew Barber, archaeologist with Navin Officer Heritage Consultants explained the contents and recommendations of the archaeological report and presented copies of his report to the Land Council representatives to consider and discuss at a subsequent meeting of the Land Council.

Feedback from the community consultation process has been taken considered in preparing this environmental assessment. Cleary Bros has agreed to present a copy of the environmental assessment to the community groups when it is approved for exhibition and to arrange further meetings to explain the proposal in detail.

The process of community consultation will continue while the application is being considered by the Department of Planning and exhibited for public comment. If the Minister approves the proposal, the consultation process will continue through a community consultative committee that will meet on a regular basis during operation of the sand quarry in the extension area.

Appendix D includes a statement of Cleary Bros Community Consultation Plan and the steps that have been taken to date within the framework of the plan.

Chapter 2

THE SITE

2.1 PROPERTY DETAILS

2.1.1 Property Description

The land for which sand mining approval is sought comprises part of Lot A DP 185785 and part of the land in certificate of title Volume 5841 Folio 139 as shown on *Figure 2.1*. The land currently occupied by the sand quarry has an area of approximately 20 hectares, including the existing dredge pond with an area of some 13.5 hectares. The proposed extension will add approximately 7.5 hectares to the extraction area.

The existing operational area has frontages to Crooked River Road and Berry Beach Road and is separated from the balance of the property by fencing and earthen bunds. The proposal will extend the operational area to the north parallel to Crooked River Road.

2.1.2 Ownership

The land is owned by Bridon Pty Ltd, a member of the Cleary Bros group of companies.

2.1.3 Local Government

The land is partly within the City of Shoalhaven and partly within Kiama local government area. All of the extension area is within the Kiama local government area. Zoning and planning controls are discussed in Chapter 4.

2.2 EXISTING LAND USE

2.2.1 Sand Quarry Site

The principal components of the existing sand quarry are shown on *Figure 2.2* and include:

- dredge pond;

- processing and stockpile area;
- access roadways; and
- rehabilitation area.

The dredge pond is a permanent man-made fresh water body with a depth ranging down to about six metres. The pond fills the void created from several decades of sand extraction on the site. The pond is an irregular shape about 800 metres long and 250 metres wide at its widest point. Extraction is proceeding at the northern end by means of a floating dredge.

The processing area is located on the western side of the pond and comprises an office, material stockpiles and an open area for loading vehicles. A smaller processing area located near the northern end of the pond receives and sorts wet sand directly from the dredge.

Access to the site is from Berry Beach Road via a sealed access road that leads to the office and reception area. Attached to the office is a three-sided covered shed for parking plant and vehicles. An unsealed road continues across the processing area and along the side of the pond to the current extraction area.

Rehabilitation works have taken place around the southern and eastern sides of the pond resulting in stable foreshores with mature vegetation. Further rehabilitation is being carried out around other parts of the shoreline as extraction is completed in those areas.

Earthen mounds have been constructed at various locations on the site to restrict visibility, prevent ingress of floodwater and to mitigate noise transmission. A visual bund has been constructed along the Crooked River Road frontage and is substantially revegetated, restricting views from occupants of motor vehicles into the site. This barrier extends northwards beyond the existing dredge pond beside the timbered area.

A further screen of vegetation was planted in the early 1990s in the paddock to the north of the bushland area. That fenced plot is now covered with mature vegetation and prevents views from the north.

The flood bund is located on the western side of the site wherever the natural level falls below 3.5 metres AHD. The flood bund is not continuous because the natural ground level reaches the barrier height in some locations. Noise bunds have been constructed on the southern side of the processing area to restrict noise transmission to residences located some distance to the south and southwest of the property.

A weather station is installed in an open area on the adjoining farmland.

Photographs 1 to 6 (following page 3.6) show various aspects of the existing site.

2.2.2 Surrounding Land

Figure 2.3 is an aerial image compiled from an orthophoto map based on 2001 photography with an inset photograph from 2004 showing a more up to date shape for the dredge pond. The figure shows the extent of the rural holding controlled by Cleary Bros and the nearby land uses.

The sand quarry is part of a rural property extending from Crooked River Road westward to the southern railway. The majority of the property is cleared grazing land, primarily low-lying and flat, having been previously known as Foys Swamp. The land has been drained by a series of channels leading to Blue Angle Creek, which drains the property northwards into Crooked River. Within the property the channel of Blue Angle Creek has previously been enlarged by machine to assist with drainage. A flood gate has been installed across the creek channel at the point of its exit from the property to control salt water backflow from Crooked River when the river is open to the sea.

Remnant bushland vegetation remains on the property to the immediate west and north of the sand quarry. Some of this vegetation is on low-lying swampland, similar to the adjoining farm. Closer to Crooked River Road the land rises into a broad dune of aeolian sand, the primary resource of the sand quarry. Vegetation remains on a small section of the dune immediately north of the dredge pond with the remainder of the dune to the north having been cleared and used for grazing.

Seven Mile Beach National Park occupies all of the land to the east of Crooked River Road across to the coast, a zone of bushland about 500 metres wide.

A sewage treatment plant is located to the north of the land controlled by Cleary Bros with the settlement of Gerroa further north, about three kilometres from the quarry.

The nearest residences to the sand quarry are located on the southern side of Berry Beach Road near the site entrance. The closest residence is approximately 90 metres from the entrance and 400 metres from the main stockpiling and loading area. Immediately adjoining land uses are identified on *Figure 2.3*.

Chapter 3

DESCRIPTION OF THE PROPOSAL

3.1 SAND RESOURCE

A resource assessment of the land identified for extending the existing Gerroa sand quarry has been undertaken by Douglas Partners (March 2005). A copy of the report from the investigation is included as *Appendix E*. Douglas Partners reviewed previous data available for the site and undertook sampling and testing of subsurface material. Collected samples were analysed chemically and physically.

There are three distinct types of sand in the resource:

- a fine grained, light coloured dune sand with no shells located generally at elevations above sea level varying in thickness from about one to seven metres (Unit 1);
- a more densely packed sand of variable grade and darker in colour with gravel and shells, located immediately below the top layer and varying in thickness from four to eight metres (Unit 2);
- a dark grey, coarse and densely packed sand with included gravel, up to four metres thick (Unit 4).

A layer of dark estuarine or lagoonal clay with high organic content up to 2.5 metres thick (Unit 3) overlies the deepest sand resource. This clay layer tapers away to less than one metre thickness towards the north eastern end of the extraction area.

The Douglas Partners report includes an assessment of resource volume and geotechnical constraints to the proposed extraction. Douglas estimates that about 660,000 cubic metres of sand can be readily extracted from the identified area. This estimate is based on removal of the clay band to access the underlying deep sand wherever the clay band is less that one metre thick. If the clay were to be removed at other locations where it is between one and two metres thick, it is estimated a further 16,000 cubic metres of sand can be obtained. However some 22,000 cubic metres of clay would have to be removed to obtain this additional sand.

Geological and geotechnical aspects of the resource relevant to its extraction are discussed in Chapter 5.

In extending the sand quarry, Cleary Bros proposes to extract all of the sand in units 1 and 2 and the unit 4 sand wherever the intervening clay band is less than about one metre thick, making extraction practicable.

3.2 SITE DEVELOPMENT

3.2.1 Relationship with Current Extraction Area

The existing development consent granted by the Minister for Infrastructure and Planning in 2003 permits sand extraction from within the dredge pond and beneath the processing area, as shown on *Figure 1.3*. That approval will expire in 2009.

The current application seeks approval for continued sand extraction from the areas approved in 2003 in addition to extraction from the extension area. This will permit subsequent reclamation of sand settling on the floor of the dredge pond while the extension area is being quarried and will enable the processing area to be quarried as a final stage when there is no further dry land to be extracted.

If the processing area were to be quarried within the timeframe of the current consent, there would be no approved location for processing, stockpiling and loading while the extension area is being extracted.

3.2.2 General Layout

Figure 3.1 shows the layout of the proposed sand quarry extension in relation to the existing operation. The additional area designated for sand extraction amounts to approximately 7.5 hectares. This area has been determined with regard to the following objectives:

- enable extraction of as much of the sand resource as practicable by direct extension of the existing dredge pond along the sand dune formation to the north;
- keep sand extraction activities at least 40 metres clear of the drainage channel draining the balance of the property northwards to Blue Angle Creek;
- protect significant stands of vegetation on the property identified as endangered ecological communities;
- set the extraction area back from the eastern property boundary so a visual screen can be constructed to minimise visibility of the workings;
- avoid disturbance to Aboriginal relics identified for preservation; and
- specify land for sand mining that is capable of being extracted without unacceptable amenity impacts to nearby residents.

The existing layout of infrastructure at the site will not change as a result of the proposed extension. In particular, the following features of the existing layout will be retained:

- vehicular access will be obtained via a sealed access road from Berry Beach Road;

- the office and nearby stockpiling and truck loading area will be retained on the western side of the dredge pond; and
- earthen mounds installed for noise attenuation, flood protection and visual screening will be retained.

Internal vehicular access to the extension area will be obtained around the western side of the dredge pond, utilising the flood bund where available. The wet scrubber may move northwards in stages as the dredge progresses into the extension area.

The essential change to the quarry layout to be created by extending the extraction area is a northerly extension of the dredge pond, with forested visual screen on the eastern (road) side and flood bund/ access road on the western side.

3.2.3 Preparation for Extraction

Prior to extending the dredge pond in a northerly direction, the following preparatory works will be carried out.

i. Visual Screen

Works to extend the roadside visual screen will commence as soon as approval for he extension is received. The visual screen may be progressively established by constructing and planting an earthen bund as has been done in the southern section of the site, or in areas where relative levels make this impractical, by undertaking dense planting in a strip beside the property boundary.

During the initial years of extraction within the extension area, sand mining will be adequately screened by existing vegetation along the roadside. This will provide time for the planted vegetation screen beside the open area further north to become effective.

ii. Boundary Marking

A surveyor will mark the extent of the approved extraction area and produce a survey plan of the boundaries. Boundary markings will be in a form easily identified and capable of lasting for the duration of extraction. Colour-coded star pickets are suitable for this purpose.

An ecologist will assist the surveyor to establish the boundary clear of the probable route ball of any tree to be retained. This same procedure was successfully implemented for the last extension of the sand quarry.

iii. Flood Bund

An earthen bund has been constructed on the western side of the dredge pond for flood protection. Existing levels in the extension area will be checked and if necessary, the perimeter of the extraction area will be raised to achieve design heights for flood protection. The flood bund will be used as an access route to the northern end of the dredge pond.

It is not necessary to develop the ultimate extension of the flood bund from the outset, as this would disturb vegetation for no immediate purpose. The flood bund will be progressively extended when needed as dredging proceeds, to maintain a closed cell around the dredge pond.

iv. Fencing and Signage

The property is currently fenced to Crooked River Road and carries closely spaced signs to warn of the quarry. The fencing and signage adjacent to the extension area will be checked and upgraded or renewed as required prior to extraction moving into that area.

While the active quarrying area will be securely fenced at all times, it is not necessary for the balance of the extension site to be fenced until needed for quarrying. The company may elect to erect temporary internal fencing to separate part of the extension area from the active quarrying area. In this manner, undisturbed parts of the property can be made available for grazing until required for extraction.

v. Compensatory Planting

Compensatory planting is described in section 5.4 and the draft Vegetation Management Plan (*Appendix K*). This work will be commenced from the outset of operations within the extension area.

vi. Erosion and Sediment Controls

Erosion and sediment controls will be put in place prior to commencing disturbance in parts of the extension area where there is a possibility of transfer of sediment from the quarry into the adjoining bushland and riparian zone. The western sides of the extension area slope away from the sand dune and will require such protection. Where the land drains to the dredge pond, controls are not needed.

vii. Services

There will be no requirement to alter or extend existing services at the quarry.

viii. Monitoring Equipment

Additional monitoring equipment to be installed includes a dust gauge and several boreholes for groundwater monitoring. The new dust gauge will be located at the northern end of the property to monitor dust levels in the direction of the northerly residence. Boreholes will be drilled to the east, west and north of the extension area with a view to monitoring any changes to groundwater quality between the dredge pond and the external drainage channel or in the direction of the National Park.

Existing monitoring equipment associated with the sand quarry, comprising boreholes, a water level gauge on the dredge pond, dust gauges and a weather station will continue to be monitored. Two existing boreholes will be consumed by the extension.

3.3 SAND EXTRACTION

3.3.1 Production Process

Figure 3.2 is a process flow diagram illustrating the manner in which sand is extracted from the site and prepared for sale. The following processes are undertaken:

i. Clearing and Topsoil Stripping

The extension area comprises areas of woodland, tall grassland and grazed paddock. Where trees or tall grass and shrubs are present the vegetation will be removed in stages in preparation for sand mining. Clearing campaigns will generally provide about 50 metres of cleared working space for the sand dredge. In the grazed areas vegetation removal will occur as part of topsoil stripping.

As the sand quarry progresses, topsoil will be progressively stripped from the cleared area and transferred to locations on the site where rehabilitation work is in progress. If the topsoil cannot be immediately used it will be separately stockpiled. The thin layer of organic rich sand immediately beneath the topsoil will be collected and used for site works or stockpiled for sale as top dressing.

Monitoring for archaeological material will be carried out during the stripping process.

ii. Sand Extraction

After removing topsoil and the layer of organic rich sand, the upper layers of aeolian sand above the water table may be removed by excavator loading into trucks where suitable access is available. The remainder of the sand profile will be removed by dredging.

Material is extracted from the base of the dredge pond using a floating suction dredge. The resulting slurry is piped to the shore through a 200-millimetre pipeline and passed through various screens in the wet sorter. The wet sorter separates stone from sand and finer particles. Screened sand is pushed away from the sorter and stockpiled where water can continue to drain back into the pond. Heavier materials may be further screened in the dry sorter (when operational) to grade into saleable size ranges. Fine particles return directly to the dredge pond with the wash water.

The dredge removes sand to within close proximity of the shoreline. When the final shoreline profile is being formed, a bulldozer or hydraulic excavator works along the shoreline to shape material on the edge of the dredge pond and create the desired batter.

iii. Materials Stockpiles

After standing and draining, screened products are stockpiled for sale. Sand is normally left in freestanding stockpiles, while storage bins are used for grades of stone and specialised products. A bulldozer is used from time to time to consolidate spreading stockpiles. Sand production is regulated to meet market demand with the result that production stockpiles remain relatively small and manageable.

Other saleable construction materials including topsoil, mulch and crusher products such as blue metal, road base, crusher dust and crushed sandstone, may be brought to the site from time to time and stockpiled in storage bins located beside the truck loading area. In the 2005-2006 financial year some 3,000 tonnes of materials were imported to the Gerroa site. It is normal practice for Cleary Bros to deliver materials to the site in the same trucks that are collecting sand from the site so there is little or no additional traffic from this activity.

iv. Loading and Dispatch

A rubber tyred loader is used to load products onto transportation vehicles. All vehicles accessing and leaving the site are required to use the sealed access road and report to the site office, located at the southern end of the loading area.

v. Batter Shaping

After sand extraction is complete from a section of the dredge pond the shoreline is stabilised by a combination of partial backfill and shaping using the dredge, bulldozer and excavator. The shoreline zone, extending ten metres above and below "normal" water level is graded to a maximum slope of one in six.

3.3.2 Transport

Products are removed from the site either in Cleary Bros' trucks or directly in customers' trucks and trailers. The number of vehicles accessing the site will not significantly alter as a result of the proposed extension. Vehicle numbers will continue to fluctuate in accordance with the demand for products from the operation. Records collated for the traffic assessment (see section 5.9) indicate that on average about 14 loads of sand are removed from the site each day when the site is operating at or near maximum approved production. Records show that about nine per cent of loads are taken in utilities or box trailers, with the remainder in trucks, ranging from one tonne to 28 tonne loads.

The existing development approval places a number of limitations on transport vehicles accessing the site, as follows:

- trucks are restricted to entering or leaving the site during the same hours that the site is permitted to operate (see section 3.4.2 below);
- trucks to or from the south are to use Berry Beach Road and the Princes Highway, avoiding Gerroa Road;
- trucks to or from the north are to use Crooked River Road, Fern Street, Belinda Street and the Princes Highway, avoiding the Gerringong commercial centre;
- Gerroa Road (south from the site) may only be used when the destination is accessed from that road.

These requirements will continue to be observed for the duration of operations in the proposed extension area.

3.4 EQUIPMENT AND PERSONNEL

3.4.1 Plant and Equipment

Table 3.1 lists the equipment currently used by Cleary Bros at the Gerroa sand quarry. These items of plant, or replacement items of similar size, will be adequate to continue the operation into the extension area. The equipment listed in *Table 3.1* is not necessarily in continuous operation.

Table 3.1 SAND MINING EQUIPMENT

Item	Number	Function
Bulldozer* (Cat D6)	1	Managing stockpiles, stripping topsoil, profiling batters and bunds, general earthworks
Rubber Tyred Loader (Cat 966)	1	Loading materials to trucks, moving materials within the site
Excavator* (Cat 330 or similar)	1	Assistance to the dredge, general earthworks, profiling batters and bunds
Sand dredge (Cat 3408 motor)	1	Obtain wet sand from the bottom of the pond and pump to the wet sorter
Wet sorter	2	Separating sand from fine and coarse particles. Only one sorter can be used at a time, to suit the dredge
Trucks	1	Collecting sand products from the site, moving materials within the site
Water truck*	1	Dust suppression within the site

* intermittent use only

A dry sorter on the site has been decommissioned.

3.4.2 Hours of Working

It is proposed to operate the extension within the existing approved hours for the sand quarry. These hours are specified in conditions of the current development consent and are summarised below:

- 7.00 am to 6.00 pm Monday to Friday;
- 7.00 am to 1.00 pm Saturday;
- No operation on Sundays or public holidays.

The site is normally closed for an extended period from Christmas into the New Year.

On site repair or maintenance work to plant and equipment that is inaudible at residences may be undertaken outside the above hours.

3.4.3 Workforce

At the present time there are two full time personnel employed at the sand quarry. At peak times the company may allocate up to four personnel to operate the various items of equipment and manage the sand extraction process. Additional personnel may be present for short periods when clearing, topsoil stripping, bund construction or rehabilitation works are in progress.

An average of about five personnel are employed to collect and deliver sand and other materials produced at Gerroa. The actual number of drivers allocated to Gerroa on any day depends upon demand for sand products. The proposed extension will maintain continuous employment positions for site personnel and drivers servicing Gerroa. Continuation of sand mining does not involve any long-term change to employee numbers on the site.

A significant proportion of the company's workforce external to the site is reliant upon continued production from the Gerroa sand quarry. This matter is discussed in section 5.10.

3.4.4 Safety

The existing Gerroa sand quarry operates under the safety requirements of the Department of Primary Industries which administers the *Mines Inspection Act, 1901* and *Mines Inspection General Rule, 2000*. The Act stipulates requirements for the occupational health and safety of employees and the general safety and working conditions around the sand quarry and processing plant. These requirements will apply to the proposed extension.

The Company has incorporated the statutory requirements into a documented due-diligence safety management system applying to all activities at the site.

3.5 WASTE MANAGEMENT

During operation the sand quarry generates very little waste. Any dredged materials that are unsuitable for sale, such as fine particles, are returned in the wash water to the to the dredge pond. The method of managing waste products generated from the sand quarry extension is summarised in *Table 3.2*.

Table 3.2 WASTE MANAGEMENT

Waste Type	Management Method
Debris resulting from clearing vegetation in preparation for sand extraction;	Large logs will be retained on site for use in rehabilitation as fauna habitat. Smaller shrubs, grasses and tree crowns will either be processed through a tub grinder to produce mulch for use in rehabilitation, or taken off site for disposal.
Food and general waste contributed by personnel on the site, amounting to small quantities of putrescible materials packaging and beverage containers;	Waste from personnel collected in a waste receptacle at the quarry will be transported to a waste disposal centre from time to time.
Waste from on-site plant and equipment servicing, including replaced components, oily rags, packaging and lubricants.	Plant servicing and running repairs will be carried out at the sand quarry. Maintenance personnel will remove all waste materials, including waste oil and grease for disposal or recycling within Cleary Bros Maintenance Division waste management system.

In order to reduce waste generation, staff will be encouraged to reduce as far as practicable taking materials into the sand quarry that will later require removal as waste.

3.6 WATER MANAGEMENT

The following objectives apply to water management at the sand quarry:

- minimise water consumption, as far as practicable;
- prevent deterioration of water quality in the dredge pond, creek system and groundwater;
- protect the site from flooding; and
- maintain the dredge pond at a safe level.

For the purposes of water management, the dredge pond acts as a water quality pond, a stormwater detention basin and a holding storage for water used on site.

3.6.1 Water Consumption

The sand mining process does not intentionally consume water, although water is lost to evaporation. Water included in the slurry pumped from the pond is largely returned to the pond except for residual moisture retained in stockpiled sand, which

progressively drains to the pond or evaporates while the sand is awaiting sale. Sand that is sold and removed from the site has a moisture content in the range four to six per cent.

Operational water from the dredge pond will be consumed in dust suppression and irrigation of plantings undertaken in rehabilitation works. Watering for dust suppression is limited to the loading area as the access road is sealed and is applied with reference to weather conditions and daily vehicle numbers, noting that the site despatches an average of 14 loads per day. For worst case calculation purposes, water consumption is based on a daily application of 150 per cent of the average daily evaporation rate (4.8 millimetres) over a loading area of about 2000 square metres). This equates to an average daily application rate of 14.4 kilolitres for an average of 238 non-rain days per year.

Irrigation of plantings will only be required during periods following planting or seeding for rehabilitation or screening. This work will be timed where possible to coincide with the cooler months to reduce the need for watering.

Water from the dredge pond is available for fire fighting purposes, but is not routinely consumed for this purpose.

Potable water for the small workforce is separately provided from a rainwater tank that can be topped up by tanker if needed.

Table 3.3 summarises the various uses for dredge pond water on the site and the anticipated maximum annual requirement.

Table 3.3 WATER CONSUMPTION

Use	Source	Maximum Annual Requirement (megalitres)
Dust Suppression	Dredge Pond	3.4
Irrigation	Dredge Pond	0.5
Fire fighting	Dredge Pond	nil

3.6.2 Flooding

Perimeter flood barriers have been installed where necessary to prevent floodwater from entering or leaving the site. As specified in the flood study (refer section 5.3) a flood barrier has been installed on all parts of the site perimeter where the ground level is less than 3.2 metres AHD. This level has been calculated to provide 0.5 metres of freeboard above the flood level predicted to occur during the once in 100 year flood event occurring on the property.

3.6.3 Water Release

On rare occasions Cleary Bros may release water from the dredge pond to the external drainage system to maintain a safe operating level. A discharge point for this purpose has been included in the environment protection licence for the site. Water release has not been necessary for some time. When required, the cleanest water at the surface of the pond is released.

3.7 RATE AND DURATION OF QUARRYING

3.7.1 Production Limits

At the present time there are two production limits applicable to the operation:

- production of quarry products from any part of the site is limited to 80,000 tonnes per annum (2003 development consent):
- the scale of operation is limited to 100,000 cubic metres per annum "obtained or moved" by dredging (environment protection licence).

No changes are proposed to the existing approved production limits.

3.7.2 Duration of Operations

It is intended that mining operations should be permitted on the site until all of the deposit approved for extraction has been won. As a guide, if continuous extraction were to take place at the maximum rate of 80,000 tonnes per year, the deposit would be fully worked within nine years. Given fluctuations in market demand, a duration of up to 50 per cent longer should be anticipated. For approval purposes a realistic time frame would be 15 years, giving the company adequate time to consider its options as the available resource approaches exhaustion. This would also allow time for the processing area to be extracted as a final stage.

Rehabilitation works will continue on the site after cessation of extraction, processing and sale of products.

3.8 REHABILITATION

3.8.1 Requirements under the Existing Consent

The development consent issued by the Minister for Infrastructure and Planning in 2003 contains a number of requirements for site rehabilitation, including:

- lodge a rehabilitation bond with the Department of Planning;
- decommission and remove all plant and equipment upon completion of quarrying;
- rehabilitate and revegetate disturbed areas on the site; and
- include in the quarry environmental management plan (QEMP) a rehabilitation and landscape plan showing final landuse and landform and how it will be achieved.

Cleary Bros has complied with these requirements as applicable to date. The proposed extension of the sand quarry now proposed will not alter rehabilitation proposals for the land subject to the 2003 consent. The same rehabilitation principles will be applied to the extension area, as explained in the following sections.

3.8.2 Possible Alternative Future Use for the Property

Cleary Bros has been examining the feasibility of establishing a golf course on the company's rural land adjoining the Gerroa sand quarry. As part of this exercise a preliminary assessment was submitted to the Department of Planning. The feasibility investigations include economic, environmental and social considerations and are at an early stage. To date a number of independent consultant reports have been commissioned and some community consultation has taken place. Cleary Bros has yet to consider the outcome of feasibility investigations and decide whether to proceed with the project. The company has not set a timeframe for considering this matter.

The rehabilitation plans described in this document for the sand quarry are appropriate for restoring bushland and habitat in conjunction with an adjoining rural land use. Should the golf course proposal proceed to a formal application and subsequently receive planning approval, then the rehabilitation plan for the golf course would complement and extend the rehabilitation plan for the sand quarry.

The locations identified in this environmental assessment for compensatory planting on the rural property have been checked for consistency with the preliminary concept prepared for the golf course. The compensatory planting for the sand quarry extension is not within areas identified for golf course development and hence is unlikely to be subsequently disturbed should the golf course proposal proceed.

3.8.3 Objectives

The objectives of site rehabilitation are as follows:

- after the conclusion of sand mining, leave the site free from all sand mining artefacts including machinery, structures, buildings, signage, products and roads, except as required for rural purposes;
- create safe and stable landforms with a natural appearance designed for low maintenance;
- establish indigenous vegetation on all land areas disturbed by the sand quarry to create wildlife habitat including wetland habitat within and around the shoreline of the dredge pond;
- nurture to maturity vegetation screens and compensatory planting established during the sand mining operation;
- control weed growth within the rehabilitation areas and compensatory planting areas;
- retain a minimum of access tracks for maintenance or as required for ongoing rural use of the property;
- progressively rehabilitate sections of the site when they are no longer required for operations to minimise the extent of work remaining when extraction ceases; and
- continue rehabilitation beyond closure of the sand mine until these objectives have been achieved.

3.8.4 Final Landform

Sand mining modifies the landform by creating a water-filled depression and earthen embankments around parts of the site perimeter. It is not practicable to attempt to return the land to its original profile, as that would involve import of a substantial quantity of fill material with significant delay to the rehabilitation process.

At the completion of mining operations in any part of the pond the shoreline will be profiled to have a gradient of one in six for six metres either side of normal water level as shown in the typical cross section, *Figure 3.3*. This is similar to the profile prepared along completed sections of shoreline at the southern end of the pond. The straight shoreline resulting from dredging will be modified to provide a more natural and interesting appearance with an irregular edge and some shallow sections and islands. Material for filling the shoreline will be obtained from stockpiles of organically rich sand stripped from the surface during preparations for extending the dredge pond. Alternatively if sufficient quantity of stockpiled material is unavailable, suitable material may be brought to the site for this purpose. Such

material would be virgin excavated natural material and would be selected so as to avoid bringing weed propagative material to the site. In particular, topsoil from external locations and the surface layers of any stockpiled material would not be brought to the site for profiling purposes.

It is proposed to remove any unnecessary earthen bunds following completion of extraction. This may include sections of the flood barrier on the western side of the pond that are used as access roads. Other mounds supporting established mature vegetation or contributing to visual screening may be retained. In particular the sight bund along Crooked River Road will be retained because to remove it would create excessive disturbance and it is consistent with the former sand dune parallel to the road.

The land remains part of a rural property. It is not anticipated however, that farming activities will resume in the area of the sand quarry following closure as this would compromise the rehabilitation work. In the absence of approvals for any alternative use the sand quarry will be restored for a future role as a wetland and forested area within a privately owned farming property.

3.8.5 Rehabilitation Methods

Rehabilitation methods employed at the site are described in detail in a work instruction included in the quarry environmental management plan for the site (Perram & Partners 2003). A copy of that work instruction is included as *Appendix F*.

The work instruction provides for wetland and dryland rehabilitation including species lists for planting, with details for design, establishment, maintenance and control of weeds and feral animals.

Chapter 4

PLANNING CONTEXT

4.1 OVERVIEW

The approval process for the proposed extension is prescribed by the Environmental Planning and Assessment (EP&A) Act 1979. The Threatened Species Conservation Act 1995, Native Vegetation Act 2003 and the (Commonwealth) Environment Protection Biodiversity Conservation Act 1999 are also potentially relevant to the proposal.

Planning instruments applying to the land affected by the development include:

- Kiama Local Environmental Plan, 1996;
- City of Shoalhaven Local Environmental Plan, 1985
- Illawarra Regional Environmental Plan No 1, 1986; and
- State Environmental Planning Policy No 11 – *Traffic Generating Development;*
- State Environmental Planning Policy No 44 – *Koala Habitat Protection; and*
- State Environmental Planning Policy No 71 – *Coastal Protection*

This section discusses the extent to which the relevant legislation, planning instruments and guidelines apply to the proposed development.

4.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT

Part 3A of the EP&A Act, 1979 sets down the procedure to be followed for obtaining planning approval for a development that is declared to be a project under that part. The proposed extension of the Gerroa sand quarry has been declared by order of the Minister, published in the Government Gazette to be a project under Part 3A because it is *major infrastructure or other development that, in the opinion of the Minister, is of State or regional environmental planning significance*.

Section 75D of the Act provides that a development declared to be a project is not to be carried out without the Minister's approval. A project approved by the Minister may be carried out provided any conditions attached by the Minister are complied with. The Minister may grant approval notwithstanding the provisions of any planning instrument, except for cases where the development would be *wholly prohibited* by a planning instrument. The Gerroa sand quarry is not wholly

prohibited by a planning instrument; hence the Minister is able to approve the project.

The provisions of Part 1A of the Environmental Planning and Assessment Regulation, 2000 apply to the assessment of a proposed development declared by the Minister to be a project.

4.3 THREATENED SPECIES CONSERVATION ACT

The Threatened Species Conservation (TSC) Act 1995 provides the process for preparing a species impact statement where a development proposal will significantly affect threatened species, populations or ecological communities, or their habitats. Planning aspects of the Act are administered through the EP&A Act. Section 5A of the EP&A Act sets out a seven point test to determine whether there will be a significant impact and hence a requirement for a species impact statement. Section 5C of the EP&A Act requires that where threatened species of fish or marine vegetation is involved then Part 7A of the Fisheries Management Act is to be considered in conjunction with the TSC Act.

Appendix J is a flora and fauna assessment of the site from which it is concluded that the proposal is not likely to significantly affect threatened species, populations or ecological communities, or their habitats. Hence there is no requirement for a species impact statement to be prepared for this project.

4.4 NATIVE VEGETATION ACT

Where the Native Vegetation Act 2003 applies, native vegetation must not be cleared except in accordance with a development consent granted under that Act or a property vegetation plan approved under that Act. However, this requirement will not apply to the proposed extension of the Gerroa sand quarry should the Minister for Planning approve the project. Subsection 75U(1)(e) of the EP&A Act specifies that an authorisation under the Native Vegetation Act is not required for an approved "project" as defined in Part 3A of the EP&A Act.

4.5 ENVIRONMENT PROTECTION BIODIVERSITY CONSERVATION ACT, 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), is an Australian Government Act requiring approval from the Commonwealth Minister for the Environment for a "controlled action", being a project or development that would have a significant effect on:

- a matter of national environmental significance;
- the environment of Commonwealth land; or
- the environment generally, where the action is undertaken by the Commonwealth.

The Act currently identifies six matters of national environmental significance:

- world heritage areas;
- wetlands protected by international treaty (the Ramsar convention);
- nationally listed threatened species and ecological communities;
- nationally listed migratory species;
- nuclear actions; and
- the environment of Commonwealth marine areas.

Where there is a need for approval under the EPBC Act, this is separate to approvals required under New South Wales State law. The Department of Planning and Environment Australia have established procedures to minimise duplication when both State and Commonwealth approvals are required.

The matters of national environmental significance potentially relevant to the proposal are *nationally listed threatened species and ecological communities* and *nationally listed migratory species*. These matters of potential relevance have been addressed in *Appendix J*, where it is concluded that they will not be significantly affected by the proposed quarry extension.

Consequently it is considered that the proposal is not a controlled action. On this basis no approval is required under Commonwealth law for the proposed quarry extension to proceed and the matter does not need to be referred to the Commonwealth Minister for the Environment.

4.6 ENVIRONMENTAL PLANNING INSTRUMENTS

Section 75R(3) of the EP&A Act provides that environmental planning instruments, other than State Environmental Planning Policies, do not apply to the carrying out of a project approved under Part 3A. However, section 75I(2)(e) of the Act requires that the Director-General include in a report to the Minister reference to the provisions of any environmental planning instrument that would otherwise have governed the carrying out of the project and that has been taken into consideration in the environmental assessment of the project.

Consequently, for the purposes of assessment, it is appropriate to consider the provisions of the local environmental plans, regional environmental plan and State environmental planning policies applying to the land.

4.6.1 Kiama Local Environmental Plan 1996

The objectives of the Kiama LEP 1996 are listed in *Table 4.1* together with a statement of the consistency of the proposal with each objective.

Table 4.1 OBJECTIVES OF KIAMA LEP 1996

Kiama LEP Objective	Consistency of Proposal
(a) To define future urban boundaries	Not relevant.
(b) To retain a rural separation between villages and towns which help characterise the Council's area	The proposal is consistent.
(c) To protect natural and built environmental features of the Council's area	The proposal includes compensatory measures for natural environmental features that are affected. The built environment is not affected.
(d) To provide for controlled urban growth within the defined boundaries	Not relevant.
(e) To provide for consolidation of existing urban areas particularly around existing business and transport centres and where environmental (including social) parameters are suitable	Not relevant
(f) To protect prime crop and pasture land outside defined urban boundaries	Not relevant
(g) To consolidate and strengthen existing retail/business centres	Not relevant
(h) To encourage the provision of a range of retail and business services which are more attractive convenient and accessible to the community,	Not relevant
(i) To provide for tourism related uses and activities and to attract them to selected localities within the Council's area	Not relevant.

Kiama LEP Objective	Consistency of Proposal
(j) To ensure that new developments are well designed and complement the character of the surrounding land and the Council's area	The proposal is consistent.
(k) To ensure that residential areas are based on neighbourhood and environmental design principles, including the following …	Not relevant.
(l) To protect the Council's area's natural heritage through appropriate controls and plans of management	The proposal includes compensatory planting for the area of disturbed vegetation to be affected.
(m) To identify and conserve items of environmental heritage of a local, regional, State and national significance,	No listed items are affected.
(n) To provide industrial lands within environmental constraints to increase the employment base of the Council's area and improve the self-sufficiency level of the local community	Not relevant.
(o) To identify land required for public purposes and to provide for the classification of public land for general community or operational use	Not relevant.
p) To minimise the adverse impact of activities within the Council's area on the global environment	The sand quarry is operated as efficiently as possible, consistent with this objective.
(q) To promote the more efficient use of water and energy within the Council's area	The sand quarry is operated as efficiently as possible, consistent with this objective.
(r) To assist the sustainability of prime crop and pasture lands	Not relevant.
(s) To ensure the preservation of the landscape and special scenic qualities of the Council's area	The proposal will restore a vegetated frontage to Crooked River Road.
(t) To protect biological diversity and maintain essential ecological processes and life support systems	The proposal is consistent with this objective by including compensatory planting at four times the area of native vegetation disturbance.

Kiama LEP Objective	Consistency of Proposal
(u) To ensure that activities and development within the catchments of the Council's area do not impact adversely on the water quality of the estuaries and wetlands systems	The sand quarry is a wetland system, separated from external watercourses. Water quality in the sand quarry is better than in the natural drainage system and will be maintained at a high standard.
(v) To ensure planning and development have regard to total catchment management philosophy and principles	The proposal is consistent. Water quality and catchment hydrology will not be significantly affected.
(w) To promote the sustainability of the natural ecosystems within the Council's area	The compensatory planting will link remnant areas of vegetation on the property.
(x) To restrict development on flood liable land	The land to be quarried is generally above flood level. The sand quarry will not significantly affect flood performance and is protected against flooding.
(y) To enhance individual and community well-being and welfare by encouraging a path of economic development that safeguards the welfare of future generations.	The proposal is consistent.
(z) To foster the cultural development of the Kiama area, especially the arts and crafts skills of the community,	Not relevant.
(aa) To restrict the fragmentation of non-urban land other than for agricultural purposes.	The proposal will ultimately create a wetland in an area that is largely unavailable for significant agricultural use. the land will not be fragmented.
(ab) To conserve, protect and maintain riparian corridors.	The proposal will enhance riparian corridors. Compensatory planting is proposed along drainage channels that are currently open.

The portion of the site within Kiama local government area is zoned Rural 1(a) by the Kiama LEP. Extractive industries are generally permissible within the 1(a) zone provided development consent is obtained. The objectives of the 1(a) zone are listed in *Table 4.2* below together with a statement of the consistency of the proposal with each objective.

Table 4.2 OBJECTIVES OF THE RURAL 1(a) ZONE – KIAMA LEP

Rural 1(a) Zone Objective	Consistency of Proposal
(a) to provide suitable land for agricultural use	A section of the site amounting to approximately four hectares has been used for grazing in the past, but is no longer used for this purpose. The conversion of this area to wetland will not affect achievement of the objective in Kiama.
(b) to protect the agricultural potential of rural land	A section of the extension area has been used for grazing in the past. Compensatory planting will also occupy grazing land. These are small areas in comparison with the size of the property and available rural land in Kiama.
(c) to prevent the fragmentation of rural land of prime crop and pasture potential	Not relevant as the site does not have prime crop or pasture potential
(d) to enable uses that are compatible with the rural use of the land	Extractive industry is compatible with adjacent rural uses
(e) to protect the landscape quality of the rural area	The site is enclosed by woodlands screening it from the rural landscape
(f) to cater for small domestically-based enterprises that do not adversely affect the environment or the amenity of the neighbourhood and its residents	Not relevant
(g) to ensure that development and land management practices do not have an adverse effect on water catchments, water quality, land surface conditions and important ecosystems such as streams, estuaries and wetlands	The extraction operation is designed and operated in a manner that there is no significant impact on surrounding land and waters.

Clause 37 of the LEP refers to land designated an "area of high conservation value", shown by hatching on the LEP mapping. Clause 37(2) states that development is prohibited within an area of high conservation value, except for certain purposes stated in the clause. The land designated area of high conservation value on the sand quarry site is indicated on *Figure 4.1*.

Part 3A of the EP&A Act provides that the Minister can approve a project provided it is not *wholly prohibited* under an environmental planning instrument. As sand extraction is not prohibited on most of the land affected by the proposed extension

area the Minister is not prevented from approving the project over the land designated in the LEP to be an area of high conservation value.

Clause 37(5) of the LEP states

> *The Council must not consent to development on land adjoining an area of high conservation value if the Council considers that, because of the proposed development, the objectives of the area will not be met.*

Part of the proposed sand quarry extension is located on land adjoining an area of high conservation value. The objectives of areas of high conservation value, stated in clause 37(1), are listed in *Table 4.3* below together with a statement of the consistency of the proposal with each objective.

Table 4.3 OBJECTIVES OF AREAS OF HIGH CONSERVATION VALUE

Objective of Area of High Conservation Value	**Consistency of proposal**
a) to conserve environmentally important land having ecological, scientific, faunal, floristic or aesthetic values, and	The proposal will conserve environmentally important land. Intact endangered ecological communities located near the extraction area will be protected as part of the development.
(b) to preserve intact rainforests and promote regenerating rainforest areas which are of significance, and	An area of littoral rainforest will be largely preserved and extended by compensatory planting.
(c) to preserve areas of significant vegetation stands and to promote the regeneration of forests and eradication of vegetation which competes with native flora, and	Adjoining areas of significant vegetation will be preserved. The proposal includes compensatory planting to extend these areas, rehabilitation of disturbed areas with indigenous vegetation and weed control within the bushland area.
(d) to protect wildlife and associated habitats and to protect and promote wildlife corridors, and	The proposal has been restricted in area to minimise the effect on significant vegetation and associated wildlife habitat. Significant wildlife corridors will not be affected and some corridors will be extended by the compensatory planting.

Objective of Area of High Conservation Value	Consistency of proposal
(e) to exclude activities which would prejudice the ongoing conservation or rehabilitation of land referred to in paragraph (a), and	The proposed extension of the sand extraction operation will assist ongoing conservation and rehabilitation of the endangered ecological communities referred to in (a). By retaining the company on site, protection and maintenance of the edges of these areas can be undertaken. This would be less likely should the land revert to rural uses.
(f) to encourage and allow activities which will meet the conservation objectives, and	The proposed extension of sand extraction is an activity that will meet conservation objectives for the endangered ecological communities.
g) to protect water sources that are to be used for drinking water purposes.	Not relevant.

In summary, undertaking the proposal on land adjoining the area of high conservation value will not prevent the objectives of the area of high conservation being met.

Clause 58 of Kiama LEP refers to development of flood liable land. The clause states that the consent authority shall not approve development on land considered to be flood liable, but may approve it in certain circumstances, including where

> *a statement of environmental effects or an environmental impact statement indicates that the development would not be contrary to the public interest.*

This clause of the LEP predates Part 3A of the EP&A Act which does not require that an EIS or SEE be prepared for the proposal. This environmental assessment demonstrates that the proposal would be in the public interest. Clause 58(3) requires the consent authority to take into account a number of factors when determining an application for development on flood prone land. Those factors are listed in *Table 4.4* together with an assessment of the consistency of the proposal.

Table 4.4 MATTERS FOR CONSIDERATION – FLOOD LIABLE LAND

Matter for Consideration	Consistency of proposal
a) the likely levels, velocity, sedimentation and debris carrying effects of flooding, and	The flooding assessment included with this assessment addresses flooding and determines flood levels, concluding that the proposal would have an insignificant effect on the behaviour of floods in the area.

Matter for Consideration	Consistency of proposal
(b) the structural sufficiency of any building the subject of the application and its ability to withstand flooding, and	Not relevant as the application is not for the purposes of a building.
(c) the effect which the development, if carried out, will or is likely to have on the flow characteristics of floodwaters, and	The flooding assessment included with this assessment addresses the effect on floodwaters, concluding that the proposal would have an insignificant effect on the behaviour of floods in the area.
(d) whether or not access to the site will be possible during a flood, and	The site access road is at approximately the same level as the surrounding road system. Hence access to the site will be available provided the external public road system is not cut by flood waters.
(e) the likely increased demand for assistance from emergency services during a flood.	It is unlikely the proposal would require assistance from emergency services during a flood.

Clause 66 of the Kiama LEP refers to development of land identified on the Acid Sulphate Soils map. The proposed area for further sand extraction is identified as Class 3 on the map. Proposed works within this classification involving excavation more than one metre below natural ground surface require development consent. Clause 66(5) lists matters to be considered by the consent authority before determining a development application to which Clause 66 applies. Those factors are listed in *Table 4.5* together with an assessment of the consistency of the proposal.

Table 4.5 MATTERS FOR CONSIDERATION – ACID SULPHATE SOIL

Matter for Consideration	Consistency of Proposal
(a) a preliminary soil assessment to ascertain the presence or absence of acid sulfate soils within the area of the proposed works, unless the applicant agrees that acid sulfate soils are present within the area of the proposed works, and	Douglas Partners has considered the findings of site investigations for evidence of acid sulphate soils, concluding that groundwater is not strongly indicative of acid sulphate soil conditions. Dredge pond monitoring does not indicate oxidation of significant amounts of pyritic material.
(b) the adequacy of an acid sulfate soils management plan prepared for the proposed development in accordance with Acid Sulfate Soils Assessment and	An acid sulphate soils management plan has been prepared and is included as an Appendix to this document. The plan includes contingency

Matter for Consideration	Consistency of Proposal
Management Guidelines, *and*	measures to be implemented should acid sulphate conditions be encountered.
(c) the likelihood of the proposed development resulting in the oxidation of acid sulfate soils and the discharge of acid water from the area of the proposed works, and	There is little likelihood because there is little oxidisable material present, the method of processing results in the fine fraction of dredged material washing back into the pond where oxidation is not a risk and pond water is not unduly acidic. Process water is not discharged.
(d) any comments received from the Department of Land and Water Conservation within 21 days of the Council having sent that Department a copy of the development application and of the related acid sulfate soils management plan.	The Department of Planning will consider any comments from other Government agencies.

4.6.2 City of Shoalhaven Local Environmental Plan 1985

The portion of the project within Shoalhaven City includes part of the dredge pond and its rehabilitated shoreline, access road, office and the southern part of the processing area. Extraction is ultimately proposed for the processing area as a final stage when sand extraction is complete from other parts of the site.

The Shoalhaven LEP zones the portion of the site within Shoalhaven City partly Rural 1(a) and partly Environment Protection (Special Scenic) 7(d2), as shown on *Figure 4.1*. Extractive industries are permissible within the 1(a) zone provided development consent is obtained but are prohibited within the 7(d2) zone. However, as indicated in section 4.5.1 above, Part 3A of the EP&A Act provides that the Minister can approve a project provided it is not *wholly prohibited* under an environmental planning instrument.

Clause 9(3) of the LEP requires a consent authority, in determining a development application, to take into account the aims and objectives of the LEP and the objectives of the zone within which the development is proposed.

The objectives of the Shoalhaven LEP 1985 are listed in *Table 4.6* together with a statement of the consistency of the proposal with each objective.

Table 4.6 OBJECTIVES OF SHOALHAVEN LEP 1985

Shoalhaven LEP Objectives	Consistency of Proposal
(a) to provide for a variety of residential life styles,	Not relevant
(b) to ensure space is provided for community services and facilities as well as recreational activities,	Not relevant
(c) to enable a variety of commercial uses while consolidating existing commercial centres,	Not relevant
(d) to enable accommodation of industrial uses,	The proposal is an extractive industry accommodated by the plan.
(e) to ensure that the council gives due regard to the effect of natural hazards upon development,	This is an objective for Council. Natural hazards of fire and flood have been considered.
(f) to ensure that development and expansion of coastal villages are sympathetic to the coastal environment,	Not relevant
(g) to maintain the agricultural use of prime crop and pasture land by minimising development which has an adverse and irreversible impact on the land's agricultural potential,	Not relevant
(h) to protect items of the environmental heritage,	There are no designated items affected.
(i) to provide a safe and efficient transport network connecting land use activities inside and outside the City,	Not relevant
(j) to encourage the provision of adequate community facilities and services,	Not relevant
(k) to ensure the social amenity and well-being of the City,	Continuation of sand mining will maintain employment and income generation within the City.
(l) to provide the most appropriate public utility services in the most effective manner,	Not relevant

Shoalhaven LEP Objectives	Consistency of Proposal
(m) to encourage appropriate forms of tourism which are sensitive to and compatible with the natural and cultural environments of the City,	The proposal is located in a tourist area but is well screened so that it does not detract from this objective
(n) to maintain the rural character of non-urban areas,	The proposal is consistent with this objective
(o) to ensure the protection of important natural and cultural environments,	Within the City of Shoalhaven, the proposal does not involve further disturbance to the natural environment
(p) to protect and enhance scenic and landscape qualities,	The sand extraction operation is well screened at its older southern end with mature vegetation so that it does not detract from the scenic and landscape quality of the Shoalhaven area.
(q) to ensure that the potential for winning extractive and mineral resources, where appropriate, is not compromised by other forms of development,	The proposal is consistent
(r) to ensure that development achieves the water quality or river flow objectives of ground water, rivers, estuaries, wetlands and other water bodies,	The proposal is consistent
(s) to avoid, mitigate or remedy the adverse effects of development on the environment,	The proposal is consistent
(t) to minimise energy consumption and promote energy efficient design and appliance use,	The proposal uses energy efficiently
(u) to minimise potable water consumption and promote wastewater reuse as well as water saving designs and fittings,	Not relevant
(v) to minimise waste generation and promote recycling and reuse of materials, and	The proposal returns all reject materials to the dredge pond
(w) to minimise the clearing of native vegetation especially those local species which are poorly represented in conservation reserves.	Vegetation clearing is not proposed within Shoalhaven City area.

The objectives of the 1(a) zone are listed in *Table 4.7* below together with a statement of the consistency of the proposal with each objective.

Table 4.7 OBJECTIVES OF THE RURAL 1(a) ZONE – SHOALHAVEN LEP

Rural 1(a) Zone Objectives	Consistency of Proposal
a) to conserve and maintain the productive potential of prime crop and pasture land,	Not relevant as the land is not prime crop or pasture land.
(b) to ensure that existing or potential agricultural land use is not jeopardised by non-agricultural land uses, and	Not relevant as the land affected by sand mining in Shoalhaven City has no existing or potential agricultural land use.
(c) to conserve cultural landscapes.	Not relevant as the existing landscape is no longer natural, having been altered by sand extraction and earlier activities over a number of decades.

Clause 27 of the LEP refers to development on acid sulphate soils. Development consent is required for any development likely to involve exposure to the atmosphere of soil that contains iron pyrites. The consent authority must firstly be satisfied that measures can and will be taken to avoid or mitigate the actual or potential contamination of waterways in the vicinity by acidity from acid sulphate soils. There is minor potential for acid sulphate soil to be affected by the development. The process minimises exposure of dredged material to atmosphere, except for washed sand, draining fines back to the dredge pond. An acid sulphate soils management plan has been prepared describing monitoring requirements and contingency action should acid sulphate conditions be encountered.

Clause 28 refers to development on land that is likely to be affected by bushfire. The site is separated by a sealed road from a national park and is potentially fire affected. However, the sand extraction operation will not adversely affect fire control measures or create any increased risk to personnel or increased demand for emergency services. The dredge pond may be used as a source of water to fight any fire entering the property and the staff would assist in fire management on the property.

Clause 29 refers to development of flood liable land. The effect of the clause in relation to the development application is to require the consent authority to consider a flood assessment report and to reach a conclusion as to whether the development is feasible despite being flood affected. A flood assessment has been included with the application demonstrating that the proposal will not significantly alter flood levels or flow rates.

In summary the proposal complies with the requirements of Shoalhaven LEP with respect to the portion of the site zoned Rural 1(a). For the portion zoned Environment Protection (Special Scenic) 7(d2) extractive industry is prohibited but the Minister has the ability to approve the proposal over this area of land which will remain covered by dredge pond and rehabilitated shoreline.

4.6.3 Illawarra Regional Environmental Plan No 1, 1986

The Illawarra REP is primarily an advisory document aimed at maximising opportunities for people of the region to meet their wide-ranging needs, particularly in relation to access to land resources. The plan is aimed at:

- identifying regional planning issues applicable to development and local planning within the region;
- advising Government and public authorities who manage land, exercise functions and set funding priorities within the region; and
- establishing parameters and controls for development, particularly as they relate to environmental quality and social well-being.

Part II of the REP sets down provisions relating to rural lands. Within this part, Clause 14 is relevant to the proposal, referring to land identified on the REP mapping as supporting rainforest vegetation species and adjacent land.

Where a consent authority receives an application to clear vegetation, remove trees or carry out other development on land to which Clause 14 applies, the consent authority is required to consult with the Director-General of the National Parks and Wildlife Service and before granting consent, be satisfied that:

- the clearing, tree removal or development will not have a detrimental effect on the rainforest or rainforest species ; or
- any detrimental effect on the rainforest or rainforest species can be justified by other factors.

The effect of the proposal on rainforest vegetation is discussed in Section 5.4.

Part III of the REP relates to extractive materials. The Gerroa sand resource is mapped in the REP as land containing extractive materials. The proposal is consistent with the objectives of the plan relating to extractive materials, which include:

- managing extractive resources to meet community needs while minimising environmental impacts;
- ensuring that when development proposals affecting land containing extractive resources are assessed, consideration is given to the consequences of rendering the resources unavailable;

- ensuring that extractive materials transport has minimal impact on the community and that bulk transport bypasses urban areas where possible.

Clause 35 is relevant to the proposal, requiring the consent authority to consider attaching to appropriate development consents a condition requiring transport of extractive materials by means other than road haulage. In this case haulage by any means other than road is impracticable because of the diverse destinations for the product and the lack of accessibility of the site by other transport means.

4.6.4 SEPP No 11 - Traffic Generating Developments

State Environmental Planning Policy No 11 is intended to ensure that the Roads and Traffic Authority is made aware of any development application for traffic generating development and given an opportunity to make representations before the application is determined by a consent authority.

The proposed continuation of sand extraction is a development of the type referred to in Schedule 1 of SEPP 11 because it is within the meaning of item (m) "extractive industry or mining".

Clause 7 of SEPP 11 requires the consent authority to forward a copy of a development application to the Roads and Traffic Authority within seven days of its receipt. The application may not be determined until the Roads and Traffic Authority submits a representation, advises that it will not submit a representation, or 21 days elapse from the date of referral of the application.

4.6.5 State Environmental Planning Policy No 26—Littoral Rainforests

SEPP 26 is aimed at preserving littoral rainforest by providing a mechanism for considering development affecting land within or near the areas marked on the SEPP 26 maps. The planning instrument applies only to the land shown on the maps and land within 100 metres of the mapped land.

The proposed sand quarry extension at Gerroa does not affect any land to which SEPP 26 applies.

4.6.6 State Environmental Planning Policy No 44 – Koala Habitat Protection

The aim of SEPP 44 is to encourage conservation and management of areas that provide habitat for koalas with a view to maintaining a permanent koala population over their present range and reverse the trend for population decline.

SEPP 44 applies within the local government areas listed in Schedule 1 of the SEPP. Of the two local government areas affected by the Gerroa sand quarry, Shoalhaven is listed but Kiama is not. Hence the SEPP applies only to that portion of the proposal within Shoalhaven City.

Part 2 of SEPP 44 sets down steps for development control under the policy. Part 2 applies to land that is the subject of a development application. The current application for approval of a project under Part 3A of the EP&A Act does not constitute a development application. Hence the development control provisions of the policy do not apply to the current application.

Notwithstanding the above, an assessment of the proposal has been undertaken for the benefit of understanding whether the land would be considered potential koala habitat or core koala habitat as defined in the SEPP to inform the decision-making process. The assessment is referenced in section 5.4.

4.6.7 State Environmental Planning Policy No 71 – Coastal Protection

i. Application

State Environmental Planning Policy No 71 applies to the coastal zone as defined in the Coastal Protection Act 1979. The Cleary Bros sand extraction operation at Gerroa is within the coastal zone.

ii. Matters for Consideration

Clause 8 of SEPP 71 sets out matters for consideration to be taken into account by a consent authority when it determines a development application for development on land to which the policy applies. Notwithstanding that the current application is made under Part 3A of the Act, the matters for consideration are listed in *Table 4.8* together with an assessment of the consistency of the proposal.

Table 4.8 MATTERS FOR CONSIDERATION (Clause 8)

Matter for Consideration	Consistency of Proposal
(a) the aims of this Policy set out in clause 2,	The aims of the policy are separately listed and individually addressed in Table 4.8 below.

Matter for Consideration	Consistency of Proposal
(b) existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved,	The proposal is not located on the foreshore and will not affect public access.
(c) opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability,	The proposal is not located on the foreshore and provides no opportunities for new foreshore access.
(d) the suitability of development given its type, location and design and its relationship with the surrounding area,	The sand extraction operation is an existing development. Sand extraction has been part of the local environment for several decades. The proposal is for its continuation, which is consistent with the use of the land within recent living memory.
(e) any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore,	The development is not located on or near the coastal foreshore and will have no significant impact on the foreshore.
(f) the scenic qualities of the New South Wales coast, and means to protect and improve these qualities,	The sand extraction operation is screened by roadside vegetation and will remain so. The proposal will not affect the scenic qualities of the coast. vegetation screening will be further enhanced during the course of the proposal.
(g) measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats,	The site has been investigated by Kevin Mills & Associates with the conclusion that the proposal is not likely to significantly affect threatened species, populations, ecological communities or their habitats.
(h) measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994) and marine vegetation (within the meaning of that Part), and their habitats	The proposal does not involve disturbance to any natural water body or waterway and will not affect measures to conserve fish or marine vegetation.

Matter for Consideration	Consistency of Proposal
(i) existing wildlife corridors and the impact of development on these corridors,	Kevin Mills & Associates has investigated the site and confirmed that the proposal will have no significant affect on existing wildlife corridors.
(j) the likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards,	The proposal will not interact with coastal processes because it is set back from the coastal area.
(k) measures to reduce the potential for conflict between land-based and water-based coastal activities,	The proposal will not interact or conflict with any water-based coastal activities.
(l) measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals,	Aboriginal archaeological investigations have been undertaken with assistance from Aboriginal representatives. A previously identified area of archaeological interest on the dune crest will be protected.
(m) likely impacts of development on the water quality of coastal waterbodies,	The development is not likely to significantly affect water quality in coastal waterbodies. The operation uses a dredge pond which is fully contained within a flood bund.
(n) the conservation and preservation of items of heritage, archaeological or historic significance,	As with previous extensions to the sand quarry some Aboriginal artefacts have been discovered on the site in a sparse and spasmodic pattern. The archaeologist has concluded that there are no reasons to prevent the sand quarry extension from proceeding and has proposed limited salvage.
(o) only in cases in which a council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities,	Not relevant, as we are not dealing with a draft LEP.

Matter for Consideration	Consistency of Proposal
(p) only in cases in which a development application in relation to proposed development is determined: *(i) the cumulative impacts of the proposed development on the environment, and* *(ii) measures to ensure that water and energy usage by the proposed development is efficient.*	(i) The proposal will have a cumulative impact with the existing sand extraction and rural operations. The area of disturbance will be extended to the north as the southern area is rehabilitated. Screening will restrict visibility from outside the property. (ii) The proposal uses energy to operate the dredge and processing equipment. The techniques are as efficient as modern technologies allow. Water is not consumed by the process.

iii. Aims of the Policy

The aims of SEPP 71 are set down in clause 2. Each aim is listed and the consistency of the proposal discussed in *Table 4.9* below.

Table 4.9 AIMS OF THE POLICY (Clause 2)

SEPP 71 Aims	Consistency of Proposal
(a) to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast, and	The proposal will not significantly affect the natural, cultural and recreational attributes of the Gerroa area. It will permit managed extraction of a regionally significant economic resource in the area followed by progressive rehabilitation to extend wetland areas and forested land.
(b) to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore, and	Not relevant as the proposal is not located at or near the foreshore and has no effect on public access.
(c) to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore, and	Not relevant as the proposal is not located at or near the foreshore and has no effect on public access.

SEPP 71 Aims	Consistency of Proposal
(d) to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge, and	Several Aboriginal archaeological surveys have been undertaken with the assistance of Aboriginal representatives. An area containing relics has been preserved. The archaeologist has concluded that there are no reasons to prevent the sand quarry extension from proceeding.
(e) to ensure that the visual amenity of the coast is protected, and	The proposal will not affect the visual amenity of the coast. The site is not visible from the coast and is screened from the tourist road.
(f) to protect and preserve beach environments and beach amenity, and	Not relevant as the proposal is not located near a beach and will have no significant effect on beach environments.
(g) to protect and preserve native coastal vegetation, and	The proposal has been modified to protect native vegetation. Most of the affected area is pasture. Compensatory planting is proposed.
(h) to protect and preserve the marine environment of New South Wales, and	Not relevant as the site does not include any aspect of the marine environment and the operation will have no significant effect on external marine environments.
(i) to protect and preserve rock platforms, and	Not relevant, as the proposal does not affect any rock platforms.
(j) to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the Protection of the Environment Administration Act 1991), and	The principles of ecologically sustainable development have been observed in developing the proposal.
(k) to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area, and	The proposal is appropriate for the location in that it extracts sand from an area to the west of the timbered coastal strip screened from its beachside national park and main north-south tourist road. The screening provided along the site boundary will protect the scenic quality of the coastal area.

SEPP 71 Aims	Consistency of Proposal
(l) to encourage a strategic approach to coastal management.	A strategic approach has been adopted in this area from the outset. The sand extraction area is confined to rural land west of the immediate coastal zone, separated from land preserved for nature conservation, recreation and tourism.

iv. Development which cannot be Approved

Clauses 14, 15 and 16 of SEPP 71 limit the ability of the consent authority to approve applications for development with certain characteristics. The circumstances in which a consent authority may not approve a development application together with a comment on the applicability to the current application are given in *Table 4.10*.

Table 4.10 DEVELOPMENT CONTROL

Development Characteristic	Relevance to Current Application
14 A consent authority must not consent to an application to carry out development on land to which this Policy applies if, in the opinion of the consent authority, the development will, or is likely to, result in the impeding or diminishing, to any extent, of the physical, land-based right of access of the public to or along the coastal foreshore.	Not relevant as the proposal does not affect access to the foreshore
15 The consent authority must not consent to a development application to carry out development on land to which this Policy applies in which effluent is proposed to be disposed of by means of a non-reticulated system if the consent authority is satisfied the proposal will, or is likely to, have a negative effect on the water quality of the sea or any nearby beach, or an estuary, a coastal lake, a coastal creek or other similar body of water, or a rock platform	Not relevant as the proposal does not require effluent disposal.

Development Characteristic	Relevance to Current Application
16 The consent authority must not grant consent to a development application to carry out development on land to which this Policy applies if the consent authority is of the opinion that the development will, or is likely to, discharge untreated stormwater into the sea, a beach, or an estuary, a coastal lake, a coastal creek or other similar body of water, or onto a rock platform.	Not relevant as the proposal does not discharge stormwater. The dredge pond collects all water from site operations. Water may be released from the pond should a high level be sustained with safety risk. In this case the water is treated by settling in the pond prior to release.

v. Master Plans

Clause 19 requires a consent authority to take into consideration a master plan adopted in accordance with SEPP 71 before determining an application for development on land to which SEPP 71 applies. However under Clause 18 the Minister may waive the need for a master plan to be adopted.

Clauses 20 to 24 describe the process for preparation and adoption of a master plan. The clauses provide for a draft master plan to be publicly exhibited and referred to the Coastal Council. The Minister then considers any submissions received before deciding whether to adopt, vary or reject the draft master plan.

This process is not relevant to the current application because, as indicated earlier, the application is for approval of a project under Part 3A of the EP&A Act. The application is not an application for development consent and the Minister's role as approving body is not that of a consent authority as referred to in SEPP 71.

4.7 OTHER GUIDELINES AND PLANS

4.7.1 Crooked River Estuary Management Plan

The Crooked River Estuary Management Plan was published by Kiama Council in September 2003. The plan was prepared in accordance with the NSW Government's Estuary Management Policy and was overseen by a committee comprising representatives of State and local government and community members.

The Crooked River has a catchment area of 32 square kilometres of predominantly rural land, including the Gerroa sand quarry. The management plan presents strategies and actions for dealing with issues and concerns regarding the catchment

raised during the consultation process. These strategies are grouped under the following categories:

- water quality
- nature conservation;
- sedimentation;
- entrance conditions and flooding;
- foreshore access
- public infrastructure; and
- cultural heritage.

The Gerroa sand quarry is mentioned in relation to water quality where an objective is to manage any impacts on the estuary associated with sand mining in the catchment. This objective is developed in strategy WQ 10 where the target is "100% compliance with development controls and guidelines by sand mining operators; no adverse impacts of sand mining on water quality in Crooked River or its tributaries."

The proposed extension of the sand quarry is designed and will be managed to achieve these targets.

Chapter 5

ENVIRONMENTAL ASSESSMENT

5.1 SOILS AND SLOPE STABILITY

5.1.1 Top Soil

The sand profile on the site is described in the report by Douglas Partners (*Appendix E*) and discussed in section 3.1. The existing top soil with its organic content including propagative material will be re-used during restoration work. Where possible topsoil stripping will be coordinated with restoration so that topsoil can be directly transferred from one location to the other.

Topsoil unable to be directly placed on a restoration area at the time it is being stripped, will be stockpiled in low uncompacted berms for as short a period as possible. Proposed topsoil handling methods are designed to maximise survival of native propagules in the soil and retain the organic content in the surface layer to assist rehabilitation and re-establishment of native vegetation.

5.1.2 Acid Sulphate Soils

Douglas Partners (*Appendix E*) drilled four sampling boreholes to depths ranging from 13.5 to 17.5 metres collecting soil/sand samples at one metre depth intervals. Chemical testing was carried out to assess aggressivity and acid sulphate soil potential.

The aggressivity testing results were indicative of non-aggressive or mildly aggressive ground conditions. The acid sulphate testing did not indicate the presence of actual acid sulphate soil (AASS) conditions. Of 69 samples collected and tested, four samples reacted in a manner to indicate potential acid sulphate soils (PASS) with only one sample giving a strongly indicative result.

Five samples were selected for further testing based on the results of the initial screening tests. All five demonstrated total oxidisable sulphur at or in excess of 0.03 per cent. This is the action criterion threshold value nominated in the *Acid Sulphate Soils Assessment and Management Guidelines* triggering a requirement for an acid sulphate soil management plan.

Douglas Partners suggested that exceedences in Unit 1 materials (upper aeolian sand profile) were anomalous results, but applying a precautionary approach concluded

that unless otherwise indicated by site-specific testing before or during excavation, all materials of estuarine origin (units 2, 3 and 4) and the site in general will need to be monitored for potential acid sulphate conditions.

A draft acid sulphate soil management plan (ASSMP) has been prepared in accordance with the guidelines and is included in *Appendix G*. In compliance with the plan the operator will:

- continue the current monitoring of surface water, groundwater and dredge pond water;
- prior to extraction, progressively test in-situ acid sulphate soil potential to develop treatment methods for individual sections and units of the sand resource to be extracted;
- during extraction, monitor feed stock and finished sand to confirm the effectiveness of the processing methodology to meet product specifications;
- monitor pyritic content of reject fines to assess concentration of oxidisable sulphur and if needed, the neutralisation dosage rate;
- control placement of reject materials, including sulphidic fines and shell fragments with possible burial, if needed; and
- maintain buffering material for use if pH modification becomes necessary.

The report accompanying the draft ASSMP plan notes that environmental risks from acid sulphate soils have been satisfactorily managed at the sand quarry in the past, assisted by the natural carbonate content of the shell material present throughout the sand. The report envisages that there will be minimal or no requirement for addition of neutralising materials during and after extraction. Nevertheless a precautionary approach is recommended.

Cleary Bros will incorporate the requirements of the draft acid sulphate soils management plan in the Quarry Environmental Management Plan for the Gerroa Sand Resource for implementation during and following extraction operations on the extension site.

5.1.3 Stability

Stability of the dredge pond batters is essential during sand extraction operations and in the longer term when the site is restored to wetland/bushland with a newly created landform. Unstable batters are unsafe for site workers and future visitors to the site and lead to batter creep that may threaten surrounding vegetation. This is particularly relevant in the area to the immediate north of the existing dredge pond where the dune system reaches its greatest height, with the natural surface being some four metres above dredge pond level. At this location there is a strip of littoral

rainforest to be preserved on the dune crest adjacent to the top of the proposed batter.

After considering the structural characteristics of the sand, Douglas Partners suggests that during excavation an average excavation slope of not greater than 25° or about (2.1H to 1V) be employed both above and below the water level to maintain short term stability. During restoration material can be deposited in the base of the pond and the shoreline adjusted to suit the rehabilitation design. Douglas suggests the following design criteria for restoration work:

- above the beach zone, a final batter in the range 2H:1V to 3H:1V;
- a gradient of 6H:1V in the beach zone;
- an underwater maximum batter of 4H:1V for depths greater than one metre below extreme low water level.

The above criteria will be incorporated into the detailed rehabilitation design. In order to achieve the design criteria it may be necessary to bring some clean fill to the site for placement in the dredge pond towards the end of the operation. Only virgin excavated natural material would be used for this purpose and if placed near the shoreline the material would be covered with natural soils from the site to maintain consistent growing conditions for wetland vegetation.

5.1.4 Mitigation Measures

In summary, Cleary Bros will implement the following safeguards to manage soils on the site:

- restrict soil disturbance to the minimum area ahead of the extraction operation;
- restore and stabilise disturbed areas as soon as extraction or surface operations are complete in those areas;
- recover topsoil as a first step when extending the work area and either reuse directly for rehabilitation or stockpile in low, uncompacted berms for subsequent re-use;
- maintain vegetation on finished surfaces to limit subsequent erosion;
- implement the procedures described in the Acid Sulphate Soil Management Plan; and
- restore all batters to comply with gradients specified by Douglas Partners.

5.2 CLIMATE

The Gerringong-Gerroa district is characterised by flat and undulating lowlands between the coast and high mountains to the west. The area enjoys a temperate climate, moderated by its closeness to the Pacific Ocean. Some of the State's highest rainfall is recorded in the high country to the west of the site, but the precipitation rate rapidly declines across the lowlands from the escarpment towards the coast. The annual precipitation at Kiama Bowling Club is similar to that recorded in coastal areas of Sydney.

A meteorological station at the sand quarry has been recording rainfall, wind and temperature since 2003. This information is collected for operational purposes and retained by Cleary Bros. A better guide to average conditions that may be experienced at the site during the currency of sand mining is obtained from the nearest meteorological station at Kiama Bowling Club, some 17 km to the north where records have been kept since 1897. *Table 5.1* presents a summary of significant data sourced from the Bureau of Meteorology station No 068038 at Kiama Bowling Club.

Table 5.1 TEMPERATURE, RAINFALL, HUMIDITY AND WIND AVERAGES

Item	J	F	M	A	M	J	J	A	S	O	N	D	Year
Temperature													
Mean Daily Max. Temp. (°C)	25	24.9	24.1	22.1	20.1	17.6	16.8	18.1	19.8	21.7	22.5	23.8	21.1
Mean Daily Min. Temp. (°C)	17.5	17.7	16.4	14.1	12.2	9.3	8.4	8.8	10.6	12.4	14.3	16.3	12.8
Rainfall													
Mean Monthly Rainfall (mm)	111	119	145	132	121	126	87.6	77.4	75.2	86.7	86.8	94.4	1261
Mean No of Raindays	12.2	11.7	12.7	11.2	10.8	9.8	8.6	8.5	9.2	10.7	11	11.3	127.6
Humidity													
Mean 9am Rel. Humidity (%)	72	74	71	69	70	65	63	59	60	64	68	70	66
Mean 3pm Rel. Humidity (%)	67	70	67	67	65	58	58	55	58	63	65	66	63
Wind													
Mean 9am Wind Speed (km/hr)	8.2	8.1	8	8.1	8	10	10.1	9.2	10	9.8	9.1	9.1	9
Mean 3pm Wind Speed (km/hr)	10.8	10.7	10.3	9.1	8.5	9	9.6	11.2	11.7	10.8	11.3	11	10.3

Notes: 1. Data from Bureau of Meteorology Station No 068038, Kiama Bowling Club

2. Monthly rainfall entries rounded to three significant figures.

Temperature

The Illawarra region experiences a mild maritime climate with relatively little temperature variation on a monthly basis. Average monthly maximum temperature ranges from 16.8 ^{o}C in July to 25 ^{o}C in January, although temperatures in excess of 40 ^{o}C have occurred in the warmer months. The average monthly minimum temperature ranges from 8.4 ^{o}C in July to 17.7 ^{o}C in February. Temperatures as low as 3 ^{o}C have been recorded in the winter months.

Rainfall

Rainfall is highest from late summer through autumn to early winter, with the monthly average reducing by about one third during late winter. September is the driest month with an average of 77.4 millimetres while the wettest month, February, averages 144.9 millimetres. The monthly average number of raindays shows a similar pattern with an average of about 12 raindays in January, February and March and eight to nine days in July, August and September. This demonstrates that there are more wet periods and higher rainfall intensity in the summer months. The annual average rainfall is 1,261 millimetres.

Humidity

Mean monthly humidity is highest in late summer and lowest in late winter and early spring.

Evaporation

The evaporation rate determines the quantity of water likely to be needed for dust suppression. Evaporation data are not recorded at meteorological stations near to the site. The nearest coastal meteorological stations where evaporation is recorded are at Sydney Airport and Nowra RAN Air Station. The mean daily evaporation for these stations is 4.9 and 4.8 millimetres respectively. Evaporation at Sydney Airport ranges from 7.1 millimetres per day in January to 2.5 millimetres per day in June, while at Nowra Air Base the range was from 6.3 to 2.9 millimetres.

Wind

Wind at the sand quarry can influence dust generation, dispersion and settling and noise propagation. It can also influence the frequency of temperature inversions.

The average monthly wind speed varies by about 20 per cent throughout the year. Afternoon (3 pm) winds are generally stronger than morning (9 am) winds. The highest average afternoon speeds occur from late winter through to mid summer, averaging above 11 kilometres per hour. Average afternoon wind speeds in the autumn and early winter, are in the range 9 to 10 kilometres per hour.

5.3 HYDROLOGY AND WATER QUALITY

5.3.1 Dredge Pond Hydrology

The dredge pond is bunded to produce a closed catchment, designed so that there is no natural exchange of surface water with the surrounding drainage system. The pond receives water from incident rainfall, runoff from peripheral areas within the site and from exchanges with groundwater in the locality. Water is lost from the pond by evaporation and from exchanges with groundwater.

Sand mining operations utilise dredge pond water, but this is recirculated to the pond either by direct surface flow or infiltration to the sand profile at the working area. There would be minor additional evaporation from this activity.

Douglas Partners (*Appendix E*) has examined records of dredge pond level for a seven year period deriving that the yearly maximum and minimum values moved within a limited range. High dredge pond levels experienced during this period declined rapidly, suggesting good connectivity with groundwater.

The existing site bunds are designed to prevent ingress of floodwater from the surrounding land, allowing half a metre of freeboard above the predicted once in 100-year flood level. This bunding will be continued around the extension area wherever the natural ground level falls below the designated bund height of 3.2 metres AHD. Should the pond remain at an unsafe level after surrounding floodwaters have subsided, water can be released from the dredge pond to natural drainage. There have been few occasions when a release has been necessary.

5.3.2 Drainage Characteristics

The existing drainage system in the area is shown on *Figure 5.1*. The site is within the catchment of Blue Angle Creek, a tributary of the Crooked River, which flows to the sea via a restricting sand bar at Gerroa Beach. The river mouth is periodically closed, having to be opened mechanically from time to time by the Council. Conversely storm surges of seawater can breach the bar entering the river mouth and causing flood conditions within the estuary.

Blue Angle Creek has a catchment extending to foothills on the western side of the Southern railway with an area of about 12 square kilometres. The former Foys swamp is a floodplain providing storage for flood waters that are unable to pass quickly through the restricted downstream channel of Blue Angle Creek and the constriction at the mouth of the Crooked River.

Within Cleary Bros' property Blue Angle Creek is a man-made channel, having been shaped in the past to assist in draining the former Foys Swamp for rural purposes. A

number of tributary drains have also been constructed within the property to drain the rural property. Some 20 years ago floodgates were installed on Blue Angle Creek close to the point where the creek leaves Cleary Bros property. The purpose of the floodgates is to prevent back flow of floodwater into the property from the Crooked River at times when river levels are higher than flood levels on the property. This can occur for example when there is a storm surge forcing seawater into the river system.

The proposed sand quarry extension will not affect the drainage system external to the extension area. The boundary of the extension area is at least 40 metres from the bank of the man-made channel of Blue Angle Creek.

5.3.3 Groundwater

Douglas Partners examined records of groundwater obtained form boreholes on the site noting that the sand acts as an aquifer with moderate variation in groundwater levels but a consistent underlying flow gradient trending generally east or north east in different parts of the site. While groundwater levels vary rapidly with rainfall the base level is controlled by the main drainage channel on the property that leads to Blue Angle Creek. Groundwater levels vary more rapidly between the highest dune and the lower areas to the north.

Douglas concluded that proposed sand extraction in the extension area is not expected to result in variation in the range of groundwater levels previously experienced in the dredge pond or monitoring bores on the site. The steepest groundwater gradient will occur in the area immediately east of the dredge pond which is effectively the same as current conditions.

5.3.4 Flooding

A flood study to consider the effect of the proposed sand quarry extension has been undertaken by Evans and Peck (refer *Appendix H*). This study followed previous flood studies of the locality, used to determine the height for flood bunds already constructed at the sand quarry. For the current study, additional ground profile surveys were undertaken to provide cross sections for the hydraulic model.

The study used a hydrologic model to estimate the peak discharge of floodwater from the tributaries for various storm events. This information was then used as an input to the hydraulic model to predict flood levels, taking into account flood storage and channel characteristics. The hydraulic model considered the effect of the existing sand quarry and proposed extension. Surrounding the sand quarry area with a flood bund reduces the available storage on the flood plain. However much of the proposed extension is on higher land that would not have been inundated during a flood.

The results of the model show that for a "critical" 36 hour duration storm of 100 year average recurrence interval, the proposed bunded sand quarry extension would result in a maximum flood level increase of 15 millimetres. Evans and Peck noted that this is an insignificant increase and concluded that the effect of the mine extension will not be sufficient to cause changes in peak flows that affect other areas or changes in flow velocities that affect creek stability.

5.3.5 Water Quality

i. Water Quality Objectives

Water quality objectives for the Illawarra catchment have been published by the Department of Environment and Conservation. Where the channel leading to Blue Angle Creek passes through Cleary Bros rural property it would fall into the Department's category of an "uncontrolled stream", defined to have largely natural flow patterns that may have been altered to a limited degree. The water quality objectives for uncontrolled streams derive from the likely circumstances of those streams to protect: aquatic ecosystems; visual amenity; secondary contact recreation (boating); primary contact recreation (swimming); livestock water supply; irrigation water supply; and homestead water supply, as may be appropriate in the locality.

Within the Cleary Bros property and immediately downstream the relevant objectives are those for aquatic ecosystems, livestock water supply and irrigation water supply. Limits for pH are provided in the objectives in respect of aquatic ecosystems; primary contact recreation and homestead water supply. The same pH limits would apply in each case being 6.5 to 8.5.

ii. Surface Water

The proposed sand quarry extension has very little potential to contribute water to the external creek system, confined to the following:

- during site preparation, natural runoff from initial boundary works parallel to the channel leading to Blue Angle Creek; and
- during operation, occasional water release from the dredge pond after an extended rain event when high pond levels present a safety risk.

When initial works are being carried out on the periphery of the extension area, such as installation of the flood bund, a geofabric barrier will be installed at the edge of the work area where needed to control any potential sediment movement towards the external drainage system. Once the peripheral works are complete and stabilised, the geofabric fencing will be removed to enable fauna to access the pond.

Douglas Partners (*Appendix G*) considered the results of field measurements of total dissolved solids and dissolved oxygen in the dredge pond, main drainage channel on the property and Blue Angle Creek to the north. The water within the sand quarry dredge pond was found to be generally of higher quality than water in the external waterways.

Douglas Partners also examined test results for nutrient levels in the dredge pond and the nearby Foys Swamp drainage system leading to Blue Angle Creek. Ammonia, nitrate and total phosphorus have been measured. All available test results in the period 2003 to 2006 were examined with the finding that all results for the dredge pond were within the ANZECC guidelines for fresh water with the exception of one total phosphorus result from August 2006. The review indicates that water in the Foys Swamp drainage system has generally higher concentrations of nutrients than the dredge pond. This adds weight to the conclusion that the dredge pond water is generally of better quality than that of the external drainage system.

The current environment protection licence for the operation permits water to be discharged from the dredge pond at a licensed discharge point. Concentration limits are not specified in the licence but there is a requirement for any discharge to comply with section 120 of the Protection of the Environment Operations Act, where it is an offence to pollute any waters. Cleary Bros has advised that the need to lower the pond level is a rare event, occurring years apart.

iii. Pond Water and Groundwater

Douglas Partners (*Appendix E*) examined records of pH measurements from the dredge pond and nearby groundwater bores, reporting that the dredge pond pH has generally moved in the range 6.0 to 9.0 and the monitoring bore pH has moved in a narrower range of 5.9 to 8.5. The lowest pH readings in the pond (most acidic) have been recorded in periods of heavy rainfall suggesting flushing of organic acids or pyritic material from the aquifer. The similar low readings in the groundwater bores were opined to come from the same source.

Overall Douglas considers the pH monitoring results relatively benign, within the natural range of the groundwater and possibly signifying relatively low pyrite content and a buffering of the system by included shells.

By implementing the requirements of the acid sulphate soils management plan described in section 5.1, Cleary Bros will ensure that the operations do not contribute to a deterioration in water quality in the pond and to associated groundwater.

The fuel storage tank on the site is located over an impervious bunded surface to retain any spilt fuel and thereby prevent contamination of groundwater.

5.4 FLORA AND FAUNA

Kevin Mills and Associates has visited the Gerroa sand quarry on many occasions to investigate the surrounding flora and fauna and rehabilitation of the site. In 2005 Dr Mills undertook a flora and fauna survey of Cleary Bros' entire rural property at Gerroa. The report from the 2005 survey is included as *Appendix I*. For the current proposal, Dr Mills has again visited the site during 2006 and prepared a detailed flora and fauna assessment for the sand quarry extension, included as *Appendix J*. This report has taken into account the latest changes to legislation and feedback Cleary Bros received from consultation.

For the purposes of the investigation a project area of about 16 hectares was defined on the property extending north and west of the existing sand quarry. This land was surveyed for vegetation communities, fauna habitats, threatened species and threatened ecological communities. The report includes seven-part tests of the significance of the likely impact from the sand quarry extension on several threatened species and endangered ecological communities. Principal findings and recommendations from the investigation are summarised below.

5.4.1 Vegetation

An extensive plant list has been prepared containing the names of 101 native species and 25 introduced species identified on the site. Seven distinct vegetation communities have been identified, two of which are artificial, summarised in *Table 5.2* and shown on *Figure 5.2.*

Table 5.2 VEGETATION COMMUNITIES

Vegetation Type	Comment
1. Littoral Rainforest	Endangered Ecological Community. Rare, appearing as small stands along the coast. Simple rainforest community of about 0.9 hectares within Blackbutt - Banksia Forest on sand dunes. Not shown on SEPP 26 – Littoral Rainforest maps.
2. Blackbutt – Banksia Forest	Common in Shoalhaven, less common in Kiama. A tall forest dominated by Blackbutt of about 1.7 ha. Present on the sand dune immediately north of the existing dredge pond in the form of younger remnant trees from previous logging.
3. Bangalay – Banksia Forest	Endangered Ecological Community. Common in Shoalhaven, less common in Kiama. Scattered trees remaining from previous clearing with grass understorey. Occupies about 1.6 hectares north of the Blackbutt – Banksia Forest.
4. Swamp Sclerophyll Forest on	Endangered Ecological Community. Rare, occurs on swampy sites along the coast. Occurs on the lower land adjacent to the

	Coastal Floodplains	western edge of the proposed extension and beside Blue Angle Creek.
5.	Phragmites Reedland	Part of community 4 above. Occurs adjacent to the Swamp Sclerophyll Forest on waterlogged land.
6.	Miscellaneous Forest (planted native trees)	An area of about 0.3 hectares planted with local native trees about 1992 for screening purposes. Located at the southern end of the cleared grazing land.
7.	Introduced Grassland	A paddock containing mostly introduced grassland with pasture improvement at the northern end of the proposed extension.

Mills has described each of the vegetation communities in terms of its floristics (principal species present), structure, location on the property and regional status.

5.4.2 Vegetation of Conservation Significance

While individual plant species of conservation significance are known to occur generally in the district, none have been located during the many surveys conducted on the site. Mills indicates that the extension area does not provide the type of habitat where individual plant species of conservation significance occur.

By contrast, three vegetation communities, listed as endangered ecological communities in the *Threatened Species Conservation Act, 1995*, are present within the project area:

- Littoral Rainforest – part of this community is within the extension area, although the major portion has been excluded. Mills describes the community as having eastern and western sections. The western section, within the extension area, is described as "far sparser with almost no continuous rainforest tree canopy";
- Swamp Sclerophyll Forest on Coastal Floodplains – all of this community has been excluded from the proposed extension; and
- Bangalay Sand Forest – Mills states "this community has been heavily disturbed in the past, the scattered trees indicating the forest was largely cleared for grazing many years ago.

Seven part tests in respect of the endangered ecological communities are discussed in section 5.4.4.

5.4.3 Fauna

i. Fauna Species

A fauna species list has been compiled for the property based on the results of current and previous studies carried out on the property and surrounding land. The list contains 204 species, with 33 mammals, 147 birds, 15 reptiles and nine frogs. Included in these numbers are eight introduced mammal species and six introduced bird species.

ii. Fauna Habitats

Fauna habitats in this area correspond to the vegetation communities. Mills nominates two habitats as most important for fauna:

- the Swamp Sclerophyll Forest containing swamp mahogany trees;
- treeless wetlands, particularly the rehabilitated shallows at the southern part of the dredge pond.

Neither of these habitats will be disturbed by the proposed extension of the sand quarry and will be extended as part of the rehabilitation and compensatory planting works.

To assess the habitat potential of the forest areas to be cleared under the proposal, Mills surveyed randomly selected trees within the extension area to assess their habitat value based on the occurrence of hollows. Blackbutt trees within the extension area are remnants from previous logging and are generally not large. Hollows are rare with only one hollow being identified in 13 Blackbutt trees surveyed. In the Bangalay Sand Forest an average of about one hollow per tree was identified for the 14 trees surveyed, which Mills records as a very low density of hollows.

iii. Significant Animal Species

Thirteen animal species recorded in the Seven Mile Beach area are listed in schedules of the *Threatened Species Conservation Act, 1995*. These species include one amphibian, seven birds and five mammals. After considering the records of sightings of the various species and their habitat requirements, Mills concludes that the following threatened species are known to occur on or near land affected by the proposed sand quarry extension:

- Swift Parrot;
- Australasian Bittern;

- Black Bittern;
- Powerful Owl;
- Grey-headed flying fox;
- Large Bentwing-bat.

In addition some migratory species of birds protected under the (Commonwealth) *Environment Protection and Biodiversity Conservation Act, 1999* would occur on or near the area from time to time.

5.4.4 Seven Part Tests

Seven part tests in accordance with section 5A of the Environmental Planning and Assessment Act have been included in *Appendix J* for the six threatened fauna species and three endangered ecological communities identified as potentially affected by the proposal.

On the basis of the findings of the seven part tests, Mills concluded that subject to recommended mitigation measures being implemented, the proposed extension of the sand quarry is not likely to have a significant impact on any threatened species, population or ecological community listed in the *Threatened Species Conservation Act, 1995* or the *Fisheries Management Act 1994* or their habitats. Consequently a species impact statement is not necessary for the proposal.

5.4.5 Consideration of Other Acts and Policies

The project has been assessed to determine whether reference to the Commonwealth Minister for Environment is required in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.* The categories of potential involvement of the Commonwealth legislation are for "critically endangered and endangered species", "vulnerable species" and "internationally protected migratory species". Mills concludes from the assessment that the proposed sand quarry extension will not have a significant impact on the species listed within the above categories. Hence reference to the Commonwealth Minister is not required.

Mills has considered State environmental planning policies Nos 14 (*Coastal Wetlands*) and 26 (*Littoral Rainforests*) concluding that neither has relevance to the proposal because no part of the site has been included on maps to which those policies apply. State Environmental Planning Policy No 44 (*Koala Habitat Protection*) does not apply within Kiama local government area where the quarry is to be extended, but does apply within Shoalhaven where the access road and loading area are located. There are two species of trees in this area that are of a type listed in SEPP 44. Bushland is considered potential koala habitat if trees of the listed species exceed 15 per cent of

the trees present. The planted swamp mahogany (*Eucalyptus robusta*) to the east of the access road form more than 15 per cent of the trees in that area. Hence this area is potential koala habitat, but Dr Mills has confirmed it is not core koala habitat. There have been very few recorded sightings of koalas in the area in recent times. Consequently there are no actions to be taken under the SEPP.

Kiama Local Environmental Plan, 1996 designates some of the land affected by the proposal to be an "area of high conservation value", but the mapping does not appear accurate as some areas of dredge pond and cleared paddock are included while some bushland areas are omitted (refer to *Figure 4.1*). This local planning instrument does not apply to the proposal which has been declared a project under Part 3A of the EP&A Act.

5.4.6 Impact Assessment

In undertaking the assessment Kevin Mills and Associates has considered the effect on the surrounding bushland of several decades of sand quarrying at Gerroa. Quarrying has had no observable impact on bushland surrounding the site including Seven Mile Beach National Park. It has been demonstrated that setting the edge of workings five metres back from existing trees has been sufficient to ensure that the trees are not significantly impacted. Over many years of visitation, Dr Mills has not observed excessive algae in the pond and given the low concentrations of nutrients it is unlikely that an algal bloom would occur.

The proposal involves progressive removal of about 1.7 hectares of previously logged forest, 1.6 hectares of modified forest and 0.3 hectares of planted trees within the proposed sand quarry extension area. The effect of the proposal in fragmenting the remaining forested area on the property has been considered. Mills observes that past clearing has already fragmented the forest and that while the quarry extension will sever one link, creating and strengthening other links nearby as part of compensatory planting will mitigate the impact.

Mitigation measures recommended to minimise impacts on flora and fauna fall generally into three categories:

- protect the Swamp Sclerophyll Forest from disturbance;
- undertake planting to compensate for removing other forest types; and
- actively manage the remaining native vegetation on the site.

The Swamp Sclerophyll Forest is not included within the extension area. Dr Mills has identified the boundary of this forest type and a survey plan has been prepared. The boundary line forms part of the defined edge of the proposed extension area and has been set back five metres from the nearest trees within the Swamp Sclerophyll Forest. This same setback distance was implemented for the last extension of the

sand quarry and has been verified to be adequate for protecting the adjoining forest. Erosion and sediment controls will be implemented to arrest any drift of disturbed sand into the Swamp Sclerophyll Forest area, which occurs at a lower level than adjoining dunes.

In consultation with Cleary Bros, Kevin Mills and Associates has identified approximately 20 hectares of the broader rural property where compensatory planting is to take place. These areas are shown on *Figure 5.3* and cover approximately five times the area of native vegetation to be removed. Plantings will be consistent with naturally occurring communities on the site. The proposal includes extending the remaining littoral rainforest to the east to revegetate a disused access track closer to the boundary fence and plantings of Blackbutt and Bangalay, the principal species to be removed.

The draft vegetation management plan (Appendix K) includes methods for planting and management of the compensatory planted areas. This plan will be finalised to include any requirements emanating from the approval to extend the mine and will be incorporated into the quarry environmental management plan for the site.

The remaining native vegetation in the application area will be actively managed by protecting it from further disturbance, controlling weeds and where necessary, planting appropriate native species.

5.5 ARCHAEOLOGY AND HERITAGE

5.5.1 Aboriginal Archaeology

The Gerroa sand quarry has been the subject of several investigations for Aboriginal artefacts over the last 20 years, generally preceding extensions to the mining area. The area of the sand quarry extension now proposed was partly surveyed in 1992 by Robert Paton Archaeological Studies Pty Ltd. This survey occurred after the Land and Environment Court had granted development consent for the sand quarry to be extended essentially to the northern end of the forested land (see *Figure 1.2* for the extent of the Court approval).

As a result of Paton's work several areas of archaeological significance were identified. The National Parks and Wildlife Service subsequently issued a "consent to destroy" under section 90 of the *National Parks and Wildlife Act, 1974* for archaeological material in the Court-approved mining area. That consent required that two locations, identified in the document as Area A and Area B, be fenced and safeguarded from further disturbance. Those locations are shown on *Figure 5.4*.

For the current application, Cleary Bros commissioned Navin Officer Heritage Consultants Pty Ltd to review the Aboriginal cultural heritage of the extension area. That review, undertaken in 2005, indicated a need for additional investigation of the archaeological resource in the extension area to reliably predict the impacts of sand mining. A Preliminary Research Permit was subsequently obtained following application to the Department of Environment and Conservation. The permit, issued under section 87 of the *National Parks and Wildlife Act 1974,* authorised subsurface investigation within the proposed extension area.

Navin Officer subsequently carried out the subsurface investigations with Aboriginal representatives in attendance and prepared a report of the findings, included as *Appendix L.*

The testing program included 51 test pits, with shell material recovered from 26 pits and a total of 39 lithic items recovered from five pits. The findings are similar to that recorded by Paton, with isolated higher concentrations occurring on the crest of the dune and the western side consisting of Pipi midden and stone artefacts. Navin Officer noted the pattern of pipi shell middens to be sparse, spasmodic and fragmented. Artefact material was found to be even sparser. The site was assessed to be of moderate significance at the local level.

Navin Officer opined there are no reasons to prevent the sand quarry extension from proceeding as the potential for other such sites to occur in the district is high. The report notes that the larger of Paton's fenced areas, Area A, is within a 0.6 hectare portion of dune crest that has been excluded from the extension. The other fenced location, Area B, is only partly included in the sand quarry extension. This area was the subject of concentrated testing and shown to contain little of archaeological significance.

The consultants believe that the sand quarry extension will provide an opportunity to address unanswered research questions about the site and recommend that limited salvage excavations should occur. Cleary Bros would be pleased to permit the salvage to take place.

A copy of the report was forwarded to the Jerrinja Local Aboriginal Land Council for consideration. The land council's response is incorporated into *Appendix L.* As has occurred in the past, the company will arrange for initial soil stripping operations to be monitored by Aboriginal representatives for identification of any artefacts.

5.5.2 European Heritage

Schedule 2 of Kiama Local Environmental Plan, 1996 lists heritage items identified in the Kiama local government area for protection. There is only one listing in the Gerroa area, listed as "Black Head, Gerroa, palaeontological site". The proposed sand quarry extension will have no effect upon this heritage item.

Similarly Shoalhaven local Environmental Plan, 1985 lists heritage items in Shoalhaven identified for protection. There are no listings in the vicinity of the sand quarry extension.

An examination of the State Heritage register held by the NSW Heritage Office indicates that there are no state-listed items in the Gerroa area.

Consequently the proposed sand quarry extension will not have a significant impact on any listed item of the environmental heritage.

5.6 LANDSCAPE AND VISUAL CHARACTERISTICS

5.6.1 Existing Landscape

The existing sand quarry workings are located within a perimeter of bushland and are almost completely obscured from view from locations outside the site. Cleary Bros installed earth berms and undertook tree and shrub planting along the Crooked River Road frontage many years ago to restrict the visibility of the operation. These measures have proven successful, effectively screening the site from view, except for a few locations where as a result of recent dry conditions it has been possible to obtain a brief glimpse into the property through the screening foliage. The company intends to address these minor breaches to consolidate the screen.

About one third of the extension area to the north of the dredge pond has a timbered frontage to Crooked River Road. The constructed earth berm along the road boundary continues through part of this area and is fully revegetated. In this location the ground level of the sand dune is approximately the same as the level of the road.

Further north the proposed sand mining area incorporates a cleared grazing paddock with no effective screening to the road frontage at the present time. The ground level in the cleared paddock is about one metre lower than that of the road surface, at present giving travellers on the road a view over the property.

At the southern end of the cleared paddock a rectangular fenced area contains dense screening vegetation. This locality was fenced and planted in the early 1990s following an approval from the Land and Environment Court to mine to the end of the timbered land. The screen was established to screen the anticipated northern end of workings from northerly views. While this planted area is not currently relied upon to screen the workings, its effectiveness demonstrates that vegetation screening can be achieved in the area. It is to be replaced with more extensive screen planting at the northern end of the extension area.

Existing vegetation screening is highlighted on *Figure 5.5*

5.6.2 Proposed Extension

As the sand mining operation extends to the north it will be initially set back from the road boundary by approximately 35 metres to protect a strip of littoral rainforest and a locality of archaeological interest, as explained in sections 5.4 and 5.5. In this area the existing vegetation will continue to provide an effective screen to the workings. Furthermore a disused access track within the property beside the boundary fence will be revegetated with rainforest species as part of compensatory planting, further enhancing the screen.

As part of the works for the sand quarry extension it is proposed to extend the existing vegetation screen further north along the Crooked River Road frontage, beside the cleared paddock as shown on *Figure 5.5*. Because of the relative levels of the paddock and road, the earth berm constructed along this frontage will be lower than the berm further south, but will provide a suitable bed for planting. Screen planting will extend 10 metres into the property from the boundary fence and has been designed to ensure dense shrub cover at eye level. A report by Kevin Mills and Associates specifying the screen planting is included as *Appendix M*. To ensure that the vegetation has the longest available period to mature before it is required to screen the workings, screen planting will be undertaken in the first year of the sand quarry extension and be continuously maintained thereafter.

Cleary Bros undertakes not to extend the sand quarry workings into any area of the site that has not been effectively screened from view from motorists on Crooked River Road. In the event that a bush fire reduces the effectiveness of the screen, Cleary Bros will restore the vegetation as quickly as possible.

The balance of the cleared paddock, to the north of the proposed sand quarry extension, will be revegetated as an area of compensatory planting described in section 5.4. Converting this residual area of paddock to a forest will further assist to screen the proposed sand quarry workings.

In summary, the proposed screening measures are designed to prevent the sand quarry extension from being observed from publicly accessible land. With the sand

quarry unable to be viewed it will not have a significant visual impact. The visual characteristics of Crooked River Road will be altered in that the current westerly view over a cleared paddock will be restricted by vegetation. The road will then have forested borders on both sides.

5.7 NOISE

The proposed sand quarry extension does not involve an increase in sand production, changed production methods or any modification to existing noise bunds near the site office. The only aspect of the proposal that could alter the noise characteristics of the site is that dredging operations will progressively move to the north. In doing so the dredging noise source will be moving further away from the nearest residences to the south, but closer to the residence to the north-west.

Renzo Tonin and Associates Pty Ltd has previously carried out noise studies at the site. The consultant recommended that the previous assessment should not simply be updated because it was based on background noise measurements recorded over 10 years ago using methods not consistent with current practice. Consequently Renzo Tonin was commissioned to undertake a fresh noise assessment of the sand quarry and to consider the effects of the proposed extension. The report is included in *Appendix N*. This assessment was carried out to accord with the requirements of the Department of Environment and Conservation (DEC) specified in the Department's *Industrial Noise Policy* and *Environmental Criteria for Road Traffic Noise*.

Background noise measurements were recorded at the three nearest residences, the Seven Mile Beach Holiday Park (caravan park) and two picnic areas within Seven Mile Beach National Park. It was noted that existing operations from the sand quarry were inaudible at the picnic areas because of the dominating sound of the surf. Existing traffic noise was also measured at two residences and the caravan park, being the three most affected receivers. Intrusiveness and amenity noise criteria were developed for each location in accordance with the DEC guidelines enabling project specific noise goals to be established for industrial noise and traffic.

Concurrent site operations are limited owing to the number of plant items and personnel available at the site. Three scenarios were modelled, using the ENM computer programme, to represent the highest noise levels likely to be generated:

- sand extraction plus truck loading at the loading area;
- clearing and/or pond shaping plus truck loading; and
- sand extraction plus truck loading at the wet sorter.

Site noise was modelled for conditions of calm, isothermal conditions and for a slight to gentle breeze between the noise source and each receiver. The results indicate that noise from the proposed extension of the sand quarry is predicted to comply with the

noise guidelines under both calm isothermal and adverse wind conditions. Consequently Renzo Tonin has indicated that no further noise mitigation measures are required for site noise.

Traffic noise was assessed based on a conservative estimate of truck movements derived from data recorded during a typical year of operations. The US Federal Highways Administration noise prediction model was used to predict noise at the façade of the nearest affected residences. The results show that the maximum traffic noise generated from the site will comply with criteria developed from the DEC noise guidelines. Renzo Tonin considered that traffic noise mitigation measures were also not required for the proposed sand quarry expansion.

5.8 AIR QUALITY

Air quality considerations associated with the Gerroa sand quarry include particulate matter generated by wind and site operations and fumes from the exhaust of plant and equipment and vehicles visiting the site. Given the nature and scale of the operation, exhaust fumes are not considered to have a significant impact on the local environment.

Background air quality in the vicinity of the sand quarry would be affected by rural activities, traffic and natural conditions such as sea spray, pollination, fire and the effects of strong winds on vegetation.

Potential sources of particulate matter at the sand quarry include tree clearing, topsoil stripping, product loading, vehicle movement, landform shaping (bund construction, shoreline profiling) and the effects of wind on stockpiles and other exposed dry surfaces. Sand mining and screening are wet processes and would not be considered to generate dust.

Dust deposition has been monitored at the existing sand quarry for a number of years. One dust gauge is located near the vehicle entrance to the site and a second on the eastern side of the dredge pond. In mid 2005 the second gauge was relocated to move it clear of the operational area where recorded levels were not representative of boundary conditions. The monitoring results from the dust gauges indicate that total insoluble solids collected at those locations is well below the annual average threshold for loss of residential amenity, which is four grams per square metre per month.

The site's annual environmental management report for 2005 lists laboratory results for total insoluble solids collected at the two dust gauges covering the months January to November 2005. These results are reproduced in *Table 5.3*.

Table 5.3 DUST DEPOSITION RESULTS

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Average
Southern	1.3	2.5	1.0	1.8	3.2	2.9	1.9	1.0	3.2	5.0	4.5	2.57
Northern*	3.8	5.5	1.5	1.4	0.7	1.1	1.2	0.8	0.9	1.7	1.4	1.82

* The northern dust gauge was moved to the eastern side of the pond after the July sampling.

These results are recorded inside the site and do not represent deposition at residential receptors which are expected to be lower owing to the greater distance from the workings.

It is proposed to extend sand mining operations about 800 metres to the north. A further dust deposition gauge will be installed at the northern end of the property to give information of dust levels in that area. This gauge will be installed as soon as approval for the extension is received so that several years of data can be collected well before operations approach the northern end.

To minimise dust generation on the site the access road has been sealed from the entrance gate to the site office. It is proposed to retain the safeguards for dust control included in the Quarry Environmental Management Plan, as follows:

- keep to a minimum the area of land disturbed for operational purposes. When a disturbed area is no longer to be used, revegetate it as soon as practicable;
- cover the loads of all vehicles carrying materials likely to create dust to or from the site, except during loading and unloading;
- keep internal haul roads and loading areas moist when in use to minimise vehicle-generated dust;
- regulate production to avoid excessive product stockpiling; and
- minimise dust generation by closing the site for loading and transport in extreme wind conditions.

These safeguards will continue to be implemented at all times during the life of the proposed sand quarry extension.

5.9 TRANSPORT

The proposed sand quarry extension involves continuation of an existing operation. The extension will not alter current traffic conditions internal or external to the site.

Masson Wilson Twiney (MWT) carried out the most recent traffic study of the operation, reporting in February 2001. That study was undertaken to accompany a development application submitted for the purpose of extending the duration of sand mining under a then existing approval. A copy of the MWT report is included as *Appendix O*.

MWT analysed traffic generation from the site for a two year period 1998-2000 revealing the split of vehicle direction is about 70 per cent to the north and 30 per cent to the south. The data indicated that the site typically generated an average of 28 truck movements per day (14 loads). Southbound vehicles use Berry Beach Road while northbound vehicles use Crooked River Road.

During a survey week in November 2000 the site was found to generate 6.6 per cent of truck movements on Berry Beach Road and 4.8 per cent of truck movements on Crooked River Road. Considering all traffic on the external road system, the site was found to contribute approximately 1.1 per cent of total traffic on Berry Beach Road and 0.2 per cent on Crooked River Road.

MWT concluded that the level of truck generation does not provide any traffic engineering or capacity concerns. The consultant also examined accident statistics for three years revealing that most accidents occurred on the Princes Highway and that vehicles associated with the Gerroa sand quarry raised no general or particular concerns.

The MWT report included traffic counts to 1997 demonstrating an annual growth of about two per cent in traffic flows on Main Road 571, used by vehicles accessing the site from the north. The relevant monitoring location is on Fern Street at a point 0.8 km south of Gerringong Road. More recent Roads and Traffic Authority data for this location show annual average daily traffic (AADT) volumes presented in *Table 5.4*.

Table 5.4 AADT VOLUMES FOR FERN STREET

Year	AADT
1997	6951
2000	7866
2003	8799

These data show a growth of four per cent per annum in AADT on this route over the six year period. Cleary Bros has examined sales statistics the Gerroa sand quarry for 2005 during which some 58,000 tonnes of products were removed from the site. In 2005 the split of vehicle direction was about 60 per cent to the north and 40 per cent to the south.

Road conditions have improved since the MWT study was undertaken, including:

- new roundabout at the intersection of Fern Street and Elambra Parade, between Gerroa and Gerringong;
- road re-sheeting and better separation of traffic from pedestrians and cyclists between Gerroa and Gerringong;
- shoulder sealing and widening at the intersection of Cleary Bros access road and Berry Beach Road.

The proposed extension will not alter traffic generation or direction of travel from the site. Owing to traffic growth on the external road system, the relatively minor contribution to traffic from the sand quarry has reduced as a proportion. Recent accident statistics were obtained from the RTA for the three year period 2002 to 2005 showing that there was no significant involvement of trucks in accidents on the road system utilised by sand quarry vehicles. This is consistent with conclusions reached by MWT in 2001. A copy of the recent accident data is included in *Appendix O*.

The existing site entrance from Berry Beach Road will remain the only access to the sand quarry. It is proposed to retain current management procedures for heavy vehicles accessing the site, included in the Quarry Environmental Management Plan:

- Limit truck movements to or from the site as follows:
  - 7.00 am to 6.00 pm Monday to Friday;
  - 7.00 to 1.00 pm Saturdays;
  - no trucks on Sundays of public holidays.
- Trucks proceeding south from the site are to use the Princes Highway, accessed via Berry Beach Road.
- Trucks proceeding north from the site are to use the Princes Highway, accessed via Berry Beach Road, Crooked River Road, Fern Street and Belinda Street.
- Gerroa Road may be used only when the destination is accessed from that road.

The approved truck routes are shown on *Figure 5.6*

5.10 SOCIO-ECONOMICS

5.10.1 Strategic Value of the Resource for New South Wales

The need to identify and secure sources of construction materials to support continued expansion and development in the Sydney Region has long been recognised by the New South Wales Government. A 1996 position brochure issued by the then Department of Mineral Resources declared that the Sydney region uses approximately six million tonnes of sand per year, more than half the State's

production and predicted that within a decade up to 50 per cent of Sydney's requirements may have to be sourced from outside the metropolitan region.

The Penrith Lakes scheme, which has been a major source of good quality sand in the Sydney region is predicted to be exhausted shortly after 2010. In the absence of other major sources being developed in the Sydney area, it is predicted that in the next decade, import of fine aggregate to the Sydney region will increase significantly.

There is an ongoing necessity to implement a strategy for sourcing and transporting large quantities of sand from outside the Sydney region. A key element in the strategy is the need to protect currently operating sand quarries and proven resources from unnecessary sterilisation resulting from narrowly focussed planning decisions.

The Department of Primary Industries has advised that Cleary Bros site at Gerroa is identified in Illawarra Regional Environmental Plan No 1 as a regionally significant extractive resource. The Department also notes that the site is included in a section 117(2) direction from the Minister for Planning placing constraints on Kiama Council should the Council wish to prepare a draft local environmental plan that is likely to restrict the obtaining of extractive materials identified by the Department (refer to DPI letter in *Appendix B*).

The current development consent for sand extraction on the Gerroa site was granted by the Minister for Planning after the project had been declared State significant development under sections of the EP&A Act since replaced by Part 3A. Consistent with the Government's concern that the sand resource is of strategic importance to the State, the current extension proposal has been declared a project to which Part 3A of the Act applies.

Cleary Bros has not in the past supplied sand to the Sydney region and has no plans to do so in the future. The company has instead preferred to concentrate on helping to meet the demand for fine aggregate in the Illawarra area. It is predicted that Cleary Bros' competitors will divert an increasing proportion of their production towards Sydney over the coming decade as Sydney demand increases. During this period it is likely that construction industry in the Illawarra area will become more reliant on Cleary Bros to supply products containing sand from its Gerroa sand quarry.

5.10.2 Importance of the Sand Quarry for Cleary Bros

Cleary Bros produces concrete through a vertically integrated organisational structure where the company undertakes a number of successive operations, including extracting and processing hard rock and sand, transporting these materials to the company's batching plants, concrete batching and delivery to the end user. This structure gives Cleary Bros control over its major material supplies and other

cost inputs enabling competitive pricing to be maintained. The benefits from the integrated structure accrue to the company in the form of sustained production and profits and to the community in the form of price competition that works to hold down concrete prices.

Should Cleary Bros be unable to secure continued access to a controlled source of sand and thereby become reliant on its competitors for this vital resource, the competitors would be in a position to squeeze Cleary Bros' profit margins until the concrete business became uncompetitive. In these circumstances the closure of Cleary Bros Concrete Division is seen as inevitable in the medium term. This would have immediate employment repercussions and may affect the viability of the entire Cleary Bros Group.

5.10.3 Economic Analysis

Gillespie Economics has investigated the economics of sand extraction at Cleary Bros Gerroa sand resource. The Gillespie report considered continuation of sand extraction within two economic frameworks:

- benefit-cost analysis to assist consideration of the economic efficiency or net community welfare impact of the proposal;
- regional economic analysis to assist consideration of the contribution of the sand extraction to direct and indirect regional output, value added, income and employment.

The benefit-cost analysis placed indicative values on a range of potential economic costs and benefits of continuing to extract sand. The analysis showed that the net present value of benefits over costs would be in the order of $2.4 million. Additional non-quantified benefits include the additional producer surplus reliant on the sand resource and the consumer benefits associated from competition which keeps sand and concrete prices lower. Externality costs including environmental impact were also not quantified. The economic efficiency of the proposal would only come into question if the net costing of externalities after mitigation measures, were to exceed $2.4 million.

The regional economic analysis showed that if Cleary Bros were to cease sand extraction at Gerroa, the minimum medium term impacts on the Illawarra regional economy would be those associated with cessation of sand extraction and closure of the Concrete Division of Cleary Bros as a result of becoming uncompetitive.

In these circumstances the economic impact was conservatively estimated to be the annual loss of some $22 million in direct and indirect regional output, $8 million in direct and indirect regional value added including $5 million in wages to in the order of 96 direct and indirect jobs. This is a conservative estimate based on current production levels and assuming displaced workers remain in the region. If the entire

company became unviable the economic impact would be multiplied from 9 to 10 times.

5.10.4 Social Impact

Having regard to the circumstances of the application, being for a continuation of an existing operation on company land using an existing workforce, it is apparent that the proposed extension of the Gerroa sand quarry will not create significant social impacts nor will it alter demand for social infrastructure in the local area or the Illawarra Region as a whole. In particular, the proposal will not cause:

- a distinct impact on any social group;
- an identifiable effect on the social composition and/or character of a locality; or
- an identifiable effect on the availability and use of existing community services, facilities or land.

For the above reasons a specific social impact assessment of the proposal is not considered warranted.

The sand mine extension will maintain employment for the current workforce at their current place of work. Hence there will no additional need for housing, transport or other community facilities. By contrast, failure to approve the extension would result in the social consequences of increased unemployment and reduced economic activity in the Illawarra region.

5.11 PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS

5.11.1 Occupational Health and Safety

The health and safety of the sand mine workforce, persons on surrounding properties and the community at large will be at the forefront of site management procedures. The welfare of the workforce will be protected by strict observance of occupational health and safety protocols required by WorkCover and the Department of Primary Industries.

5.11.2 Security Fencing

The site is presently fenced with signs attached every 50 metres to deter unauthorised persons from accessing the site. Access gates are kept locked when not in use. In addition stock fencing is maintained internal to the property to prevent farm animals from entering the operational area.

5.11.3 Hazardous Substances

Hazardous substances other than fuel are not stored at the sand quarry. Should there be a need for herbicides or pesticides to be used these will be brought to the site for the particular use and then removed.

The sand quarry will not emit or release any materials to the air, water or soil in such concentrations as would constitute an environmental hazard. The very little waste produced will be primarily from machinery repairs and maintenance.

5.11.4 Bushfire Management

Fire presents the most significant hazard on the property. The sand quarry itself will not contain flammable materials except as associated with mobile plant and the fuel tank located in a cleared area beside the office. The operational area will serve as a fire break and the dredge pond will be a source of water for fire fighting.

Procedures for responding to site emergencies including fire are included in a work instruction forming part of the Quarry Environmental Management Plan.

5.12 ENVIRONMENTAL RISK ANALYSIS

Possible environmental risks, possible consequences and control measures implemented to manage the risk have been identified and summarised in *Table 5.4*.

Table 5.4 ENVIRONMENTAL RISK ASSESSMENT

Possible Environmental Risk	Possible Consequence	Control Measures
Visual screen less than fully effective	It may be possible to view the workings from Crooked River Road. The image of the area as natural bushland and farming paddocks will be altered.	Planting and where appropriate, bund construction for the visual screen will be completed as soon as practicable after approval has been granted. The planted area will be watered and regularly maintained to promote growth with any failed specimens promptly replaced. Cleary Bros will not extend the sand quarry into any area that is exposed to clear view from motorists on Crooked River Road. In particular, the northern vegetation screen planted in the early 1990s will not be removed until a replacement screen is established.
Acid soil conditions permitted to develop in extracted material, draining to the dredge pond.	Lowering of dredge pond pH. Increased concentration of dissolved metal ions in dredge pond water. Decline in aquatic plant health and habitat quality of dredge pond. Possible decline in groundwater pH Possible acidity in surface soils making rehabilitation difficult	Implement the acid sulphate soils management plan as indicated, including: • regular leachate testing; • downstream and groundwater monitoring; • checking water quality before any discharge; • using aglime for base lining stockpile areas and co-interment;

Possible Environmental Risk	Possible Consequence	Control Measures
		• using quicklime solution for neutralising temporary stockpiles from high sulphide feed material; • preparing processing/stockpile areas with lime layer and leachate barrier; • reburying reject materials to a deep section of the dredge pond; • reprocessing sand with high pH levels.
Rehabilitation works not fully effective	Bare sand patches or poorly revegetated areas remaining after completion Revegetated land does not achieve maximum value as fauna habitat. Expanding weed infestation requiring ongoing maintenance	Regularly maintain and monitor progress of revegetation, with inspection at least every three months. Ecologist to assess rehabilitation each year and his report will be included in the annual environmental report for the site. Take corrective action if identified as needed.
Compensatory planting not fully effective	Wildlife habitat not effectively established in planted areas. Area of threatened ecological communities not expanded on the property as proposed. Net loss of natural characteristics of property as a result of sand quarry extension.	Regularly maintain and monitor progress of compensatory planting, with inspection at least every three months. Ecologist to assess compensatory planting each year and his report will be included in the annual environmental report for the site. Take corrective action if identified as needed.

Possible Environmental Risk	Possible Consequence	Control Measures
Flood bund ineffective	Site becomes flooded with uncontrolled drainage to Blue Angle Creek. Potential transfer of dredge pond water with particulate matter and floating debris from the site to the creek system.	Inspect the flood bund every three months to ensure the width is maintained and the surface is not eroded by weather or vehicle movement
Uncontrolled fuel spillage	Pollution of the soil, dredge pond and/or groundwater	Inspect the bund around the fuel tank every three months and remove any accumulated rain water. Implement management protocols for vehicle refuelling. Should a spillage occur during refuelling, remove and dispose to landfill any sand that becomes contaminated. Replace with clean sand.

Chapter 6

JUSTIFICATION AND CONCLUSIONS

6.1 JUSTIFICATION

The quarry extension is justified because it enables a locally-based and employment-generating company to continue sand extraction in an environmentally sustainable manner in a location where sand extraction has been taking place for decades. The justification is expanded in more detail under the following categories:

- social and economic considerations
- biophysical considerations; and
- ecological sustainability

6.1.1 Social and Economic Considerations

The proposed sand quarry extension has economic benefits for New South Wales and the Illawarra region. As explained in section 5.10, it is predicted that in the next decade, import of fine aggregate to the Sydney region will increase significantly. Maintaining the Gerroa sand resource will enable Cleary Bros to continue to supply its segment of the Illawarra market while sand from other sources may be diverted to help met Sydney's needs.

The proposed extension is vital to Cleary Bros' economic future. A significant portion of the company's business, including quarry products, concrete batching and civil engineering works is dependent upon a supply of fine aggregate. It is not tenable for the company to continue operating in these markets without a reliable supply of sand from a source controlled by the company.

The economic analysis prepared by Gillespie Economics and referenced in section 5.10 has demonstrated the economic benefits of the proposal and quantified the significant economic impact on the Illawarra economy if the extension were not to proceed.

From consideration of social issues, there is little social impact from proceeding but there would be the social consequences of unemployment and reduced economic activity in the region if the proposal were not to proceed.

It is considered the proposal is justified from a social and economical perspective.

6.1.2 Biophysical Considerations

The proposal will affect the biophysical environment in that it will permanently alter the land surface and pattern of vegetation cover on the rural property. The final surface will be a pondage with wetland foreshores grading to bushland immediately adjacent. This created environment will present new habitat opportunities for native fauna.

The presently cleared rural grazing property will be revegetated in part, amounting to about five times the area of bushland to be removed. While a newly planted area does not initially compensate for removal of mature vegetation, over time and with adequate maintenance, areas designated for compensatory planting will return to bushland. Kevin Mills and Associates has noted the areas to be cleared are themselves disturbed: the Blackbutt forest has been logged leaving smaller trees with almost no hollows; the Bangalay forest is sparse with virtually no native understorey, having been part of a grazing area in the past; and the small section of Littoral Rainforest is described as sparser than the greater portion to be retained, with little continuous rainforest canopy.

Implementation of proposed safeguards means there should be no alteration to water quality in the pondage, the nearby creek system or to groundwater. Archaeological assessment has indicated that there are no reasons for the project not to proceed.

The existing sand quarry has demonstrated that operational impacts are controllable to contemporary standards using proven techniques. When final conditions of approval are available, modified operational requirements will be detailed in an amendment to the quarry environmental management plan. This is the guiding document for quarry management and for monitoring and performance reporting.

In summary:

- operational impacts on the biophysical environment will continue to be controlled to within established standards;
- the permanent alteration to the landform will alter current habitat, but will in itself create new habitat and there will be compensatory habitat elsewhere on the property;
- with adequate screening, the extent of the sand quarry will be apparent to very few people; and
- the proposal will not have a significant impact on Aboriginal relics or affect listed heritage items.

It is considered that the effect of the proposal on the biophysical environment will be adequately compensated and does not detract from the overall justification for proceeding with the proposal.

6.1.3 Ecological Sustainability

The project justification includes consideration of the four principles of ecologically sustainable development set down in the *Protection of the Environment Administration Act, 1991*:

- ***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 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,

The proposal does not threaten serious environmental damage. The area proposed for sand mining has been carefully selected to avoid the significant stand Swamp Mahogany Forest. The loss of bushland will be generously compensated. There is no suggestion that appropriate environmental safeguards outlined in this assessment will be postponed.

- ***Inter-generational equity*** *- namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*

The proposed sand quarry extension will provide for orderly winning of a sand resource that can be economically extracted. It will not sterilise any opportunity for further extraction on the property in the future should future generations decide this is warranted. The disturbed area will be rehabilitated to bushland. There will be some loss of agricultural land as a result of the compensatory planting proposal, but this is generally confined to the lower lying areas along drainage lines.

- ***Conservation of biological diversity and ecological integrity*** *namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*

The proposed quarry extension will not significantly affect biological diversity or ecological integrity. The impact of the proposal on flora and fauna has been assessed and appropriate safeguards adopted, including creation of new bushland areas on the cleared property.

- ***Improved valuation and pricing of environmental resources 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,

(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 proposal includes pollution controls and rehabilitation works at the cost of the proponent, Cleary Bros. The cost of containing, avoiding and abating pollution will be reflected in the price to the end user of the sand extracted from the site. There is no significant waste as such from the extraction.

The proposal is sustainable in ecological terms. It is an extension to an existing sand quarry avoiding the most environmentally sensitive area on a property with a long history of sand extraction. Environmental controls described in this assessment and to be further detailed in the updated quarry environmental management plan include a combination of well-established techniques (such as for noise and dust suppression), modern practices (such as for acid sulphate soils management) and site-specific solutions (such as for vegetation retention and visual screening).

In conclusion, the proposal is considered justified because it provides for identified extractive resources of State and regional significance to be extracted in a manner that will benefit the Illawarra economy without a risk of serious environmental degradation.

6.2 DRAFT STATEMENT OF COMMITMENTS

This draft Statement of Commitments identifies the environmental management and mitigation measures that Cleary Bros commits to implement in extending the Gerroa sand quarry. It consolidates environmental management and mitigation measures contained in this Environmental Assessment and already being implemented at the sand quarry in accordance with the existing consent and quarry environmental management plan (QEMP). Cleary Bros commits to do the following:

1) Undertake the extension of the Gerroa sand quarry in a manner consistent with this Environmental Assessment and Statement of Commitments;

2) Comply with obligations under any Act;

3) Update the (QEMP) for the site to include all relevant matters contained in this Environmental Assessment and any requirements emanating from Ministerial approval for the project;

4) Operate the sand quarry within the requirements of the QEMP as updated in 3) above (Note: the existing QEMP embraces the requirements of the existing development consent with regard to such matters as environmental management, monitoring, auditing, reporting and community consultation. These requirements will be retained except where superseded in the approval for the current application).

5) Survey and fence the approved boundary of the proposed extension and ensure that all activities associated with sand extraction other than rehabilitation or approved mitigation works remain within the fenced area;

6) Maintain annual production within an upper limit of 80,000 tonnes per year;

7) Progressively rehabilitate all areas disturbed by the sand mining operations in accordance with this Environmental Assessment and the QEMP;

8) Protect from disturbance and maintain existing native vegetation around the periphery of the sand quarry;

9) Undertake compensatory planting in the locations identified in this Environmental Assessment and nurture the vegetation and created habitat to maturity in accordance with the vegetation management plan, to be incorporated in the QEMP;

10) Protect from disturbance area "A", identified on *Figure 5.4*, of significance for potential Aboriginal relics;

11) Arrange for targeted salvage excavations for Aboriginal artefacts to take place as recommended by Navin Officer prior to mining occurring in the nominated locations;

12) Prior to extending workings into any part of the extension, ensure that a screen of vegetation, with or without bunding, effectively prevents viewing of the land to be disturbed from any publicly accessible locations;

13) Ensure that the requirements of the acid sulphate soils management plan are incorporated in the QEMP and implemented where indicated to prevent degeneration of water quality in the dredge pond and in groundwater

REFERENCES

Department of Housing (1998)
Managing Urban Stormwater, Soils and Construction

Environment Protection Authority (1999)
Industrial Noise Policy

Environment Protection Authority (1995)
Environmental Noise Control Manual

Environment Protection Authority (1999)
Environmental Criteria for Road Traffic Noise

Environment Protection Authority (1998)
Action for Air

Gillespie Economics (2003)
Benefit Cost Analysis and Regional Economic Impact Assessment of Gerroa Sand Resource Extraction

Hazleton P.A. (1992)
Soil Landscapes of the Kiama 1:100,000 Sheet

Kevin Mills & Associates Pty Ltd (2005)
Overview of the Flora and Fauna, Cleary Bros (Bombo) Property at Gerroa

Navin Officer Heritage Consultants Pty Ltd (2005)
Gerroa Sand Mine Extension, Aboriginal Cultural Heritage Review

New South Wales Heritage Office
Assessing Heritage Significance

Perram & Partners (2003a)
Gerroa Sand Resource, Continuation of Extraction, Amended Statement of Environmental Effects

Perram & Partners (2003b)
Gerroa Sand Resource, Quarry Environmental Management Plan

APPENDICES

Appendix A

DIRECTOR-GENERAL'S REQUIREMENTS

Appendix B

PUBLIC AUTHORITY RESPONSES

Appendix C

COMMUNITY CONSULTATION LEAFLET

Appendix D

COMMUNITY CONSULTATION CORRESPONDENCE

Appendix E

GEOTECHNICAL ASSESSMENT

Appendix F

REHABILITATION WORK INSTRUCTION

Appendix G

ACID SULPHATE SOIL MANAGEMENT PLAN

Appendix H

FLOOD STUDY

Appendix I

2005 FLORA AND FAUNA ASSESSMENT, ENTIRE PROPERTY

Appendix J

2006 FLORA AND FAUNA ASSESSMENT, PROJECT AREA

Appendix K

DRAFT VEGETATION MANAGEMENT PLAN

Appendix L

ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

Appendix M

SCREEN PLANTING DETAILS

Appendix N

NOISE ASSESSMENT

Appendix O

2001 TRAFFIC REPORT