SECTION 96(2) APPLICATION

MODIFICATION OF CONSENT No.267-11-99

ROBERTS ROAD

MAROOTA

17 July, 2000

Prepared by:
Nexus Environmental Planning Pty Ltd
Suite 29, The Concord Centre
103 Majors Bay Road
PO Box 212
CONCORD NSW 2137
Tel: (02) 9736 1313
Fax: (02) 9736 1306
Email: kennan@ozemail.com.au

B705

1. INTRODUCTION

By Notice of Determination dated 31 May, 2000 The Minister for Urban Affairs and Planning notified Dr L S Martin (the applicant) that he had granted development consent for the extraction of sand, clay and pebble and the construction of a bund wall at Lots 1 & 2, DP 228308 and Lot 2, DP 312327, Roberts Road, Maroota (refer to Consent No.267-11-99).

This report has been prepared in support of an application pursuant to Section 96 (2) of the Environmental Planning and Assessment Act, 1979 to amend the abovementioned consent.

2. PROPOSED AMENDMENT TO CONSENT No. 267-11-99

Section 96 (2) of the Environmental Planning and Assessment Act, 1979 states, inter alia, that:

> *"A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
>
> *(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all) under this section, and*
>
> *(b) ....., and*
>
> *(c) ....., and*
>
> *(d) ....."*

The proposal is for a modification to the approved method of extraction of the sand, clay and pebble material which will in turn result in amendment of certain aspects of the development which were required as a direct result of the approved extraction method.

Part 4 of the Environmental Impact Statement ("EIS") which accompanied the Development Application, provides details of the approved development on the site, albeit with amendments resulting from consultations during the assessment of the application. The approved method of extraction, as detailed in Part 4.6 of the EIS, is as follows:

> *"Future extraction operations will involve the excavation, washing and screening of the Maroota Sand using the same process plant as per the existing operation. The proposed excavation will cover the majority of the site, some 23 ha, allowing for boundary buffer zones as described in* ***Part 4.1*** *of this EIS.*
>
> *Production objectives are demand related, however, a maximum sand production rate of 1000 t/day has been used for the extraction plan.*

Future extraction operations are to involve the following:

- *Materials are to be excavated using a self-loading scraper and transported to the process plant. In areas where the underlying material cannot be effectively excavated using the scraper, the surface would be initially ripped using an excavator and in exceptional circumstances using a dozer.*

- *Process water for washing/screening will be primarily sourced from a water dam constructed at the location of the existing excavation pit (adjacent to the northern boundary). The existing pump-out facility will be utilised.*

- *Processed material is to be stockpiled adjacent to the plant area prior to transportation off-site generally using articulated trucks. A front-end loader is to be used to load the trucks.*

- *The residue clay/silt slurry is to be delivered by pipeline to designated drying areas in the previously extracted cell where it is spread in thin layers to dry. Liberated water will be drained into the water dam for re-use in the process plant. The clay materials will be used for the rehabilitation of the extracted areas.*

- *The materials are to be sequentially extracted in "cells" commencing along the northern boundary (adjacent to the process water dam) and working towards the southern boundary (to Old Northern Road). Each cell will be approximately 200 m x 50 m wide (1 ha in area) which provides sufficient area for the machinery to load and manoeuvre within each cell. The extraction process will minimise the disturbed area (i.e. the area exposed to erosive processes) and enable rehabilitation procedures to commence during operations.*

- *Each cell will be progressively rehabilitated (following extraction of the sand materials) involving surface contouring and replacement of a suitable growth medium/topsoil layer to enhance revegetation.*

Extraction within the site will be undertaken in two stages as follows:

Stage 1 Area *located to the east of the catchment divide (i.e. the process water dam catchment), occupying a total area of approximately 16.5 ha, and*

Stage 2 Area *located to the west of the catchment divide (i.e. the catchment of the two existing water dams for the nursery), occupying a total area of approximately 6.5 ha.*

The staging will enable the existing nursery operation to continue during the initial Stage 1 extraction operation and for most of Stage 2 and as required by

the owner. The operation will use the existing process plant and sand stockpile area including the existing site entrance, weighbridge and offices.

The conceptual extraction strategy for the Stage 1 and 2 areas is that three cells will be subject to work as follows:

- *only one cell will be extracted at any one time,*
- *the clay from the processing plant will be piped to the previously extracted cell where it will be spread in a thin layer for drying, and*
- *the vegetation and topsoil from the new cell will be stockpiled in the third cell which has been extracted and now contains a layer of "dried" clay. This third cell in the sequence is to undergo rehabilitation. The topsoil from the current extraction cell will be mixed with the "dried"clay materials and used for rehabilitation of the cells.*

The mining strategy is illustrated in ***Figures 15 to 20*** *and is described as follows:*

- *The existing processing plant, weighbridge and office facilities will remain at their current location until the end of extraction of Stage 2.*
- *Extraction will initially commence in Cell 1A (within Stage 1 area), located immediately to the west of the process water dam. Prior to extraction, vegetation and topsoil will be stripped and stockpiled at a suitable location near the processing plant for rehabilitation of the final stage of extraction. The latter will be the area comprising the processing plant, the offices and the weighbridge. The existing clay drying beds will also be used. Surface runoff from the upslope catchment and from the active cell area will be diverted (via diversion drains) into the sedimentation pond prior to discharging into the process water dam to minimise on-going siltation of the water storage dam.*
- *Following completion of the Cell 1A area, excavation will continue within Cell 1B, located to the east of the process water dam. The clay drying area will be located in the previously mined Cell 1A area. The clay materials will be gravity fed from the plant to the designated drying area. Runoff and free water from the drying area would discharge (via formed drains or pipes) into the process water dam's sedimentation pond.*
- *The remaining cells within Stage 1 (Cells 1B to 1K) will be progressively excavated as described above. Prior to extraction, each cell area will be stripped of vegetation and topsoil which will be transported to the third cell in the sequence which is to undergo rehabilitation, as described earlier. Surface runoff from upslope catchments and from the active cell areas will also be progressively diverted (via diversion drains) into the dam's sedimentation pond prior to discharging into the process water dam.*

- *Final maximum rehabilitated batter slopes of 3(H):1(V) are envisaged. Temporary batter slopes adjacent to the Stage 1/Stage 2 boundary would be approximately 2(H):1(V).*

- *Following completion of the Stage 1 area, excavation of the Stage 2 area will then commence. The operation will be similar to the Stage 1 operation using the Stage 1 process plant and sand stockpile pad layout. Prior to extraction, each cell area will also be stripped of topsoil which will be transported to a previously extracted cell for use in rehabilitation as described earlier. Surface runoff from upslope catchments and from the active cell areas will be progressively diverted (via diversion drains) into the sediment pond prior to discharging into the process water dam.*

- *Following completion of excavation of the Stage 2 area, final rehabilitation of Cell 2D and the process plant and sand stockpile pad area (within Stage 1) will be undertaken. The existing processing plant will be dismantled and removed from the site. It is envisaged that sand extraction beneath the plant and stockpile pad will be processed using a mobile plant unit.*

The predicted final layout (and contours) following extraction operations at the site and a cross-section of the final landform are presented in ***Figure 21.*** *"*

The proximity of housing to the site of the approved extractive industry has resulted in the need for a variety of acoustic mitigation measures to be incorporated into the design of the extraction plan, not least of which is the requirement for perimeter bunding to assist in the reduction of the potential impact of noise from the extraction operation.

The supplementary Noise Impact Assessment prepared by Dick Benbow & Associates Pty Limited at the request of the EPA, provided details of the noise mitigation measures which will be required at the site in order to meet the requirements of the EPA. A copy of that 17 February, 2000 report is at **Attachment 1**. It can be seen from that report, and indeed from the initial noise impact assessment contained as Appendix 11 of the EIS, that the main generators of noise from the approved extraction will be:

- the dredging excavator
- pump adjacent to the dam
- scraper
- dozer.

In order to alleviate the noise impact from the approved extraction, Condition No.8 of the development consent states, inter alia:

"8. No extraction shall commence in areas that are not currently subject to extraction, until the Applicant has:

(a) constructed the perimeter bund wall;"

The construction of the abovementioned perimeter bund wall was a recommendation of the Dick Benbow and Associates report at **Attachment 1**.

In order to mitigate the potential impact from noise generated by the above machinery, Dr Martin has investigated an alternative means of winning the extractive material. Dr Martin, in conjunction with Sand Classifiers Pty Limited, has developed two (2) options:

1. The Genflo Injector, and

2. The Pumping Unit.

Details of both options are contained in the 17 April, 2000 letter from Sand Classifiers Pty Limited to Sun-A-Rise Sand, a copy of which is at **Attachment 2**. It is the Pumping Unit option which is now proposed by Dr Martin. The concept is described in the letter at **Attachment 2**.

Sand is extracted using an excavator. The excavator would start at the natural ground surface level but would immediately dig a hole so that the excavator and processing equipment would be working against an extraction face. The extraction face provides significant noise shielding.

The excavator which will be used will be fitted with acoustic mufflers to achieve a noise level of approximately 76 dBA when measured at 7 metres. This noise level has been achieved at several similar sites with noise issues. Discussions with the potential excavator suppliers have found that this specification can be met.

The excavator loads the sand into an acoustically lined hopper. The hopper is located above a belt feeder which introduces the sand into a mixing tank. The belt drive is variable rate controlled and is powered by an electric motor.

A centrifugal electrically driven water pump will be located at the approved clean water storage dam. This pump will pump water to the mixing tank through a rubber and polyethylene pipeline. The flow rate of the clean water will be controlled so that the water level in the mixing tank remains constant.

The sand slurry is then drawn out of the mixing tank by an electrically driven slurry pump and pumped via a rubber and polyethylene pipeline to the sand processing plant.

Electricity will be supplied to the belt feeder and slurry pump from a diesel generator. The generator will be fitted with an acoustic enclosure. A design for the enclosure has been provided by Enco Noise Control Pty Ltd. The design states that a noise level below 44 dBA at 30 metres will be achieved.

The belt feeder, mixing tank, slurry pump and enclosed generator will be located on a rubber tyred trailer. This will allow the unit to be moved as the sand extraction face progresses.

A concept diagram showing the proposed process has been provided by Sand Classifier Pty Limited and is included as **Figure 2** of the documentation at **Attachment 2**.

The major benefit of the proposed pumping unit system is that sand is won from the extraction

cell by means of an excavator rather than a bull dozer and/or scraper. The excavator will be fitted with a power shovel which will allow the excavator to be located on the floor of the extraction cell, thus allowing for acoustic attenuation.

The material won will be mixed with water from the approved water supply dam in a portable mixing tank located in the extraction cell. It is then transported by gravity to the processing plant by means of a pipe system. The only noise generating machinery attached to the mixing apparatus will be a diesel powered motor which will be contained in an acoustic enclosure for noise attenuation purposes.

The pumping unit method of extraction will provide a significant number of environmental benefits which will accrue when compared to the approved method of extraction. These benefits include:

- elimination of the need for both the bull dozer and scraper to win the sand from the extraction cell and transport the material to the processing plant. This will provide for a significant reduction in noise generated from the site during extraction.

- the removal of the bull dozer and the scraper from the extraction process will mean that many of the noise mitigation measures which are now required will no longer be required to meet the requirements of the EPA. In particular, there will no longer be a need for the perimeter bunding to extend around the site as proposed in the Dick Benbow report at **Attachment 1**. The removal of that bunding will mean a significant improvement in the visual impact of the site when viewed from Old Northern Road, Old Telegraph Road and Roberts Road. We are of the opinion that this will be a major environmental benefit.

- the use of the excavator and the portable mixing apparatus will mean that a smaller section of the active extraction cell will be worked at any one time compared to the total cell being worked with the use of the scraper, thus reducing the area of the site disturbed at any one time.

- the removal of the need to transport the extractive material from the extraction cell to the processing plant by scraper will mean that there will be little, if any, traffic on the site other than delivery trucks entering and leaving the site. This will have a significant and positive impact on the potential of the development to generate dust.

The proposed use of the pumping unit method of extraction raises the question of how best to incorporate the proposed means of extraction into the development application process. We are of the opinion that the proposed change to the method of extraction is not significant to the point where it would be determined that the development, as modified, would not be substantially the same as that which has been approved by the Minister. In this regard, we make the following points:

- the approved amount of sand to be extracted will not alter.

- the approved time frame for the extraction (15 years) will not alter.

- the approved number of truck movements (100 per day) from the site will not alter.

- the approved dam design and capacity will not alter.
- the existing processing plant configuration will not alter.
- the approved extraction cells proposed as part of the EIS will not alter either in their location or area. The only change will be the method of winning the material from the cells and the reduction in area of the cell disturbed at any one time.
- the removal of the bund walls from the perimeter of the site will mean that the visual impact will be altered but only in a positive way.
- the proposed landscaping of the perimeter will not alter, however, it will now not have to incorporate the perimeter bunding.
- the removal of the perimeter bunding will allow the better protection of both the endangered Acacia species and Blue Mountains Mahogany species located on the site.
- the removal of the perimeter bunding will alleviate the potential noise impact to adjoining residences during the construction of the bund wall.

On the basis of the above, we are of the opinion that the changes to the proposed development as a result of the adoption of the pumping unit method of extraction will be minor in terms of the total extraction of the site, but will be major in terms of the positive impact on the amenity of the adjoining landowners. We are of the opinion that the changes to be made will mean that the development, as amended, will be substantially the same as that approved by the Minister and as such Section 96(2) of the Environmental Planning and Assessment Act, 1979 could be utilised to effect the proposed changes.

3. JUSTIFICATION OF PROPOSED AMENDMENT

In order to justify the abovementioned positive benefits of the proposed amendment to the method of extraction, a number of reports have been commissioned as follows:

- **Dick Benbow and Associates** on the acoustic impact of the change in extraction method. A copy of that report is at **Attachment 3**.
- **Holmes Air Sciences** on the air quality impact of the change in extraction method. A copy of that report is at **Attachment 4**.
- **Scott Murray & Associates** on the impact of the removal of the perimeter bunding on the visual and landscaping aspects of the approved development. A copy of that report is at **Attachment 5**.

Dick Benbow and Associates Report

The introduction to the Dick Benbow and Associates report ("the Benbow report") states that:

"The purpose of this report is to predict noise emissions from the site with the new extraction process in place. The aim of using the new process is to minimise or eliminate the need for the construction of earth bund walls. The bund walls were required to be several metres high. This would require significant material, cost and lost time. Therefore, reduction of noise sources from the site are both environmentally and economically positive."

The same noise modelling procedures used in the acoustic impact assessment report in the EIS were again employed to test the change to the acoustic impact of the development with the new method of extraction in place. In this regard, the Benbow report states that:

"The proposed changes to the extraction system at the quarry present a major initiative from quarry management. The elimination of the need for scrapers and dozers will significantly reduce noise emissions from the site.

Previous noise predictions with the use of scrapers and dozers found that permanent and temporary earth bunds would be required at several locations on the site to control noise emissions. These bunds create several problems for the quarry operator and for the community. The material and time required to build the bunds will be significant. The bunds will generate aesthetic impacts for the community. Other issues such as landscaping, water management and dust control will also be adversely effected [sic] by the bunds. Construction of the earth bunds may also generate considerable noise impacts for the duration of the construction. This could take several weeks for each bund.

Revised noise level predictions were carried out for the new extraction technique. The predicted noise levels found that the development consent limits will generally be satisfied with the implementation of a wall in the processing area.

Elevated noise levels will occur at one residence when the excavator is operating on the natural surface level in Cell 1B. Discussions with the quarry operator and Sand Classifiers Pty Ltd have found that the time taken to excavate a working face for the excavator and equipment to work behind will only be 2 – 3 days. Therefore, noise impacts at Location B may exceed the 45 dB(A) limit for several days only.

The noise impacts during the initial excavation of each cell can also be suitably managed by commencing the cell at the furthest point from the residences and directing the excavator noise away from the residences where possible.

Therefore it is clear from the results of the modelling and the discussion presented above that as a result of the new extraction process:

(a) The permanent earth bunds around the perimeter of the site as recommended in the EIS will no longer be required;

(b) The temporary earth bunds around each extraction cell as recommended in the EIS will no longer be required;

(c) *The wall in the processing area as recommended in the EIS will still be required.*

The development consent requires site management to implement a noise management plan and to undertake noise compliance monitoring. It is considered that these items will ensure that all noise emissions from the quarry are suitably controlled and that acceptable noise levels are achieved at the nearest residences."

Thus, from an acoustic impact point of view, with the proposed method of extraction in place, there will no longer be a need for perimeter bunding or bunding around the individual extraction cells.

Holmes Air Sciences Report

With the removal of the perimeter bunds and the bund around the individual extraction cells, there is a need to determine the impact of those measures on the air quality in the area. In this regard, the report of Holmes Air Sciences concludes:

"A brief dispersion modelling exercise has been carried out to determine the effects of the amended extraction process described earlier. Based on the results of this exercise it can be concluded that the amended operations result in decreases in both concentration and deposition levels experienced at the four nearest residences. This is expected given that the total emissions are reduced by approximately 11%. Replacing the scrapers and dozers with an excavator, mixing tank and slurry pump, as proposed, will therefore have a positive effect on resulting concentration and deposition levels in the vicinity of the site."

Scott Murray & Associates Report

The removal of the bunds as recommended in the Benbow report has the potential to impact on the visual and landscaping impact of the development as amended. The Scott Murray & Associates report was prepared:

"... to describe the proposed landscape changes for the Dr Martin property following the approval for the sand extraction and processing development at the site by the Minister for Urban Affairs and Planning on the 31st May, 2000."

The report continues:

"The revised extraction process – as described in the Dick Benbow and Associates report (dated 26th June, 2000) – would result in the elimination of the need for the use of dozers and scrapers on the site, thus significantly reducing noise emissions from the site during the extraction and processing process. As a direct result, the noise modelling undertaken by, and presented in the Dick Benbow report, states that: -

- *The permanent earth bunds around the perimeter of the site as*

recommended in the EIS will no longer be required – from a noise perspective

- *The temporary earth bunds around each extraction cell as recommended in the EIS will no longer be required – from a noise perspective*

- *The wall in the processing area as recommended in the EIS will still be required – from a noise perspective*

As a result of this study it is clear that earth bunding – from a noise reduction standpoint – is not required.

However, from a visual impact viewpoint, we believe that certain earth bunding works are still required."

*"In section 3.0 **"Visual Analysis"** of the initial Rehabilitation Report - prepared by SMA for the EIS – the following extract was presented: -*

"The topography of the site is such that it falls away from Old Northern Road, and hence affords extensive vistas of large portions of the site when viewed from various vantage points along both Old Northern and Roberts Roads.

As a result, the current dam construction and sections of the future proposed extraction works would be visible to public and private view. The visual impact generated by these works is currently – and will in the future - be caused by the colour contrast of exposed soils.

While these visual impacts are temporary - and will be totally eliminated once rehabilitation works have been undertaken - strategic bund wall construction and planting works along the boundaries of the subject property, will provide a visual screen for the current, and, in particular, the future extraction works within the site."

*As a consequence, it is therefore recommended – from a purely visual impact standpoint - that initial earth bunding still be implemented at the intersection of Old Northern and Roberts Road to prevent views into the site of the early stage 1 works. Plan **MP–01B** shows this revised bunding strategy. As in the previous scheme, this bunding would achieve heights of up to approximately 3 metres within the 30 metre setback, using a maximum 1:4 road-facing slope.*

*All other earth bunding previously proposed within boundary perimeter setbacks is now to be deleted as it is no longer required from either a visual impact or noise perspective. Again, plan **MP–01B** shows the current proposal.*

It should be noted that there is no alteration to the vegetation proposed within the boundary setbacks – only the deletion of the now unnecessary earth bunding.

*Plans **MP–02B – MP-05B** have been revised to reflect this current proposal."*

From the above reports, it can be seen that the acoustic, air quality, visual and landscaping impacts resulting from the development as amended are significantly less than that which is approved. As such, we are of the opinion that the environmental benefits to be gained by the approval of the subject application are significant.

4. PROPOSED CHANGES TO DEVELOPMENT CONSENT

In order to allow the proposed change to the approved method of extraction, several changes will be required to the consent document. Following are details of the changes which are required.

Schedule 1

Removal of the words "construction of a bund wall".

Schedule 2

Removal of the definition of "construction" from the Abbreviations and Interpretation.

Page 7

modification of condition 2 (c) to remove reference to the 17 February, 2000 fax from Dick Benbow and Associates recommending the bund walls and replacement with the 26 June, 2000 report from that office.

Page 8

Removal of part (a) of condition No.8

Page 9

Deletion of condition No.18 as it relates wholly to the construction of the perimeter bund walls.

Page 10

Removal of the word "both" from the first line of condition No.21 and replacement of the term "EMPs" in the second line of that condition with "EMP".

Page 10

Replacement of the term "EMPs" in condition 24 (d) with "EMP".

Page 12

Replacement of the word "construction" in condition 35 with the word "extraction".

Page 13

Delete the words "This condition does not apply to the construction of the perimeter bund wall" from condition No.41.

Page 14

Delete the words "construction and" from condition No.46 (b).

Page 15

Delete the words "construction or" from condition No.50.

Page 16

Delete condition No.54.

5. CONCLUSION

The proposed amendment to the approved extractive industry will provide for the removal of the perimeter and internal bund walls which were a requirement of the EPA for acoustic impact attenuation.

The reports which form attachments to this SEE have clearly demonstrated that the removal of the bund walls will provide for a significant improvement to the environment compared to that which would have eventuated had the approved development been implement.

The proposed method of extraction is a significant improvement on that which is approved while at the same time not being of such significance that the development as modified would not be substantially the same as that which has been approved.

It has been demonstrated that the impacts associated with the modification as proposed will be positive and beneficial to both the environment and the community surrounding the development. As such, the application should be approved by the Minister.

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Attachment 1

Dick Benbow & Associates Pty. Ltd.

A.C.N. 074 404 943

Postal Address
P.O. Box 687
Parramatta NSW 2124
Australia
Web site: http//www.dickbenbow.com.au

Unit 4, 5-9 Hunter Street, Parramatta
NSW 2150 Australia
Telephone: 61 2 9635 5099
Facsimile: 61 2 9689 1385
E-mail: admin@dickbenbow.com.au

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TO:	Paul Wilkes		
cc:	Neil Kennan	Nexus Environmental Planning	Fax: 9736 1306
COMPANY:	EPA – Noise Control Branch	**FAX NO:**	9995 5935
FROM:	R T Benbow	**DATE:**	17 February, 2000

MESSAGE: **RE: Addendum for Noise Impact Assessment Report - Maroota**

Dear Paul,

Addendum to the noise report follows. Change in operating scenarios at start of extraction and additional noise controls enables 40 dB(A) to be achieved.

Predicted noise levels under noise enhancing weather conditions will be faxed separately shortly.

Kind Regards,
Dick Benbow

ADDENDUM TO NOISE IMPACT ASSESSMENT REPORT FOR PROPOSED SAND EXTRACTION AND PROCESSING OPERATION AT CNR OF OLD NORTHERN RD & ROBERTS RD MAROOTA

Prepared for: Neil Kennan, Nexus Environmental Planning
NSW Environment Protection Authority

Prepared by: Derek Langgons, Environmental Engineer
Shane Harris, Environmental Engineer
R T Benbow, Principal Consultant
DICK BENBOW & ASSOCIATES PTY LIMITED

Report No: EE 2602NX-Add
February, 2000
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Dick Benbow & Associates Pty Limited

ACN: 074 404 943

Unit 4, 5-9 Hunter Street
Parramatta NSW 2150
Tel: (02) 9635-5099
Fax: (02) 9689-1385
Web site: http://www.dickbenbow.com.au

Level 8, 307 Queen Street
Brisbane QLD 4000
Tel: (07) 3303 9384
Fax: (07) 3221 3354
E-mail: admin@dickbenbow.com.au

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1. INTRODUCTION

This addendum report has been prepared to address the noise control issues associated with the sand extraction and processing operations for the proposed operations at the site described in the Noise Impact Assessment Report, EE 2602NX, Issue 3, dated 8th October. 1999.

The operational scenarios analysed in the Noise Impact Assessment Report found that predicted noise levels would exceed 45 dB(A) under different stages of extraction on the site at the three nearest potentially affected receivers described as locations A, B and C.

These exceedances occurred with permanent berms in place at specific areas of the site perimeter (as described on Figure 5.1 in Report EE 2602NX).

As existing residential noise levels currently exceed NSW EPA planning guidelines, discussions with noise control officers of the NSW EPA have indicated that the operational noise levels will need to satisfy a noise limit of 40 dB(A) during neutral weather conditions and 45 dB(A) during noise enhancing meteorological effects.

2. NOISE CONTROL MEASURES

The operational scenarios were varied from the report described above to remove a diesel generator and include the following set of noise controls.

- 3-4 metre permanent earth berm around the north-eastern boundary corner and extending along the eastern boundary to the site entrance.
- 2-3 metre permanent earth berm along the north-eastern section of the northern boundary.
- 3-4 metre temporary earth berms around the active extraction cell.

  Exact heights will be confirmed during the commissioning phase.

  Figure 1 shows the location of these berms.

- Along the edge of the extraction cell, nearest each of the three residential locations, use of a bulldozer to extract the first 1-2m of sand by locating the front of the bulldozer in the direction towards the residence.

  The sand would be pushed into stockpiles in the direction of the residence and loaded out by front end loaders or excavators working from behind the stockpile of material.

  This method of operation has been used previously at other extraction sites in Maroota during the first stages of extraction until the depth of the working face is at least 2m.

  The noise emission level to the front of the bulldozer with the blade making contact with the sand deposit is at least 5 dB(A) lower than the measured noise levels to the sides of the bulldozer.

- The mobile equipment operating near the processing plant is a major contributor to the combined noise levels at locations A and B.

  Additional noise control is required by use of a combination of concrete blocks and some sand material (if necessary) to effect acoustic barriers so that the mobile equipment will have a 5 -- 8 dB(A) noise reduction. Figure 1 shows the location of the acoustic barrier.

  This is a standard approach for other processing plant areas in the extractive industry.

- During the removal of sand in cells, cell width would be reduced so that the scrapers can operate within 10 m of the extraction walls until the depth exceeds 3 m, and from then on with scrapers within 20m of the walls of the extraction area.

- Scraper removed from extraction activities at Active Cell 1B until noise compliance studies prove otherwise.

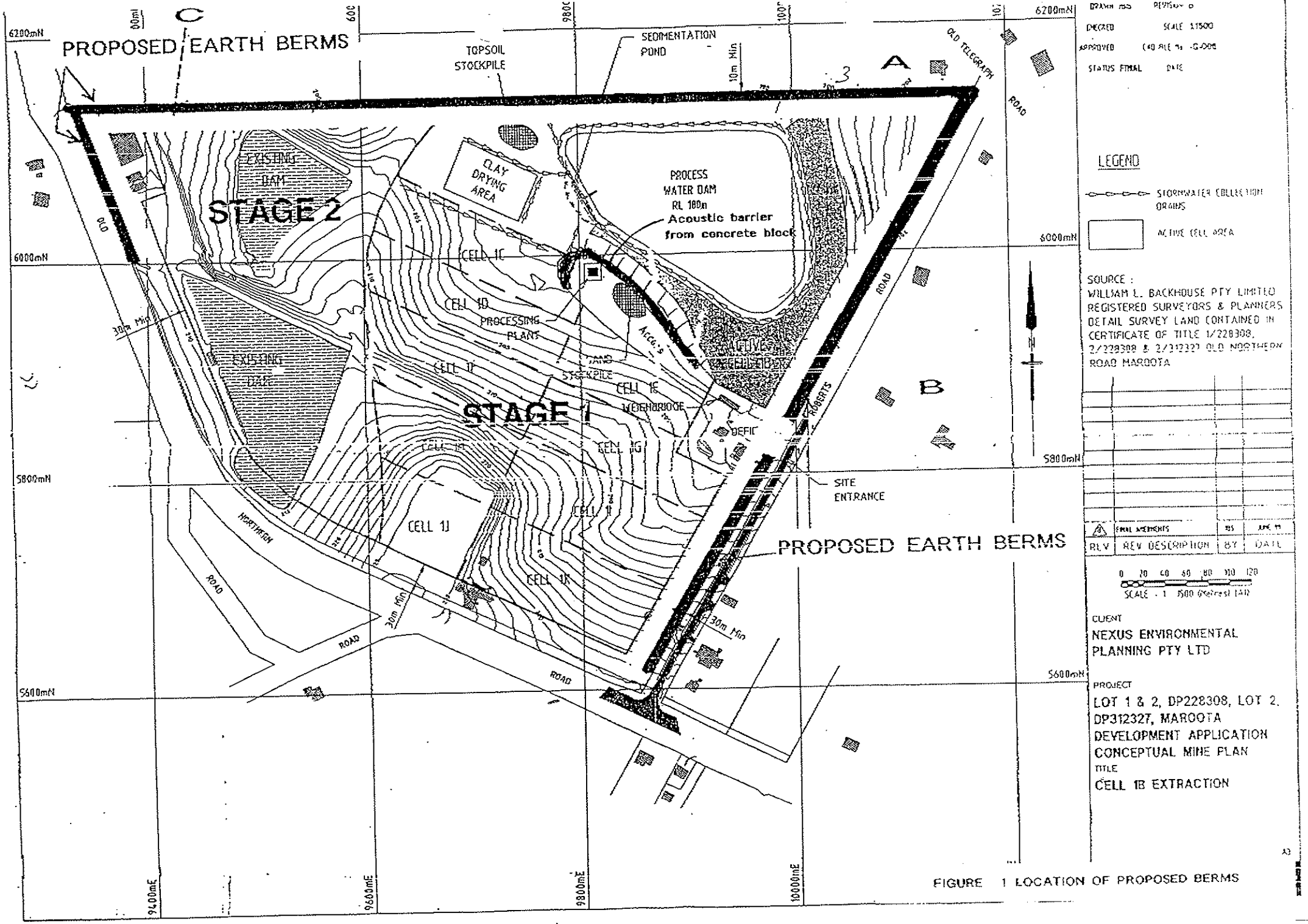

FIGURE 1 LOCATION OF PROPOSED BERMS

Table 2-1: Noise Source Allocation for each Modelling Scenario	
Noise Source	**Location**
Scenario 1 : Existing Operations	
Processing plant	Plant area
Dredging excavator	Existing dam
Front end loader	Plant area
Pump	Adjacent to dam
Scenario 2: Extraction in Cell 1B (Normal Operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1B
Scenario 3: Extraction in Cell 1B (Maximum operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1B
Truck	Plant area
Front end loader	Plant area
Dozer	Centre of Cell 1B
Scenario 4: Extraction in Cell 1D (Normal operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1D
Scenario 5: Extraction in Cell 1D (Maximum operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1D
Truck	Plant area
Front end loader	Plant area
Dozer	Centre of Cell 1D
Scenario 6: Extraction in Cell 1K (Normal Operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1K

Table 2-1: Noise Source Allocation for each Modelling Scenario	
Noise Source	**Location**
Scenario 7: Extraction in Cell 1K (Maximum operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 1K
Truck	Plant area
Front end loader	Plant area
Dozer	Centre of Cell 1K
Scenario 8: Extraction in Cell 2B (Normal Operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 2B
Scenario 9: Extraction in Cell 2B (Maximum operations)	
Processing Plant	Plant area
Dredging excavator	Existing dam
Pump	Adjacent to dam
Scraper	Centre of Cell 2B
Truck	Plant area
Front end loader	Plant area
Dozer	Centre of Cell 2B
Scenario 10: Shoulder Period Operations	
Truck	Plant area
Front end loader	Plant area

3. PREDICTED NOISE LEVELS

These are the predicted noise levels with the noise controls in place.

Table 3-1: Predicted Noise Levels from Site Operations

Scenario	Location A	Location B	Location C
Daytime Design Objective	*45*	*45*	*45*
1	37	35	36
2A *	40	39	40
2B	38	38	32
3A *	40	40	39
3B *	40	40	38
4A	37	35	35
4B	36	34	33
5A	39	40	39
5B	39	40	38
6A	36	35	32
6B	36	34	32
7A	39	40	38
7B	39	40	37
8A	37	35	36
8B	37	34	35
9A	40	40	40
9B	39	40	39
Shoulder Period Design Objective	*40*	*40*	*40*
10	35	37	37

* Scraper removed from extraction activities at surface of Active Cell 1B (under maximum operation conditions only).

The 40 dB(A) design objective can be satisfied.

R T Benbow
Principal Consultant

February 2000

Dick Benbow & Associates Pty. Ltd.

A.C.N. 074 404 943

Postal Address:
P.O. Box 687
Parramatta NSW 2124
Australia
Web site: http//www.dickbenbow.com.au

Unit 4, 5-9 Hunter Street, Parramatta
NSW 2150 Australia
Telephone: 61 2 9635 5099
Facsimile: 61 2 9689 1385
E-mail: admin@dickbenbow.com.au

FACSIMILE TRANSMISSION ADVICE

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TO:	Paul Wilkes		
cc:	Neil Kennan Nexus Environmental Planning		Fax: 9736 1306
COMPANY:	EPA – Noise Control Branch	FAX NO:	9995 5935
FROM:	R T Benbow	DATE:	17 February, 2000

MESSAGE: RE: Addendum for Noise Impact Assessment Report - Maroota

Dear Paul,

Following are the results of the predicted noise levels under worst case noise enhancing conditions.

The NSW EPA set criterion of 45 dB(A) has generally been achieved throughout. As such, the potential for annoyance at the nearest receivers to the site will be minimal.

Compliance monitoring (accounting for varying meteorological conditions) will verify this. The compliance monitoring will also verify any assumptions made in the establishment of the site specific noise prediction model.

The principles of the NSW EPA's ENCM are therefore being upheld.

Kind Regards,
Dick Benbow

4. PREDICTED NOISE LEVELS DURING NOISE ENHANCING WEATHER CONDITIONS

Table 4-1: Predicted Noise Levels from Site Operations with Controls in Place

Scenario	Wind	Location A	Location B	Location C
1	W	41	39	31
	SW	41	37	35
	SE	36	34	45
2A *	W	40	36	26
	SW	43	33	28
	SE	35	31	39
2B	W	41	40	27
	SW	42	39	30
	SE	38	37	39
3A *	W	42	44	33
	SW	43	43	38
	SE	40	41	[illegible]
3B *	W	41	43	30
	SW	42	41	34
	SE	39	39	42
4A	W	41	39	32
	SW	41	37	35
	SE	36	33	42
4B	W	40	38	29
	SW	40	36	32
	SE	35	32	40
5A	W	43	43	35
	SW	43	42	39
	SE	39	39	[illegible]
5B	W	42	43	33
	SW	42	41	37
	SE	38	39	[illegible]
6A	W	40	38	28
	SW	40	37	31
	SE	35	33	40
6B	W	40	37	27
	SW	40	35	30
	SE	35	32	40
7A	W	42	43	33
	SW	43	42	37
	SE	39	39	44
7B	W	42	43	32
	SW	42	42	37
	SE	38	39	44
8A	W	43	39	35
	SW	43	36	37
	SE	36	32	41

Table 4-1: Predicted Noise Levels from Site Operations with Controls in Place				
Scenario	Wind	Location A	Location B	Location C
8B	W	41	37	33
	SW	41	35	35
	SE	35	32	40
9A	W	45	43	38
	SW	44	42	40
	SE	39	39	45
9B	W	43	43	36
	SW	43	42	39
	SE	38	39	44
10	W	37	39	32
	SW	38	38	38
	SE	35	36	45

* Scraper removed from extraction activities at surface of Active Cell 1B (under maximum operation conditions only).

Comments

Observation of the ENM output files determined that the noise source causing the predicted noise levels to exceed the 45 dB(A) criterion (at location C under south-easterly wind conditions), was the front end loader manouvering within the plant area. Noise compliance studies conducted post commissioning will address the final height of this wall as additional concrete blocks can be added to increase the effective height of the barrier above 2m.

It is important that model calibration be conducted prior to further design of the additional ameliorative measures.

R T Benbow
Principal Consultant

Attachment 2

CARLINGFORD NSW 2118
Phone: (02) 9872 1291
Fax: (02) 9873 3261
Mobile: 0412 450 852

Sand Classifiers Pty Limited *ACN 000282735*

17 April 2000

The Manager
Sun - A - Rise Sand
Roberts Rd
Maroota

Dear Len,

Ref: SAND EXTRACTION METOD

We have considered your requirement for a 'quiet' method of excavating insitu sand and transporting it to the existing washing plant on your property at Roberts Road Maroota and submit the following proposal two proposals.

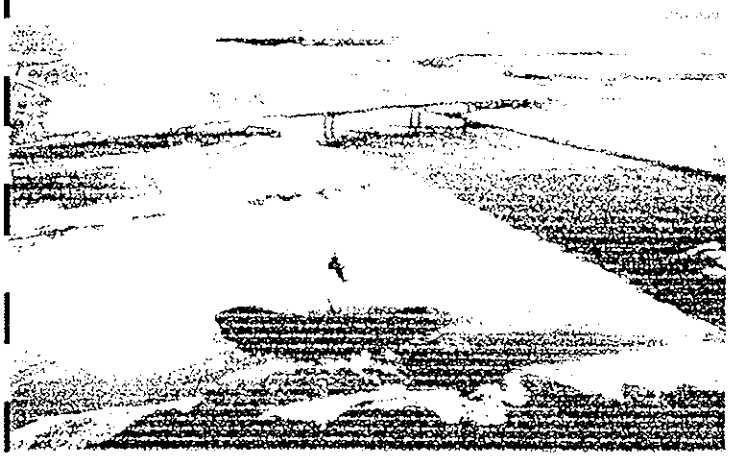
1. GENFLO EJECTOR

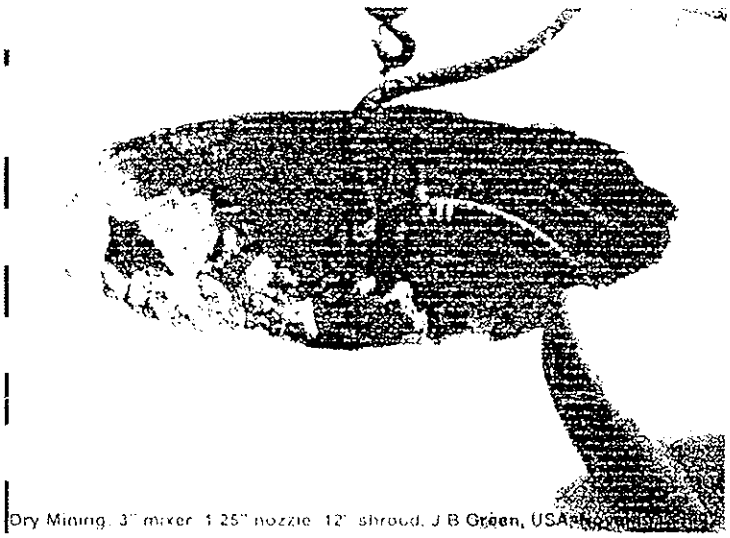
The ejector system developed by **Genflo** relies on high pressure water being supplied to an ejector system (USA009) which can be buried in sand as shown in figure 1. Extra high pressure water is also supplied to jets facing ahead of the ejector. These jets are used to break up and slurry the sand ahead of the ejector to enable it to penetrate deeper.

The ejector effectively lifts the sand slurry to the ground surface. If it is necessary to transport the slurry over a distance such as the case at your Maroota site, it will be necessary to install a booster pump at the quarry face.

Figure 1 shows the ejector being lowered into the sand by a large crawler crane. I propose that the ejector should be mounted on the dipper arm of an excavator. By doing this, the excavation system will be far more flexible and mobile.

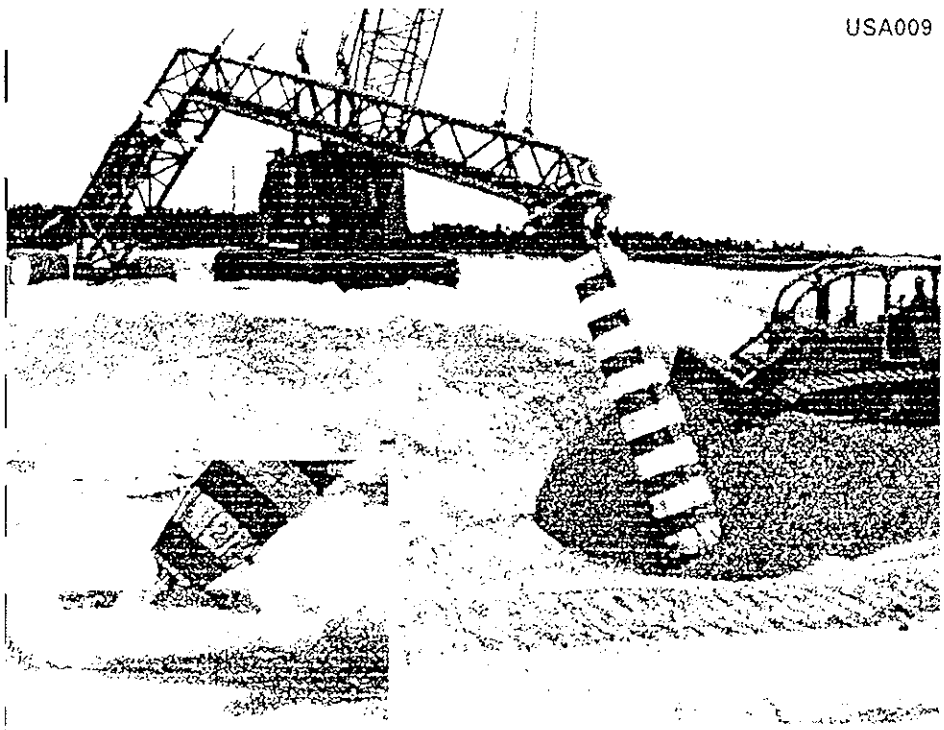
The high pressure water being delivered to the ejector will be supplied by an electrically powered centrifugal pump situated on your clean water dam. The booster slurry pump will be powered by a mobile diesel generating set situated near the quarry face. A description of the pumps and pipelines is given in the following proposal where the duties are very similar.





Dry Mining. 3" mixer. 1.25" nozzle. 12" shroud. J B Green, USA

USA009



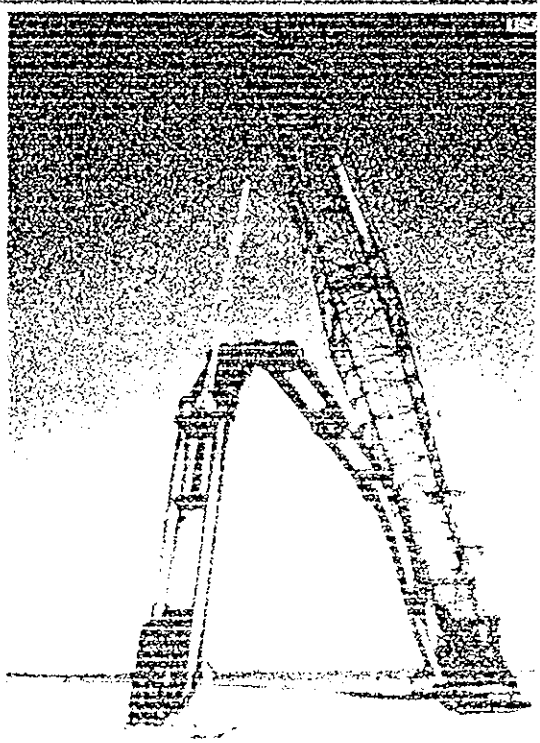


Fig 1

2. PUMPING UNIT

Figure 2 is a diagram of our proposal whereby the insitu sand will be excavated by front end loader, or excavator, and loaded onto a belt feeder. The hopper above the belt feeder will be rubber lined as a means of reducing any noise that may occur from the loading of the sand. The belt feeder will introduce the sand to the mixing tank at a variable rate controlled by variable belt speed.
An electrically powered centrifugal water pump will pump water to the mixing tank from the existing clean water dam through a rubber and polyethylene pipeline. The flow rate of the clean water will be controlled so that the water level in the mixing tank remains constant.
The sand slurry will be drawn out of the mixing tank by an electrically driven slurry pump and pumped via a rubber and polyethylene pipeline to the sand plant. Power for the slurry pump will be supplied by a diesel powered generator that is totally enclosed by an acoustic cover similar to that of the compressors and generator sets seen operating in residential and business centres where noise levels are around 70dB(A) at 1 metre.

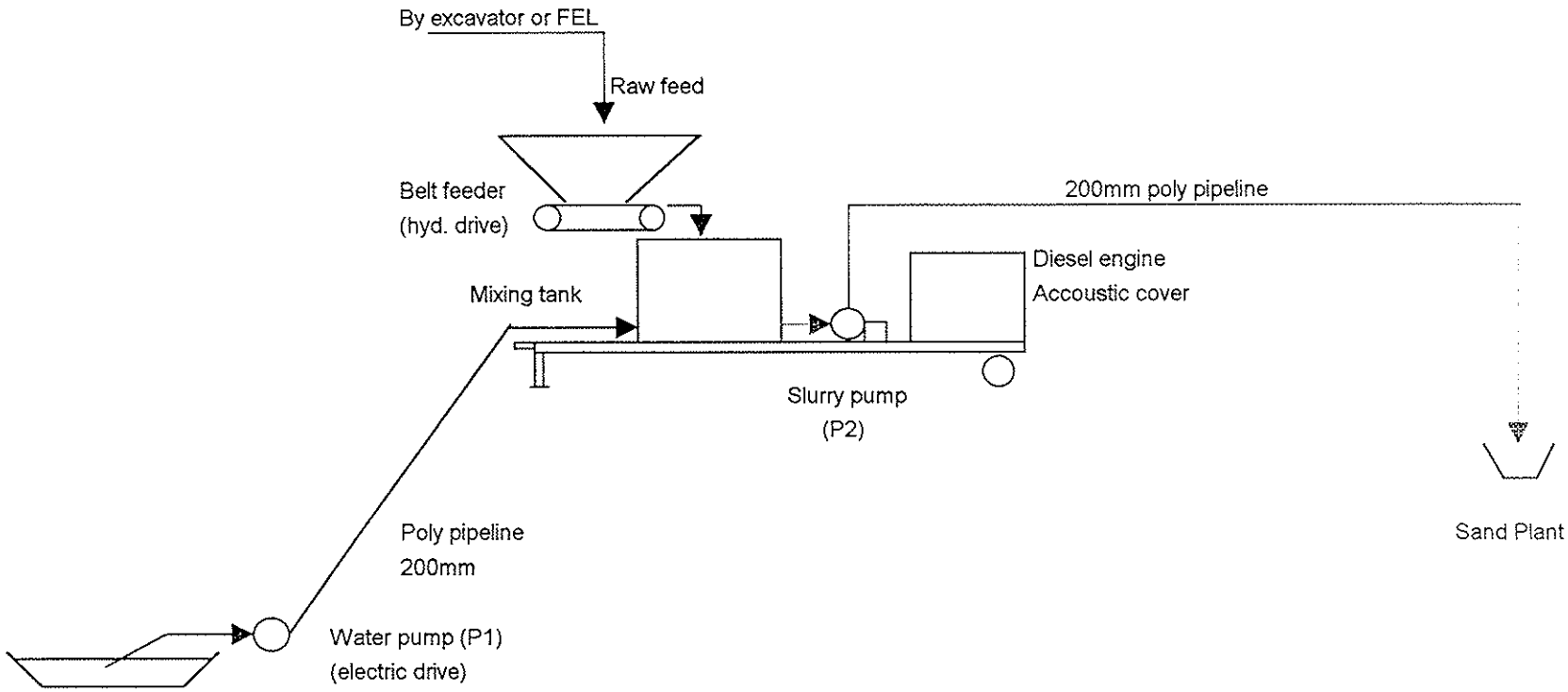
Figure 2 shows that the belt feeder, mixing tank, slurry pump and enclosed generator set are all mounted on a rubber tyred trailer that will be moved in conjunction with the advancing face of excavation. The trailer will be fitted with an integral fuel tank and drip tray extending below the fuel tank and diesel engine.
Rubber hoses will be used for the clean water and slurry pipe work close to the pumping unit to allow for any movement that may occur. The poly pipeline will be installed in 12 metre lengths, which will allow the addition and subtraction of pipeline depending on the movement of the pumping unit.

This method of excavation and transport of sand lends itself to the cellular program of excavation that you have established. The excavator or front end loader and the pumping unit will be located below the natural ground surface thus significantly restricting the horizontal spread of sound pressure levels.

2.1 Noise

I believe that an excavator should be used to feed the pumping unit in preference to the front end loader. The excavator does not have to continually move as does the FEL and will therefore create significantly less dust.
Additionally, I believe that the sound pressure levels created by the excavator can be reduced to or below the levels created by the FEL. I was recently managing the dredging operation for the Northside Storage Tunnel project at Tunks Park where a 100 tonne Liebherr excavator was being used on a barge within 50 metres of residents. By the addition of a high quality residential exhaust muffler, a discharge louvre for the radiator and an air intake silencer it was possible to reduce the sound pressure level from 87dB(A) to 65dB(A) at the same measured distance from the unit. The size of the excavator required to load 150 tonnes per hour into the pumping unit would not be anywhere near that of the 100 tonne machine and accordingly would have a lower sound power level initially.

SUN - A - RISE SAND EXCAVATING PLANT



Elevation of P2 relative to sand plant	Power (kw) P1	P2
-10m	30	10
0	43	35
+10m	55	55
+20m	60	75

Fig2

2.2 Environmental Advantages

There are several other environmentally advantageous reasons why this pumping system is preferable over conventional extractive methods.

- The area of extraction is very concentrated with no need for turning circles or contour following roads at steep inclines. The net result is a less disturbed area.
- The excavating and transporting equipment has less noise than conventional equipment and is virtually stationary and below ground level.
- The creation of dust will be insignificant as there will be no moving vehicles. There will be no need for the formation or maintenance of quality access roads.
- The sand being transported to the sand plant will be totally enclosed within the pipeline whereas sand transported by truck often falls off the truck body and is open to the effects of wind.
- The energy required to transport the sand from the excavation to the sand plant will be a minimum and significantly less that that used by conventional equipment. The table on Fig. 1 shows the power required for differing excavation levels relative to the sand plant.
- The potential for pollution of ground water will be negligible compared to conventional transport methods where trucks and scrapers can leak oil along their travel path. The engine on the pumping unit will have an appropriately sized drip tray beneath it.
- The pumping of the sand will constitute a primary wash and alleviate the requirement for a double wash in the plant.

3. RECOMMENDATION

I believe that our proposal number 2 will be a better system for your operation for the following reasons:

You will have the ability to infinitely control the rate of feed to the sand plant by the variable speed of the belt feeder. The feed rate of the ejector will be variable depending on the type of material and its feed rate and the depth at which it is operated.

In the second proposal, the excavator will be free to perform other duties without time consuming coupling and uncoupling of the ejector.

The water introduced to the pumping unit will be totally enclosed with no spillage. The water introduced to the ejector and its jets will at times be free and may create dangerous working conditions.

Should you determine that the proposed method of excavation and transport of sand is acceptable we shall prepare an assembly and installation price for the equipment together with the pipeline to your nominated length.

Kind regards

R W Davidson
Director

Attachment 3

NOISE IMPACT ASSESSMENT FOR PROPOSED CHANGES TO EXTRACTION TECHNIQUES AT SAND EXTRACTION AND PROCESSING SITE Cnr of Old Northern Rd and Roberts Rd, Maroota

Prepared for: Dr L.S. Martin

Prepared by: Derek Langgons Environmental Engineer
Shane Harris Environmental Engineer
R T Benbow, Principal Consultant
DICK BENBOW & ASSOCIATES PTY LIMITED

Report No: 10065
Issue 1
(Released: 26 June, 2000)

Dick Benbow & Associates Pty Limited

ACN: 074 404 943

Unit 4, 5-9 Hunter Street
Parramatta NSW 2150
Tel: (02) 9635-5099
Fax: (02) 9689-1385
Website: www.dickbenbow.com.au

Level 8, 307 Queen Street
Brisbane QLD 4000
Tel: (07) 3303 9384
Fax: (07) 3221 3354
E-mail: admin@dickbenbow.com.au

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As Environmental Consultants, we have made a conscious decision to use environmentally friendly products wherever possible, understanding that our clients value the environment as much as we do.

For this reason, this report has been printed on 100% recycled paper.

CONTENTS

PAGE

1. INTRODUCTION

A development application for the proposed sand extraction and processing site at Lots 1 and 2 DP 228308, Lot 2 DP 312327, Roberts Road, Maroota was approved by the Minister for Urban Affairs and Planning on the 31st of May, 2000.

An environmental impact statement (EIS) was prepared by Nexus Environmental Planning Pty Ltd for the proposal. Dick Benbow & Associates prepared a noise impact assessment that was incorporated into the EIS (Dick Benbow & Associates Report 2602, 8th of October, 1999).

The noise impact assessment included an assessment of existing ambient noise levels at the nearest potentially affected receivers to the site. Predicted noise levels for the proposed operations were assessed and several noise control strategies were discussed.

A key component of the recommended noise control strategy was the construction of several large permanent earth bund walls along the site boundaries and temporary earth bund walls around each extraction cell. These bund walls were required due to the high noise emissions associated with extraction using dozers and scrapers and due to the small separation distances between the site and the nearest sensitive receivers.

Noise limits for the site were set in the development consent conditions. These limits are discussed in Section 2 of this report.

Site management have now researched a new extraction technique. This technique eliminates the requirements for extraction using dozers and scrapers and will significantly reduce noise emissions from the site. The new process is further discussed in Section 3 of this report.

The purpose of this report is to predict noise emissions from the site with the new extraction process in place. The aim of using the new process is to minimise or eliminate the need for the construction of earth bund walls. The bund walls were required to be several metres high. This would require significant material, cost and lost time. Therefore, reduction of noise sources from the site are both environmentally and economically positive.

2. NOISE LIMITS FOR THE DEVELOPMENT

Noise limits for the operation of the site have been set as part of the development consent conditions. Condition 47 of the consent states:

"47. Noise from the premises must not exceed:

- *an $L_{A10,(15min)}$ noise emission criterion of 45 dB(A) (7am to 6pm) Monday to Saturday*
- *an $L_{A10,(15min)}$ noise emission criterion of 40 dB(A) (6am to 7am) Monday to Saturday*
- *an L_{A1} noise emission criterion of 50 dB(A) (6am to 7pm) Monday to Saturday"*

These limits apply when measured at any affected receptor and for prevailing meteorological conditions (winds up to 3 m/s), except under temperature inversions.

3. PROPOSED EXTRACTION PROCESS

The proposed extraction process has been predominantly used overseas and has been recommended to site management by Sand Classifiers Pty Ltd. The documentation provided by Sand Classifiers Pty Ltd has been reviewed and the key process description has been summarised below.

Sand is extracted using an excavator. The excavator would start at the natural ground surface level but would immediately dig a hole so that the excavator and processing equipment would be working against an extraction face. The extraction face provides significant noise shielding.

The excavator that will be used will be fitted with acoustic mufflers to achieve a noise level of approximately 76 dB(A) when measured at 7 metres. This noise level has been achieved at several similar sites with noise issues. Discussions with the potential excavator suppliers have found that this specification can be met.

The excavator loads the sand into an acoustically lined hopper. The hopper is located above a belt feeder which introduces the sand into a mixing tank. The belt drive is variable rate controlled and is powered by an electric motor.

A centrifugal electrically driven water pump will be located at the clean water storage dam. This pump will pump water to the mixing tank through a rubber and polyethylene pipeline. The flow rate of the clean water will be controlled so that the water level in the mixing tank remains constant.

The sand slurry is then drawn out of the mixing tank by an electrically driven slurry pump and pumped via a rubber and polyethylene pipeline to the sand processing plant.

Electricity will be supplied to the belt feeder and slurry pump from a diesel generator. The generator will be fitted with an acoustic enclosure. A design for the enclosure has been provided to site management by Enco Noise Control Pty Ltd. The design states that a noise level below 44 dB(A) at 30 metres will be achieved.

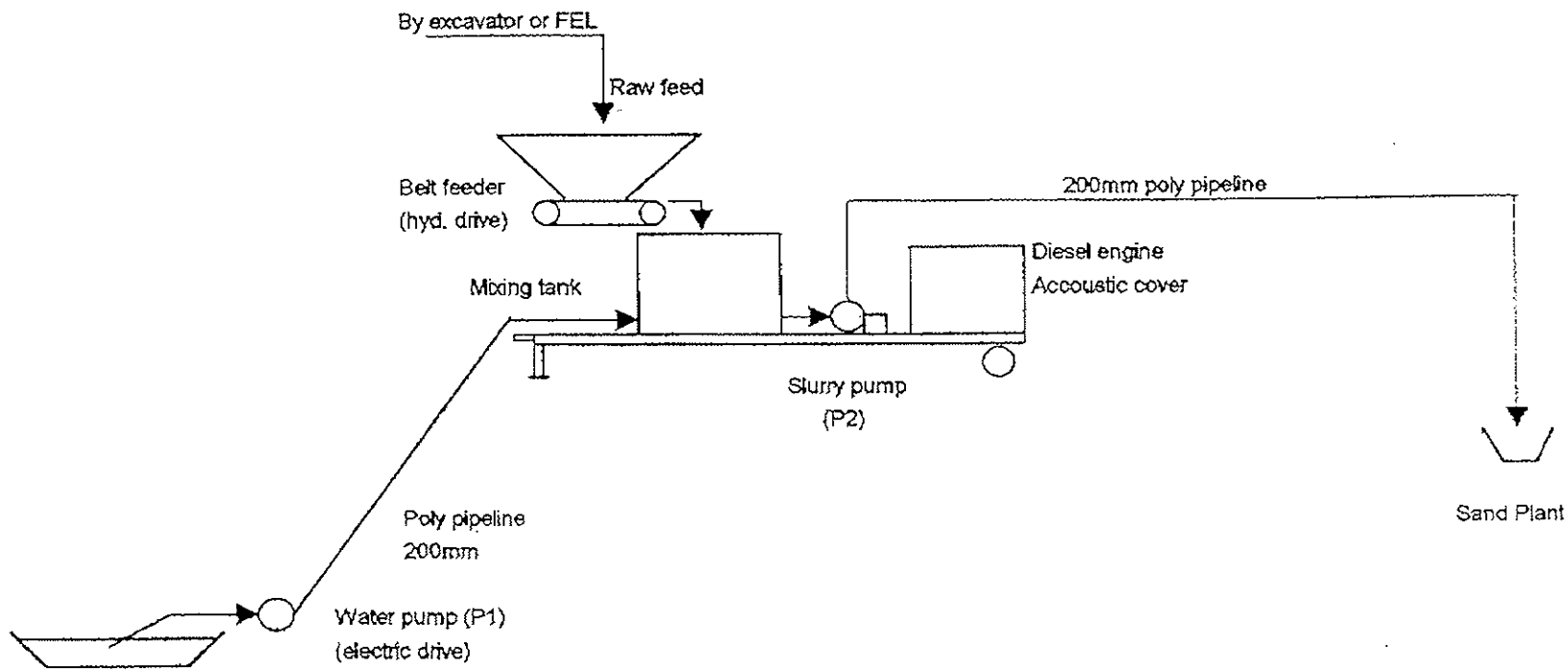
The belt feeder, mixing tank, slurry pump and enclosed generator will be located on a rubber tired trailer. This will allow the unit to be moved as the sand extraction face progresses.

A concept diagram showing the proposed process has been provided by Sand Classifiers Pty Ltd. the diagram has been included on the following page.

The key benefits of the proposed extraction process are the elimination of need for dozers and scrapers on the site. This technique will also allow for the full use of the cell extraction technique where significant shielding can be achieved by working behind an extraction face.

Hence, noise emissions from the process are more readily managed.

SUN - A - RISE SAND EXCAVATING PLANT



Elevation of P2 relative to sand plant	Power (kw) P1	P2
-10m	30	10
0	43	35
+10m	55	55
+20m	60	75

4. REVISED NOISE MODELLING

Noise modelling was carried out as part of the EIS for the site. In carrying out this modelling, current site topography was digitized into the noise model. The areas surrounding the site were also digitized from the topographical map of the region.

The ENM noise model was used to predict noise levels at the nearest receivers for the proposed operations. This model is recognised by the NSW EPA and has been used widely with high accuracy.

The noise model established for the site was revised for the proposed extraction technique. Dozers and scrapers were removed from the model and the new extraction technique was added.

The noise level predictions were undertaken for the same receivers as used in the EIS. These are as follows:

Location A: Residence at 155 Roberts Road, Maroota. This residence is approximately 15 metres north of the northern boundary of the site.

Location B: Residence at 2a Roberts Road, Maroota. This residence is located approximately 60 metres east of the eastern boundary of the site.

Location C: Residence at 156 Old Northern Road, Maroota. This residence is located approximately 140 metres north of the northern boundary of the site.

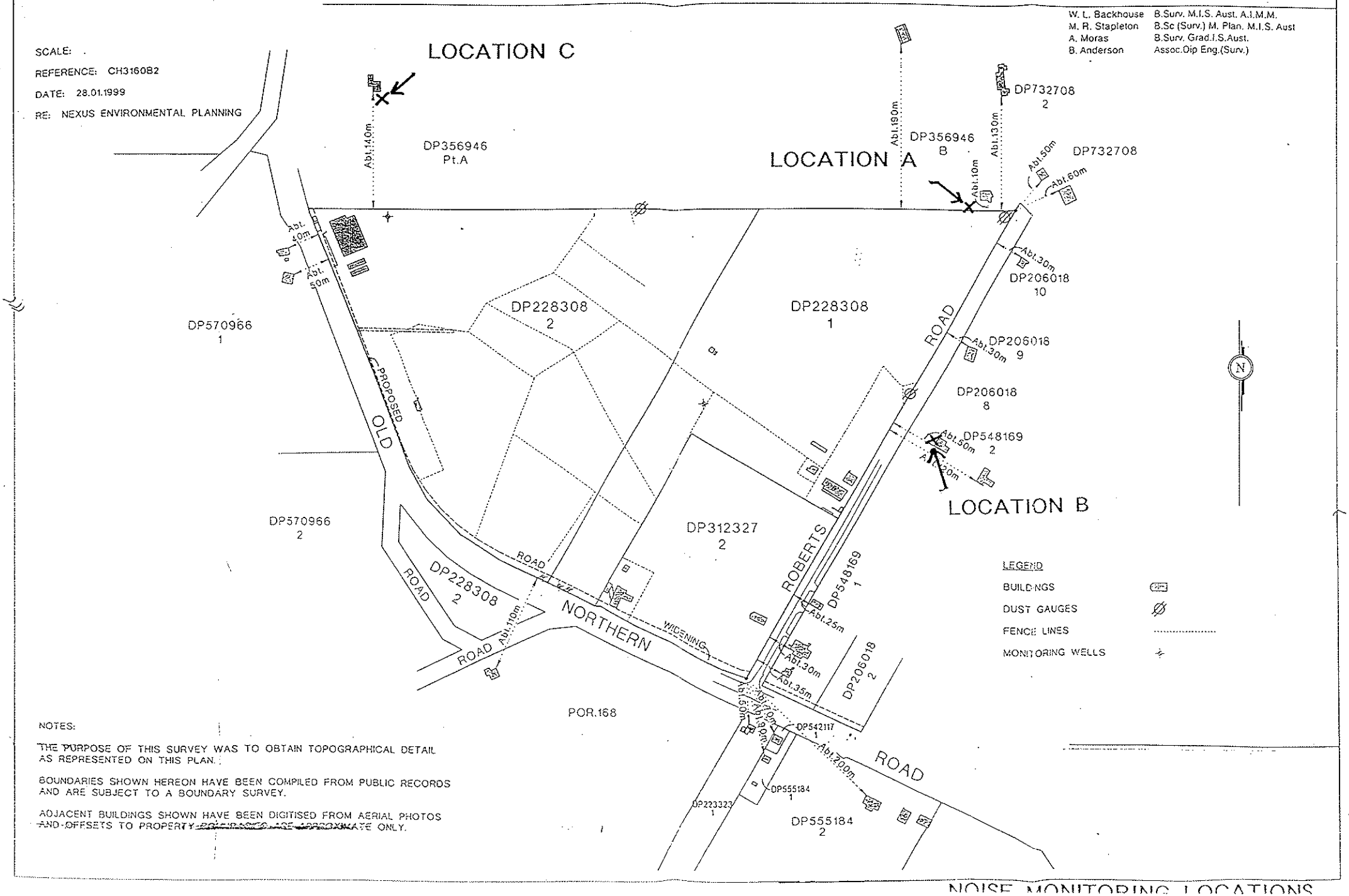
A diagram showing the receivers is presented on the following page.

The noise source data for the existing processing plant was obtained as part of the EIS. Source data for the excavator fitted with acoustic mufflers was supplied by Komatsu. As stated in Section 2, the nominated maximum sound level from the diesel generator set with the enclosure was provided by Enco Noise Control Pty Ltd. Noise source data for the pumps and electric motors was obtained from similar items on other sites. The source data is presented in Table 4-1.

It will be important to validate the source data as part of the compliance study once the process is commenced.

Noise modelling was carried out for the scenarios as detailed in Table 4-2. Each scenario was run for various meteorological conditions including a 3 m/s wind towards each of the receiver locations.

The results of the modelling are presented in Table 4-3. It should be stressed that these results do not include the proposed bund walls as recommended in the EIS.



W. L. Backhouse B.Surv. M.I.S. Aust. A.I.M.M.
M. R. Stapleton B.Sc (Surv.) M. Plan. M.I.S. Aust
A. Moras B.Surv. Grad.I.S.Aust.
B. Anderson Assoc.Dip Eng.(Surv.)

SCALE:

REFERENCE: CH316082

DATE: 28.01.1999

RE: NEXUS ENVIRONMENTAL PLANNING

NOTES:

THE PURPOSE OF THIS SURVEY WAS TO OBTAIN TOPOGRAPHICAL DETAIL AS REPRESENTED ON THIS PLAN.

BOUNDARIES SHOWN HEREON HAVE BEEN COMPILED FROM PUBLIC RECORDS AND ARE SUBJECT TO A BOUNDARY SURVEY.

ADJACENT BUILDINGS SHOWN HAVE BEEN DIGITISED FROM AERIAL PHOTOS AND OFFSETS TO PROPERTY BOUNDARIES ARE APPROXIMATE ONLY.

NOISE MONITORING LOCATIONS

Table 4-1: Noise Source Data
Sound Power Levels (dB(A))

Descriptor	dB(A)	Linear Weighted Octave Band Frequency (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Front End Loader										
L_{A10}	**104.7**	101.9	114.8	103.4	104.4	102.2	99.9	96.1	89.7	89.1
Road Transport Truck										
L_{A10}	**103.4**	127.3	113.1	104	106.5	103.1	94.9	87.7	81.9	76.2
Excavator										
L_{A10}	**100.9**	97.5	94.3	97.2	101.7	99.3	94.1	92.9	88.1	82.2
Diesel Generator with enclosure										
L_{A10}	**81.5**	81.5	80.7	87.3	79.5	79.6	74.6	73.2	69.2	65.0
Electric motor										
L_{A10}	**80.3**	105.4	92.2	85.1	79.6	77.2	74.0	71.8	67.0	61.1
Belt feeder										
L_{A10}	**88.0**	80.7	81.8	92.4	90.3	86.0	82.7	75.7	67.2	55.0
Processing Plant										
L_{A10}	**99.4**	106	108.1	96.5	93.5	93.7	93.5	93.0	91.3	87.4

Table 4-2: Noise source allocation for each modelling scenario

Noise Source	Location
Scenario 1: Truck loading only	
FEL maneuvering	Plant area
Road transport truck maneuvering	Plant area
Scenario 2: Extraction in Cell 1B and Processing	
Processing Plant	Plant area
FEL maneuvering	Plant area
Road transport truck maneuvering	Plant area
Diesel generator	Extraction Cell 1B
Belt Feeder	Extraction Cell 1B
Electric motor	Extraction Cell 1B
Excavator	Extraction Area Cell 1B
Electric motor	Water storage dam
Scenario 3: Extraction in Cell 1D and Processing	
Processing Plant	Plant area
FEL maneuvering	Plant area
Road transport truck maneuvering	Plant area
Diesel generator	Extraction Cell 1D
Belt Feeder	Extraction Cell 1D
Electric motor	Extraction Cell 1D
Excavator	Extraction Area Cell 1D
Electric motor	Water storage dam
Scenario 4: Extraction in Cell 1K and Processing	
Processing Plant	Plant area
FEL maneuvering	Plant area
Road transport truck maneuvering	Plant area
Diesel generator	Extraction Cell 1D
Belt Feeder	Extraction Cell 1D
Electric motor	Extraction Cell 1D
Excavator	Extraction Area Cell 1D
Electric motor	Water storage dam
Scenario 5: Extraction in Cell 2B and Processing	
Processing Plant	Plant area
FEL maneuvering	Plant area
Road transport truck maneuvering	Plant area
Diesel generator	Extraction Cell 2B
Belt Feeder	Extraction Cell 2B
Electric motor	Extraction Cell 2B
Excavator	Extraction Area Cell 2B
Electric motor	Water storage dam

Table 4-3: Predicted Noise Levels – No Earth Bunds in place

Scenario and Condition		Location A	Location B	Location C
1	Still wind	40	39	36
	3 m/s Westerly	**44**	**42**	31
	3 m/s South Westerly	**42**	**43**	35
	3 m/s South easterly	38	39	**45**
2 Extraction at surface	Still wind	**52**	43	38
	3 m/s Westerly	**52**	45	33
	3 m/s South Westerly	**52**	**46**	37
	3 m/s South easterly	**51**	43	**46**
2 Extraction at depth	Still wind	42	41	37
	3 m/s Westerly	45	44	32
	3 m/s South Westerly	43	42	37
	3 m/s South easterly	41	41	**46**
3 Extraction at surface	Still wind	42	41	39
	3 m/s Westerly	**46**	45	34
	3 m/s South Westerly	44	45	38
	3 m/s South easterly	39	41	**47**
3 Extraction at depth	Still wind	41	39	36
	3 m/s Westerly	45	42	32
	3 m/s South Westerly	43	43	37
	3 m/s South easterly	39	39	**46**
4 Extraction at surface	Still wind	42	38	36
	3 m/s Westerly	46	44	32
	3 m/s South Westerly	44	45	36
	3 m/s South easterly	40	40	**46**
4 Extraction at depth	Still wind	41	39	37
	3 m/s Westerly	45	42	32
	3 m/s South Westerly	43	43	36
	3 m/s South easterly	39	39	**46**
5 Extraction at surface	Still wind	41	39	43
	3 m/s Westerly	45	44	41
	3 m/s South Westerly	43	45	44
	3 m/s South easterly	39	39	**48**
5 Extraction at depth	Still wind	41	39	39
	3 m/s Westerly	45	43	35
	3 m/s South Westerly	43	43	39
	3 m/s South easterly	39	39	**46**

Note: results shaded exceed consent condition limits.

The predicted noise levels presented in Table 4-3 show that there is some potential for excessive noise levels to be generated from the site. The predictions have been carried out without any of the permanent or temporary earth bunds. The wall around the processing area recommended in the EIS has also not been included.

Several points can be made from the results:

a) Scenario 1 has been carried out for the 6am to 7am period only when loading of trucks will be carried out. The results show that the 40 dB(A) limit may be exceeded under adverse winds. An acoustic wall was recommended in the EIS for this area.

b) Predicted noise levels at Location C exceed the 45 dB(A) limit for Scenarios 2 to 5 with a south easterly wind. Analysis of the ENM output files has found that the processing plant and truck movements significantly contribute to the combined noise levels. Therefore the acoustic wall in the plant area will further reduce these noise levels.

c) The 45 dB(A) limit will be significantly exceeded at Location A during Scenario 2. However, this scenario is for when extraction is being undertaken in close proximity to the residence (Cell 1B) and the excavator and extraction equipment is at the natural surface level. The results for when the equipment is at depth comply with the 45 dB(A) limit.

A 3 metre wall was included in the noise model around the processing plant. The wall was placed in the same location as recommended in the EIS. The wall could be constructed of sand stockpiles or concrete blocks as detailed in the EIS. The model was rerun for each of the scenarios and wind conditions. The results are presented in Table 4-4.

The results show that significant attenuations are achieved. Further attenuations will be achieved through the implementation of a noise management plan. The model has also assumed several conservative factors. Noise compliance monitoring will be useful in confirming actual impacts.

Table 4-4: Predicted Noise Levels – Walls in place around processing area

Scenario and Condition		Location A	Location B	Location C
1	Still wind	39	36	34
	3 m/s Westerly	41	39	30
	3 m/s South Westerly	41	39	34
	3 m/s South easterly	38	36	40
2 Extraction at surface	Still wind	52	41	37
	3 m/s Westerly	53	44	32
	3 m/s South Westerly	52	45	36
	3 m/s South easterly	51	41	43
2 Extraction at depth	Still wind	42	39	35
	3 m/s Westerly	45	42	31
	3 m/s South Westerly	42	39	35
	3 m/s South easterly	40	39	41
3 Extraction at surface	Still wind	42	40	37
	3 m/s Westerly	46	44	33
	3 m/s South Westerly	44	44	37
	3 m/s South easterly	39	40	44
3 Extraction at depth	Still wind	41	37	36
	3 m/s Westerly	45	41	31
	3 m/s South Westerly	43	42	35
	3 m/s South easterly	39	37	41
4 Extraction at surface	Still wind	42	38	35
	3 m/s Westerly	45	42	31
	3 m/s South Westerly	44	44	35
	3 m/s South easterly	40	39	41
4 Extraction at depth	Still wind	41	37	35
	3 m/s Westerly	45	41	31
	3 m/s South Westerly	43	42	34
	3 m/s South easterly	39	37	41
5 Extraction at surface	Still wind	41	38	43
	3 m/s Westerly	45	43	41
	3 m/s South Westerly	43	43	43
	3 m/s South easterly	39	37	46
5 Extraction at depth	Still wind	41	38	38
	3 m/s Westerly	45	41	35
	3 m/s South Westerly	43	42	38
	3 m/s South easterly	39	37	43

Note: results shaded exceed consent condition limits.

5. CONCLUSIONS

The proposed changes to the extraction system at the quarry present a major initiative from quarry management. The elimination of the need for scrapers and dozers will significantly reduce noise emissions from the site.

Previous noise predictions with the use of scrapers and dozers found that permanent and temporary earth bunds would be required at several locations on the site to control noise emissions. These bunds create several problems for the quarry operator and for the community. The material and time required to build the bunds will be significant. The bunds will generate aesthetic impacts for the community. Other issues such as landscaping, water management and dust control will also be adversely effected by the bunds. Construction of the earth bunds may also generate considerable noise impacts for the duration of the construction. This could take several weeks for each bund.

Revised noise level predictions were carried out for the new extraction technique. The predicted noise levels found that the development consent limits will generally be satisfied with the implementation of a wall in the processing area.

Elevated noise levels will occur at one residence when the excavator is operating on the natural surface level in Cell 1B. Discussions with the quarry operator and Sand Classifiers Pty Ltd have found that the time taken to excavate a working face for the excavator and equipment to work behind will only be 2 – 3 days. Therefore, noise impacts at Location B may exceed the 45 dB(A) limit for several days only.

The noise impacts during the initial excavation of each cell can also be suitably managed by commencing the cell at the furthest point from the residences and directing the excavator noise away from the residences where possible.

Therefore it is clear from the results of the modelling and the discussion presented above that as a result of the new extraction process:

a) The permanent earth bunds around the perimeter of the site as recommended in the EIS will no longer be required;

b) The temporary earth bunds around each extraction cell as recommended in the EIS will no longer be required;

c) The wall in the processing area as recommended in the EIS will still be required.

The development consent requires site management to implement a noise management plan and to undertake noise compliance monitoring. It is considered that these items will ensure that all noise emissions from the quarry are suitably controlled and that acceptable noise levels are achieved at the nearest residences.

This concludes the report.

Derek Langgons
Environmental Engineer

Shane Harris
Environmental Engineer

R.T. Benbow
Principal Consultant

Attachment 4

HOLMES
AIR SCIENCES

Suite 2B 14 Glen Street,
Eastwood, NSW 2122
Phone 61-2-9874-8644
Fax 61-2-9874-8904
E-mail : holmair@ozemail.com.au
ACN 003-741-035

Neil Kennan
NEXUS Environmental Planning
P.O. Box 212
CONCORD NSW 2137

July 7, 2000

Dear Neil,

As discussed, we have prepared a summary of the impacts of the amended extraction operations with regard to the Maroota, Roberts Road project. Please find attached the details of the new emissions data and modelling work undertaken.

Please don't hesitate to contact me should anything require clarification.

Kind regards,

Jane Barnett
Holmes Air Sciences

Introduction

An air quality assessment for the proposed sand extraction and processing operations at Roberts Road, Maroota, was carried out by Holmes Air Sciences in October 1999 and formed part of the EIS for the development application for the project. This development application was approved by the Department of Urban Affairs and Planning in May 2000.

Since this time, a new method of sand extraction has been developed, eliminating the need for dozers and scrapers during the extraction process. It is anticipated that this will significantly reduce the dust emissions from the site and therefore off-site dust concentration and deposition levels.

As this new method was not part of the original proposal, further work has been done to assess the impacts of the changes with regard to dust. This is document contains a brief discussion of the modelling work carried out to achieve this, and a summary of the results.

New extraction process

The amended process will involve sand being extracted using an excavator which would start at ground level and immediately dig a hole and extract around itself. The excavator would then load the sand into a hopper which feeds the sand into a mixing tank, also located inside the hole. Water pumped from the dam to the mixing tank would convert the sand into a slurry which would then be pumped to the processing plant. The location of the processing plant remains unchanged from the original proposal.

New emission estimates

The new extraction process described above removes the need for dozers and scrapers on-site. The resulting emissions are listed below in **Table 1**, and details of the calculations are presented in Appendix A. The total emissions are now estimated to be approximately 30,767 kg/y, a reduction of more than 11% from the original proposal.

Table 1 – Estimated dust emissions for amended extraction operations

Activity	TSP emission rate (kg/y)
Excavator in pit	10,225
Conveyer stacking screened material	449
Loading product to trucks	7,150
Hauling product off-site	8,580
Wind erosion from exposed extraction area	3,560
Wind erosion from stockpiles and processing area	803
TOTAL	***30,767***

Modelling results

Tables 2 and **3** show the predicted concentration and deposition levels for the amended operations, for each of the four closest residences. The locations of these residences are shown in **Figure 1**. These residences were chosen because of their proximity to the modelled active cell and the processing plant.

As shown in **Table 2**, the maximum 24-hour average PM_{10} concentrations due to emissions from the proposal are predicted to be well below the US EPA short-term goal of 150 $\mu g/m^3$. It was argued in the original air quality report, that this is the most appropriate goal for this assessment. The predicted levels would allow a considerable background PM_{10} level to be present and still maintain air quality consistent with the US EPA 150 $\mu g/m^3$ standard. Three of the four residences are also predicted to remain below the NEPM goal of 50 $\mu g/m^3$. Residence 44 is predicted to experience a maximum 24-hour concentration of approximately 54 $\mu g/m^3$, which is slightly above the NEPM 24-hour goal. However, the NEPM allows five exceedances of this level per year. A

time series of the predicted 24-hour concentration for each day of the year (**Figure 2**) shows that although the maximum is 54 $\mu g/m^3$ there are no other levels of that order. Thus air quality is expected to comply with the stricter NEPM 24-hour goal of 50 $\mu g/m^3$ provided background concentrations remain at reasonable levels. The second highest PM_{10} concentration is estimated to be approximately 30 $\mu g/m^3$. The results listed in **Table 2** also show that the predicted maximum of 54 $\mu g/m^3$ is a significant decrease (14.5%) from the levels predicted for the original excavation activities.

Significant decreases of both the PM_{10} and TSP annual average concentrations are also predicted for the amended extraction operations, although the levels predicted for the original case were not particularly high to begin with. All concentration levels are estimated to remain well below the long-term air quality goals of 50 $\mu g/m^3$ and 90 $\mu g/m^3$ for PM_{10} and TSP respectively.

Table 2 – Predicted concentrations for the nearest residences due to the original and amended operations – $\mu g/m^3$

Residence	Particle size (averaging time)	Predicted level		Decrease
		Original proposal	Amended proposal	
3	PM_{10} (24-hour average)	37.3	32.9	11.8 %
	PM_{10} (annual average)	8.7	7.6	12.6 %
	TSP (annual average)	12.9	11.2	13.2 %
5	PM_{10} (24-hour average)	27.3	23.1	15.4 %
	PM_{10} (annual average)	2.4	2.1	12.5 %
	TSP (annual average)	3.3	2.8	15.2 %
44	PM_{10} (24-hour average)	62.7	53.6	14.5 %
	PM_{10} (annual average)	8.9	7.5	15.7 %
	TSP (annual average)	13.0	11.0	15.4 %
45	PM_{10} (24-hour average)	35.3	29.8	15.6 %
	PM_{10} (annual average)	2.9	2.5	13.8 %
	TSP (annual average)	3.9	3.3	15.4 %

Table 3 lists the predicted annual average dust deposition levels for both scenarios. Again, decreases of more than 10% are estimated for the amended extraction method.

Table 3 – Predicted deposition levels for the nearest residences due to original and amended operations – g/m^2/month

Residence	Predicted level		Decrease
	Original proposal	Amended proposal	
3	2.19	1.93	11.9 %
5	0.49	0.41	16.3 %
44	2.44	2.10	13.9 %
45	0.63	0.54	14.3 %

Conclusions

A brief dispersion modelling exercise has been carried out to determine the effects of the amended extraction process described earlier. Based on the results of this exercise it can be concluded that the amended operations result in decreases in both concentration and deposition levels experienced at the four nearest residences. This is expected given that the total emissions are reduced by approximately 11%. Replacing the scrapers and dozers with an excavator, mixing tank and slurry pump, as proposed, will therefore have a positive effect on resulting concentration and deposition levels in the vicinity of the site.

APPENDIX A – ESTIMATED DUST EMISSIONS FOR THE AMENDED OPERATIONS

Excavator on material (NERDDC, 1988)
Approximately 408,980 t of material will be excavated, which will be loaded into a hopper adjacent to the excavator. Each tonne of material excavated will generate approximately 0.025 kg of dust. Therefore, the total dust generated by this process will be approximately 10,225 kg/y [0.025 kg/t x 408,980 t/y].

Screening material
Approximately 408,980 t of material will be screened. Since the material will arrive in slurry form, it will be wet. Dust emissions have been assumed to be negligible.

Conveyer stacking stockpiles
Approximately 286,000 t of material will be conveyed to the stockpile area. Each tonne of material stacked will generate a certain amount of dust, depending on the wind speed and the moisture content. Equation 1 (**US EPA, 1995, 13.2.4-3**) shows the relationship between these variables.

Equation 1

$$E_{TSP} = k \times 0.0016 \times \left(\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right) \quad \text{kg/t}$$

where,
k = 0.74
U = wind speed (m/s)
M = moisture content (%)
[where $0.25 \leq M \leq 4.8$]

Assuming a moisture content of 2% for the product sand, the total emission for loading product to trucks is therefore given by;

$$E_{total} = 286{,}000 \times 0.001184 \times \left(\frac{U}{2.2}\right)^{1.3} \quad \text{kg/t}$$

A "wind speed factor" [that is the $(U/2.2)^{1.3}$ part of Equation 1], will vary from hour to hour. This factor has been calculated for each hour in the meteorological data file and an annual average determined to be approximately 1.325. The total emissions from stacking the stockpiles will therefore be approximately 449 kg/y [286,000 x 0.001184 x 1.325].

Loading product to trucks (NERDDC, 1988)
Approximately 286,000 t of product material will be loaded into trucks over a period of one year. Each tonne of material loaded will generate dust at the rate of 0.025 kg/t. The total emissions from the loading of trucks will therefore be approximately 7,150 kg/y [286,000 t x 0.025 kg/t].

Hauling product off-site
Approximately 286,000 t of material will be transported off-site by 20 t trucks during the year (assuming maximum production of 1,000 t/day). Assuming a return travel distance of 0.3 km and dust generation rate of 4 kg/VKT and 50% control of dust by watering of the haul road, the total dust generated will be 8,580 kg [(286,000 t / 20 t) x 0.3 km x 4 kg/km x 50/100].

Wind erosion from extraction area
The US EPA (1985) emission factor equation for wind erosion is:

Equation 2

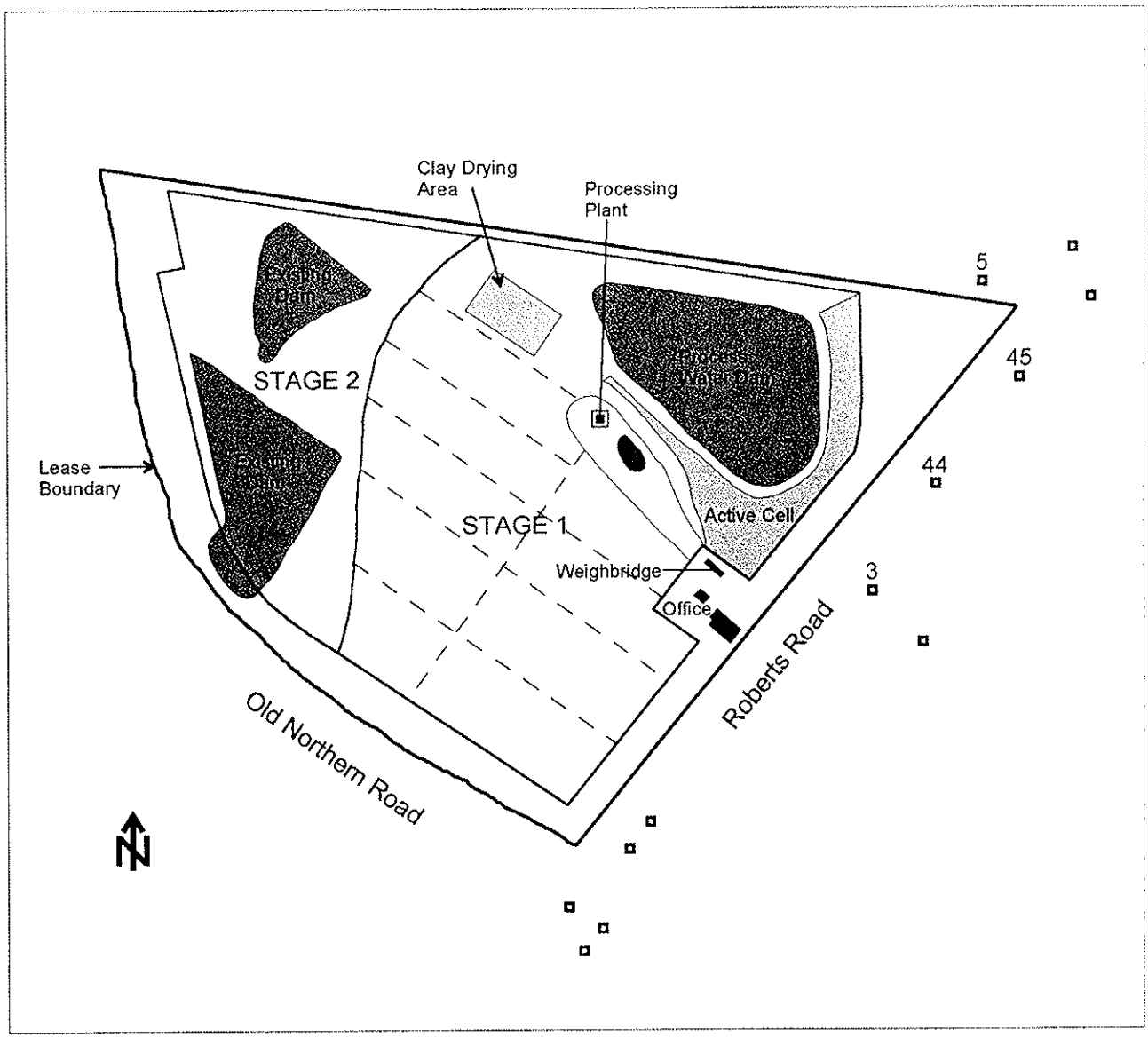
$$E_{TSP} = 1.9 \times \left(\frac{s}{1.5}\right) \times \left(\frac{365 - p}{235}\right) \times \left(\frac{f}{15}\right) \quad \text{kg/ha/day}$$

where,
s = silt content (%)
p = number of raindays per year (dimensionless),
f = percentage of time the wind is above 5.4 m/s

The equation gives a TSP emission factor of 6.5 kg/ha/day (2,373 kg/ha/y) for s=15% (**US EPA 1995, Table 13.2.2-2**), p=95 and f=4.5%.

At worst there will be a maximum of 1.5 ha of excavation area exposed at any one time. This would mean that the 1 ha active cell is exposed as well as the previous cell which has not yet been rehabilitated. The annual dust emission from the excavation areas will therefore be approximately 3,560 kg/year [2,373 x 1.5 ha].

Wind erosion from stockpiles and processing area
The silt content of product will be lower than that in the exposed areas, approximately 5%. Using Equation 2, this makes the TSP emissions factor approximately 2.2 kg/ha/day (803 kg/ha/y). Assuming that the stockpile and process area is approximately 1 ha, the annual emission will be 803 kg/year [803 kg/ha/y x 1 ha].



Proposed Site Layout

Figure 1

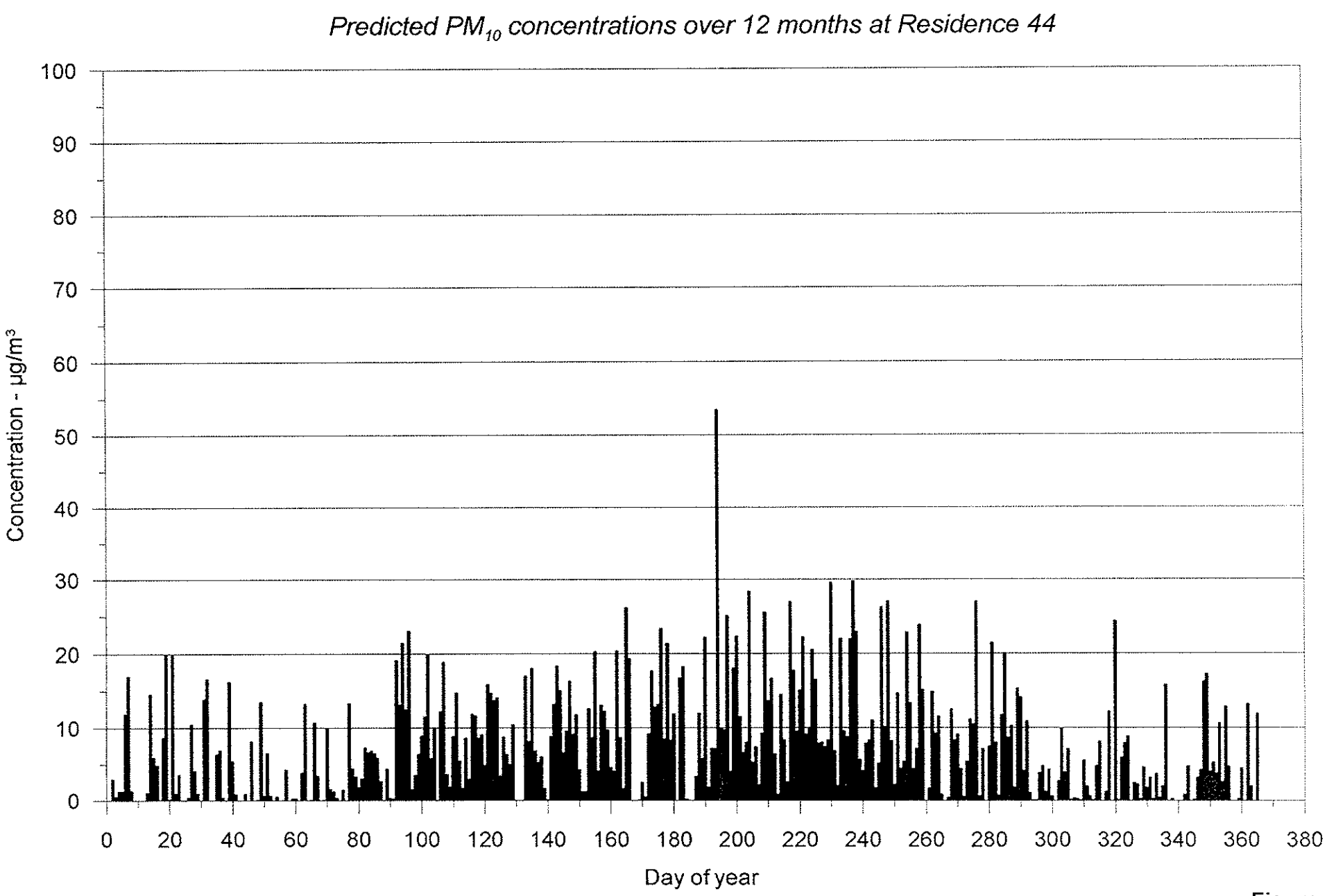

Predicted PM_{10} concentrations over 12 months at Residence 44
Concentration - µg/m³
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
Day of year

Figure 2

Attachment 5

REVISED REHABILITATION REPORT

For a

PROPOSED QUARRY

LOT 1 AND LOT 2, DP 228308
LOT 2, DP 312327
ROBERTS ROAD, MAROOTA

Prepared For:

NEXUS ENVIRONMENTAL PLANNING
PTY LTD

Prepared By:

SCOTT MURRAY & ASSOCIATES
79 ZIG ZAG LANE
CROWS NEST, NSW 2065

Tel : 9439 – 9430
Fax: 9439 – 9287
e-mail: sma@tpg.com.au

Date:

July 2000

CONTENTS

1.0 INTRODUCTION

This Report has been prepared by Scott Murray and Associates to describe the proposed landscape changes for the Dr Martin property following the approval for the sand extraction and processing development at the site by the Minister for Urban Affairs and Planning on the 31st May, 2000.

The Dr. Martin property - Lots 1 and 2 DP 228308 and Lot 2 DP 312327 - is situated on the corner of Old Northern and Roberts Roads, Maroota.

This Report should be read in conjunction with the revised noise impact assessment report prepared by Dick Benbow & Associates Pty Limited dated 26th June, 2000, the original Scott Murray and Associates Rehabilitation Report – dated October 1999 - and the following revised landscape plans prepared by Scott Murray & Associates: -

- **MP – 01B - Initial Earth Bunding & Boundary Planting Plan**
- **MP – 02B - Earth Bund & Planting Details**
- **MP – 03B - Year 3 Progressive Rehabilitation Plan & Section**
- **MP – 04B - Year 8 Progressive Rehabilitation Plan & Section**
- **MP – 05B - Final Landform / Rehabilitation Plan**

The aims of the rehabilitation guidelines presented in the original SMA report were to: -

- Initially establish, within the boundary setback areas, extensive screen planting – supplemented with earth bunding where required – to provide for visual screening and noise control of the proposed extraction works
- Ensure the extraction site is fully rehabilitated in an "orderly, progressive and controlled manner"
- Ensure that the proposed rehabilitation processes facilitate the successful establishment and on-going performance of the nominated end land-use for each disturbed area, namely:-
  - Indigenous native vegetation to the majority (70 %) of the site
  - Unimproved pasture / existing facilities to remain (23 %)
  - Retention of the existing dam (7 %)
- Ensure that the progressively rehabilitated areas of the site are protected and monitored for the life of the development.

The original SMA Plan **MP–01A** showed the intent of the initial boundary screening and earth bunding works. The majority of the earth bunding works were a requirement as a result of the Noise Impact Assessment Report prepared by Dick Benbow & Associates dated 8th October 1999.

These bund walls were to be several meters in height.

2.0 REVISED EXTRACTION PROCESS

The revised extraction process – as described in the Dick Benbow and Associates report (dated 26th June, 2000) – would result in the elimination of the need for the use of dozers and scrapers on the site, thus significantly reducing noise emissions from the site during the extraction and processing

process. As a direct result, the noise modelling undertaken by, and presented in the Dick Benbow report, states that: -

- The permanent earth bunds around the perimeter of the site as recommended in the EIS will no longer be required – from a noise perspective
- The temporary earth bunds around each extraction cell as recommended in the EIS will no longer be required – from a noise perspective
- The wall in the processing area as recommended in the EIS will still be required – from a noise perspective

As a result of this study it is clear that earth bunding – from a noise reduction standpoint – is not required.

However, from a visual impact viewpoint, we believe that certain earth bunding works are still required.

3.0 VISUAL ANALYSIS

In section **3.0 "Visual Analysis"** of the initial Rehabilitation Report - prepared by SMA for the EIS – the following extract was presented: -

> *"The topography of the site is such that it falls away from Old Northern Road, and hence affords extensive vistas of large portions of the site when viewed from various vantage points along both Old Northern and Roberts Roads.*
>
> *As a result, the current dam construction and sections of the future proposed extraction works would be visible to public and private view. The visual impact generated by these works is currently – and will in the future - be caused by the colour contrast of exposed soils.*
>
> *While these visual impacts are temporary - and will be totally eliminated once rehabilitation works have been undertaken - strategic bund wall construction and planting works along the boundaries of the subject property, will provide a visual screen for the current, and, in particular, the future extraction works within the site".*

As a consequence, it is therefore recommended – from a purely visual impact standpoint - that initial earth bunding still be implemented at the intersection of Old Northern and Roberts Road to prevent views into the site of the early stage 1 works. Plan **MP–01B** shows this revised bunding strategy. As in the previous scheme, this bunding would achieve heights of up to approximately 3 metres within the 30 metre setback, using a maximum 1:4 road-facing slope.

All other earth bunding previously proposed within boundary perimeter setbacks is now to be deleted as it is no longer required from either a visual impact or noise perspective. Again, plan **MP–01B** shows the current proposal.

It should be noted that there is no alteration to the vegetation proposed within the boundary setbacks – only the deletion of the now unnecessary earth bunding.

Plans **MP–02B – MP-05B** have been revised to reflect this current proposal.

4.0 REHABILITATION STRATEGY

The rehabilitation strategy for the site remains unchanged from the original SMA Rehabilitation Report.

5.0 CONCLUSION

The proposed changes presented in this report will in no way alter the conclusions drawn in the original SMA report: -

It is proposed that if the methods outlined in the report are followed, then: -

- *The nominated extraction areas can be successfully rehabilitated, re-establishing an extensive native vegetation cover*
- *The rehabilitation process can be staged in a progressive manner to limit possible visual impacts resulting from the excavation works.*
- *Appropriate standards will be set for the on-going monitoring of the rehabilitation process and maintenance works to ensure the successful establishment and on-going performance of these rehabilitation areas.*

On the basis of the above, we recommend that the changes presented in this report be approved.

PLAN DRAWINGS

10M WIDE SETBACK –
TO BE PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 B)

10m WIDE SETBACK
MASS PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 B)

10M WIDE SETBACK –
TO BE PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 A)

PROTECTIVE ZONE:
6 EXISTING ACACIA BYNOEANA TO
BE PROTECTED AND RETAINED

MASS PLANTING WITH SELECTED
INDIGENOUS NATIVE PLANTS

30M WIDE SETBACK –
WITH 3M HT EARTH BUND WALL
MASS PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 2, MP-02 A)

EXISTING VEGETATION TO BE
RETAINED

30M WIDE SETBACK –
TO BE PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 3, MP-02 B)

CONSTRUCT EARTH BUNDS TO FACILITATE
SCREENING OF NEGATIVE VISUAL IMPACTS

EXISTING VEGETATION TO BE
RETAINED AND PROTECTED

EXISTING BUNDING TO BE RETAINED

ACCESS ROAD

EXISTING SIGN TO REMAIN

EXISTING NURSERY AND SHADE HOUSES
TO BE RETAINED
FACILITIES TO BE USED FOR PLANT
PROPAGATION FOR USE IN SCREENING

SAND EXTRACTION SITE

OLD TELEGRAPH ROAD

ROBERTS ROAD

NORTHERN ROAD

OLD ROAD

30M SETBACK LINE

10M SETBACK LINE

LIMIT OF EXCAVATION

PROPERTY BOUNDARY

DAM

DAM UNDER CONSTRUCTION

STOCKPILE

SEDIMENTATION POND

CONCRETE PROCESSING PLANT

ELECTRICITY BOX

PLANT NURSERY

SHADE HOUSES

METAL SHED

HEADWALL

EASEMENT TO WATER

WEIGH BRIDGE

PORTABLE OFFICE

METAL GARAGE

AWNING & CARPORT

BRICK & WEATHERBOARD COTTAGE

BENCH MARK
NAIL IN BITUMEN
RL 209.42 AHD

BENCH MARK
NAIL IN BITUMEN
RL 220.27 AHD

DP228308 1

DP228308 2

DP312327 2

DP548169 1

DP205016 2

DP205016 5

DP205016 6

DP205016 9

DP205016 10

DP732106 1

DP650423 3

DP542117 1

DP223323 1

DP555184 1

LEGEND

- BENCH MARK
- COMMUNICATIONS PIT
- DUST GAUGE
- GAS MARKER
- MANHOLE
- MONITORING WELL
- PIPE INVERT
- POWER POLE
- SIGN
- TREE
- WATER SERVICE
- EXISTING VEGETATION TO REMAIN
- PROTECTION ZONE
- PROPOSED EXTENT OF EXCAVATION
- PROPOSED SCREEN PLANTING

0 20 40 60 80 100 120
SCALE

North point

Issue	Rev.	Revision Description	Date
B		D.A. ISSUE - BUND REMOVED IN SELECTED AREAS	JULY 00
A		D.A. ISSUE	OCT 99

Landscape Architect

s.m.a.

SCOTT MURRAY & ASSOCIATES
Landscape Architecture
Golf Course Architecture
Environmental Planning
Urban Design
79 Zig Zag Lane, Crows Nest NSW 2065
Telephone 02 9439 9340 Facsimile 02 9439 9287
Email sma@tpg.com.au

Prepared by
NEXUS ENVIRONMENTAL PLANNING PTY LTD

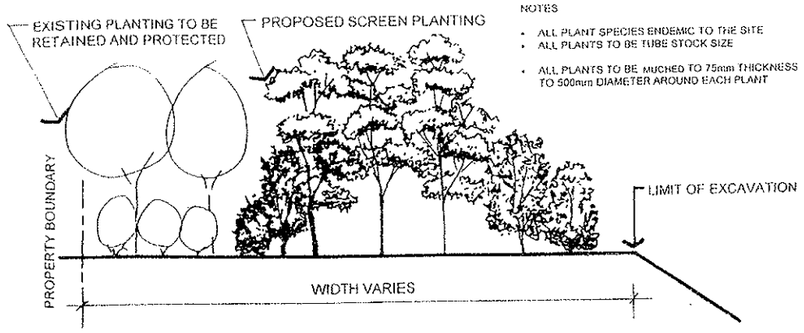
Project
LOT 1 + 2 DP 228308
LOT 2 DP 312327
MAROOTA

Title
INITIAL EARTH BUNDING & BOUNDARY PLANTING PLAN

Scale:		SMA Proj. No:		
Drawn	Checked	Coordinated	PM Approval	Director Verification
Date				

Job Number - Drawing Number: MP-01

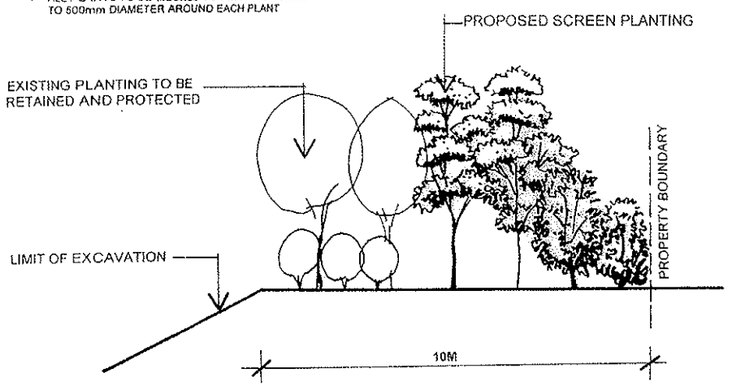
Issue: B



1 TYPICAL SCREEN PLANTING DETAIL WITHIN 10M SETBACK TO BOUNDARY NTS

NOTES:

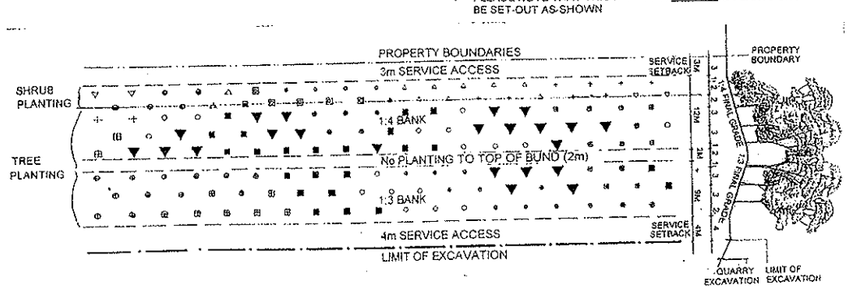
- ALL PLANT SPECIES ENDEMIC TO THE SITE
- ALL PLANTS TO BE TUBE STOCK SIZE
- ALL PLANTS TO BE MUCHED TO 75mm THICKNESS TO 500mm DIAMETER AROUND EACH PLANT



3 TYPICAL SCREEN PLANTING DETAIL WITHIN 30M SETBACK TO BOUNDARY NTS

NOTES:

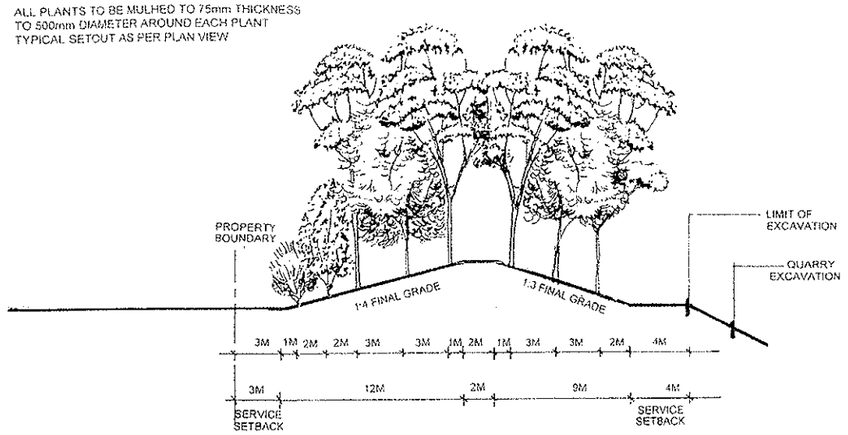
- TREES & SHRUBS TO BE PLANTED IN COPSES WITH A MINIMUM NUMBER OF 5 & A MAX OF 1 PER COPSE
- PLEASE NOTE THAT THIS MATRIX IS TYPICAL & PLANTS SHOULD BE SET-OUT AS-SHOWN



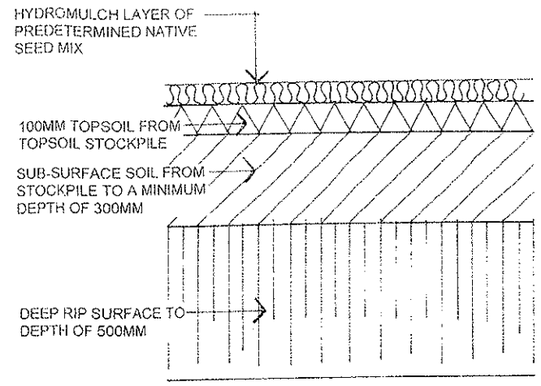
4 TYPICAL PLANTING SET-OUT TO BUNDS (Matrix) 1:500

NOTES:

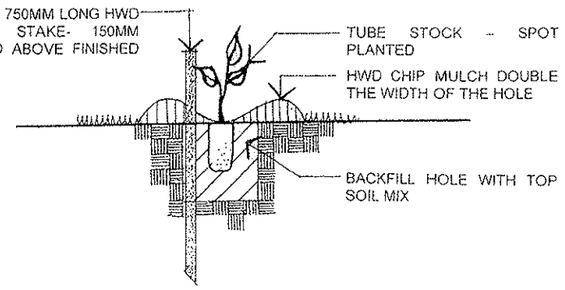
- ALL PLANT SPECIES ENDEMIC TO THE SITE
- ALL PLANTS TO BE TUBE STOCK SIZE
- ALL PLANTS TO BE MULHED TO 75mm THICKNESS TO 500mm DIAMETER AROUND EACH PLANT
- TYPICAL SETOUT AS PER PLAN VIEW



2 TYPICAL 30M WIDE BUND PLANTING DETAIL 1:200



5 TREATMENT OF FINAL EXCAVATED SURFACES 1:10



6 TYPICAL TUBE STOCK PLANTING DETAIL 1:10

GRASS SEED MIX

The grass seed component of the hydromulch mix shall, depending on the season, be made up of the following grasses: -

- **Autumn / Winter Mix**

Oats	15Kg/ha
Rye Grass	10Kg/ha
White Clover	5Kg/ha
Red Clover	5Kg/ha

- **Summer / Spring Mix**

Japanese Millet	20Kg/ha
Dobson Ryegrass	8Kg/ha
White Clover	3Kg/ha
Red Clover	3Kg/ha

Grass seed mixes for areas where a permanent grass cover is required shall also contain: -

- Rhodes Grass 5Kg/ha
- Hulled Couch 5 Kg/ha

PLANT SCHEDULE

TYPE: SANDSTONE-SHALE TRANSITION FOREST

BOTANICAL NAME	COMMON NAME	ULTIMATE HEIGHT
Trees		
Allocasuarina littoralis	Black She-Oak	10M
Angaphora costata	Smooth Barked Apple	15M
Angaphora floribunda	Rough Barked Apple	15M
Eucalyptus acmenoides	White Mahogany	18M
Eucalyptus agglomerata	Blue-leaved Stringybark	15M
Eucalyptus eugenioides	Thin leaved - Stringybark	15M
Eucalyptus gummifera	Red Bloodwood	10M
Eucalyptus notabilis	Blue Mountains Mahogany	15M
Eucalyptus punctata	Grey Gum	12M
Eucalyptus paniculata	Red Mahogany	18M
Syncarpia glomulifera	Turpentine	18M
Shrubs		
Acacia longifolia	Sydney Golden Wattle	5M
Acacia parramattensis	Parramatta Green wattle	5M
Banksia spinulosa	Short Leaved Banksia	1M
Kunzea ambigua	Thick Bush	2M
Leptospermum polygalifolium	Yellow Tea Tree	3M
Leptospermum trinerium	Cherry Ballart	3M
Hakea sericea	Bushy Needlebush	3M

North point

Issue	Rev.	Revision Description	Date
B		D.A. ISSUE - BUND REMOVED IN SELECTED AREAS	JULY 00
A		D.A. ISSUE	OCT 99

Landscape Architect

s.m.a.
SCOTT MURRAY & ASSOCIATES
Landscape Architecture
Golf Course Architecture
Environmental Planning
Urban Design
79 Zig Zag Lane, Crows Nest NSW 2065
Telephone 02 9439 9340 Facsimile 02 9439 9287
Email sma@tpg.com.au

Prepared by

NEXUS ENVIRONMENTAL PLANNING PTY LTD

Project

LOT 1 + 2 DP 228308
LOT 2 DP 312327
MAROOTA

Title

EARTH BUNDS & PLANTING DETAILS

Scale:		SMA Proj. No.		
Drawn	Checked	Coordinated	PM Approval	Director Verification
Date				

Job Number - Drawing Number: MP-02

Issue: B

INITIAL BOUNDARY SCREEN PLANTING (REFER PLAN MP-01 B)

10M SETBACK

10M SETBACK

A

DAM

PROGRESSIVELY REHABILITATED CELLS MASS PLANTED USING INDIGENOUS NATIVE SPECIES – REFER TO PROPOSED PLANT SCHEDULE (1A,1B,1C,1D)

DAM

FUTURE STAGE 2 EXTRACTION AREA

STAGE 1

OLD NORTHERN ROAD

DAM

ACTIVE EXTRACTION CELL (1F)

STOCK PILE & DRYING CELL (1E)

PROTECTION ZONE FOR ENDANGERED TREES

INITIAL BOUNDARY SCREEN PLANTING (REFER PLAN MP-01 B)

FUTURE EXTRACTION CELLS FOR STAGE 1 – (1G,1H,1I,1J,1K)

30m SETBACK

30m SETBACK

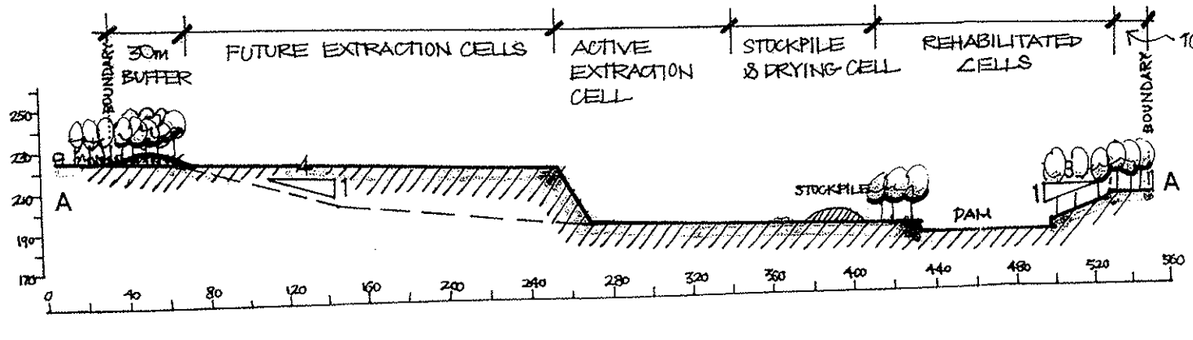
ROBERTS ROAD

INITIAL BOUNDARY SCREEN PLANTING AND EARTH BUND WALLS (REFER PLAN MP-01 B)

A

LEGEND

- REHABILITATED AREAS USING SELECTED NATIVE SEED
- STOCK PILE & DRYING CELL
- ACTIVE CELL
- PROTECTION ZONE FOR ENDANGERED SPECIES
- BOUNDARY SETBACK WITH MASS PLANTING USING TUBE STOCK INDIGENOUS NATIVE SPECIES
- CUT / EARTH BANK
- STOCKPILES
- STAGE 1 / STAGE 2 BOUNDARY



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SCALE

North point

Issue	Rev.	Revision Description	Date
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Landscape Architect

s.m.a.

SCOTT MURRAY & ASSOCIATES
Landscape Architecture
Golf Course Architecture
Environmental Planning
Urban Design
79 Zig Zag Lane, Crows Nest NSW 2065
Telephone 02 9439 9340 Facsimile 02 9439 9287
Email sma@tpg.com.au

Prepared by

NEXUS ENVIRONMENTAL PLANNING PTY LTD

Project

LOT 1 + 2 DP 228308
LOT 2 DP 312327
MAROOTA

Title

YEAR 3 PROGRESSIVE REHABILITATION PLAN & SECTION - STAGE 1 WORKS

Scale: | SMA Proj. No:

Drawn	Checked	Coordinated	PM Approval	Director Verification
Date				

Job Number - Drawing Number: MP-03

Issue: B

10M WIDE SETBACK –
TO BE PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 B)

10m WIDE SETBACK-
TO BE PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 B)

10M SETBACK

PROGRESSIVELY REHABILITATED CELLS MASS PLANTED USING INDIGENOUS NATIVE SPECIES – REFER TO PROPOSED PLANT SCHEDULE (2A)

STOCKPILE & DRYING CELL (2B)

ACTIVE EXTRACTION CELL (2C)

FUTURE EXTRACTION CELLS FOR STAGE 1 – (2D)

DAM

30m SETBACK

PROTECTIVE ZONE:
6 EXISTING ACACIA BYNOEANA TO BE PROTECTED AND RETAINED

INITIAL BOUNDARY SCREEN PLANTING
(REFER PLAN MP-01 B)

OFFICE / ACCESS

ROBERTS ROAD

30M WIDE SETBACK –
WITH 3M HT EARTH BUND WALL
MASS PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 2, MP-02 A)

30m SETBACK

30m SETBACK

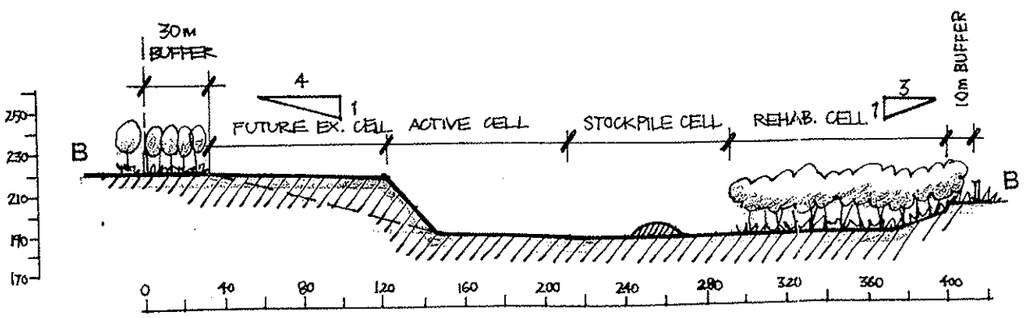
OLD NORTHERN ROAD

INITIAL BOUNDARY SCREEN PLANTING AND EARTH BUND WALLS
(REFER PLAN MP-01 B)

REHABILITATED STAGE 1

LEGEND

- REHABILITATED AREAS USING SELECTED NATIVE SEED
- STOCK PILE & DRYING CELL
- ACTIVE CELL
- PROTECTION ZONE FOR ENDANGERED SPECIES
- BOUNDARY SETBACK WITH MASS PLANTING USING TUBE STOCK INDIGENOUS NATIVE SPECIES
- CUT / EARTH BANK
- STOCKPILES
- STAGE 1 / STAGE 2 BOUNDARY



0 20 40 60 80 100 120
SCALE

North point

Issue	Rev.	Revision Description	Date
B		D.A. ISSUE - BUND REMOVED IN SELECTED AREAS	JULY 00
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Landscape Architect

s.m.a.
SCOTT MURRAY & ASSOCIATES
Landscape Architecture
Golf Course Architecture
Environmental Planning
Urban Design
79 Zig Zag Lane, Crows Nest NSW 2065
Telephone 02 9439 9340 Facsimile 02 9439 9287
Email sma@tpg.com.au

Prepared by:
NEXUS ENVIRONMENTAL PLANNING PTY LTD

Project
LOT 1 + 2 DP 228308
LOT 2 DP 312327
MAROOTA

Title
YEAR 8 PROGRESSIVE REHABILITATION PLAN & SECTION - STAGE 2 WORKS

Scale:		SMA Proj. No.		
Drawn	Checked	Coordinated	PM Approval	Director Verification
Date				

Job Number - Drawing Number: MP-04
Issue: B

10m WIDE SETBACK
MASS PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 1, MP-02 B)

NATIVE SCREEN PLANTING

EXISTING NURSERY AND SHADE HOUSES TO BE RETAINED

FACILITIES TO BE USED FOR PLANT PROPAGATION FOR USE IN SCREENING

PROPERTY BOUNDARY

100' SETBACK LINE

1:3 GRADE PLANTED BANK

DAM

REHABILITATED SITE

1:4 GRADE PLANTED BANK

OLD TELEGRAPH ROAD

BENCH MARK
NAIL IN BITUMEN
RL 209.42 AHD

EXISTING VEGETATION TO BE RETAINED AND PROTECTED

EXISTING BUNDING TO BE RETAINED

PROTECTIVE ZONE:
6 EXISTING ACACIA BYNOEANA TO BE PROTECTED AND RETAINED

ROBERTS ROAD

ACCESS ROAD

EXISTING VEGETATION TO BE RETAINED AND PROTECTED

INITIAL BOUNDARY SCREEN PLANTING
(REFER PLAN MP-01 B)

EXISTING DAM TO BE DEMOLISHED & REPLACED WITH NATIVE SCREEN PLANTING

30M WIDE SETBACK –
WITH 3M HT EARTH BUND WALL
MASS PLANTED WITH SELECTED
INDIGENOUS NATIVE PLANTS
(REFER DETAIL 2, MP-02 B)

EXISTING DWELLING TO BE DEMOLISHED & REPLACED WITH NATIVE SCREEN PLANTING

EXISTING SIGN TO REMAIN

EXISTING DWELLING TO BE DEMOLISHED & REPLACED WITH NATIVE SCREEN PLANTING

NORTHERN ROAD

BENCH MARK
NAIL IN BITUMEN
RL 220.27 AHD

DP228308
2 EXISTING VEGETATION TO BE RETAINED AND PROTECTED

DP570986 1

DP206018 10, 9, 8, 2

DP546169 1

DP650423 3

DP642117 1

DP223323 1

DP555184 1

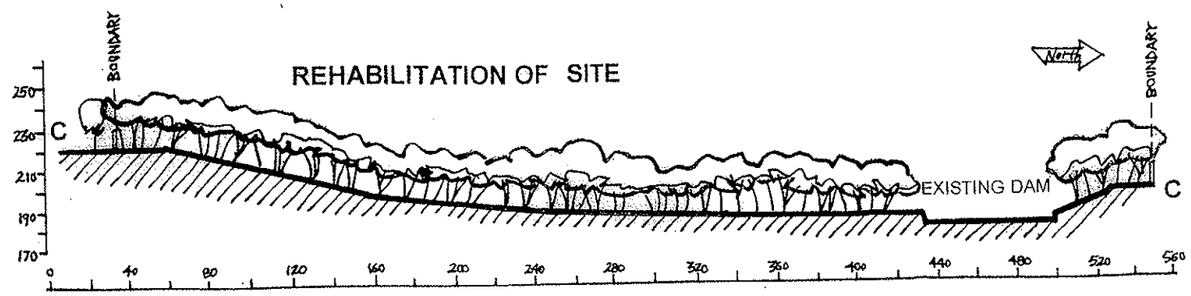
DPT32706 1

DP356946 PT A

LEGEND

- REHABILITATED AREAS USING SELECTED NATIVE SEED
- PROTECTION ZONE FOR ENDANGERED SPECIES
- CUT / EARTH BANK
- PROPOSED EXTENT OF EXCAVATION

REHABILITATION OF SITE



0 20 40 60 80 100 120
SCALE

North point

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Landscape Architect

s.m.a.
SCOTT MURRAY & ASSOCIATES
Landscape Architecture
Golf Course Architecture
Environmental Planning
Urban Design
79 Zig Zag Lane, Crows Nest NSW 2065
Telephone 02 9439 9340 Facsimile 02 9439 9287
Email sma@tpg.com.au

Prepared by
NEXUS ENVIRONMENTAL PLANNING PTY LTD

Project
LOT 1 + 2 DP 228308
LOT 2 DP 312327
MAROOTA

Title
FINAL LANDFORM / REHABILITATION PLAN

Scale:		SMA Proj. No:		
Drawn / Date	Checked	Coordinated	PM Approval	Director Verification

Job Number - Drawing Number: MP-05

Issue: B