VOLUME 1

ENVIRONMENTAL ASSESSMENT

SECTION 75W MODIFICATION (2)

DA 267-11-99

HODGSON QUARRIES AND PLANT PTY LTD

ROBERTS ROAD

MAROOTA

NEXUS
Environmental Planning Pty Ltd

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DA 267-11-99

HODGSON QUARRIES AND PLANT PTY LTD

ROBERTS ROAD

MAROOTA

23 September 2015

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B3075

STATEMENT OF VALIDITY

Submission of Environmental Assessment

Prepared under Section 75W of the Environmental Planning and Assessment Act 1979

Environmental Assessment prepared by

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Address:	PO Box 212 **CONCORD NSW 2137**
In respect of:	Section 75W Modification No.2 of Development Consent No.267-11-99

Applicant and Land Details

Applicant name:	Hodgson Quarries and Plant Pty Ltd
Applicant address:	PO Box 1778 **GOSFORD NSW 2250**
Land to be developed:	Lots 1 & 2, DP 228308 and Lot 2, DP 312327 Roberts Road MAROOTA NSW 2756

Environmental Assessment: An Environmental Assessment is attached

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Statement of Validity: I certify that I have prepared the contents of this Environmental Assessment in accordance with the 29 May 2014 Secretary's Requirements and that, to the best of my knowledge, the information contained in the Environmental Assessment is neither false nor misleading.

Signature: 

Name: Neil Kennan

Date: 23 September 2015

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EXECUTIVE SUMMARY

INTRODUCTION

Hodgson Quarries and Plant operates an extractive industry at Roberts Road, Maroota pursuant to Development Consent 267-11-99 (**the Consent**) issued by the then Minister for Urban Affairs and Planning.

It is proposed to modify the Consent to both regularise the existing extraction operation and to extend the life of the approved extraction.

This Environmental Assessment has been prepared on behalf of Hodgson Quarries and Plant pursuant to Section 75W of the Environmental Planning and Assessment Act 1979.

The objectives of the proposed modification are:

(a) To provide graded sand and gravel products suitable for use in the construction industry and specialty markets.

(b) To realise the economic potential and maximise the efficient recovery of natural resources on the Site.

(c) To successfully rehabilitate the extracted areas of the Site into an integrated, continuous agricultural landform plus an area of re-established native vegetation.

THE SITE

The land to which the Consent relates (**the Site**) is:

Lots 1 & 2, DP 228308 and Lot 2, DP 312327
Roberts Road
MAROOTA

The Site is located on the northern side of Old Northern Road, at the intersection of Old Northern Road with Roberts Road. A small part of Lot 2, DP 228308, however, is located on the southern side of Old Northern Road, however, that part of Lot 2, DP 228308 was never part of the proposed extraction and, for the purposes of preparation of information below, that section of Lot 2, DP 228308 has been discounted.

Access to the Site is via Roberts Road.

The land is within The Hills Shire Council local government area and is zoned RU1 Primary Production pursuant to The Hills Local Environmental Plan 2012.

DEVELOPMENT CONSENT No.267-11-09

The Minister for Urban Affairs and Planning, by Notice of Determination dated 31 May 2000, granted consent to DA 267-11-99 subject to conditions.

A Notice of Modification (1) dated 29 November 2000 was issued by the then Minister for Urban Affairs and Planning.

A Notice of Modification (3) dated 18 August 2015 was issued by the Minister for Planning.

The Consent, as modified, permits:

(a) development for the purposes of an extractive industry on the Site, in accordance with details contained in the Environmental Impact Statement (**EIS**) prepared by Nexus Environmental Planning Pty Ltd, dated 1999 as submitted with the development application;

(b) extraction in accordance with an extraction plan prepared by Woodward Clyde which details both the sequence and depth of extraction, and

(c) extraction in accordance with the modified method of extraction as detailed in the documents prepared by Dick Benbow & Associates which were submitted with the s.96(2) modification application.

(d) continuation of extraction on the Site until 31 May 2016 to a depth of RL 186.08m AHD.

THE PROPOSED MODIFICATION

Hodgson Quarries and Plant seeks the approval of the Minister for Planning to modify the Consent as follows.

Dam Construction

Part of the Consent was for the continued construction of a water supply dam on the Site, that dam being required to provide sufficient water to maintain the life of the approved extraction.

The approved dam was to be constructed in two (2) stages, details of which were described in the EIS which accompanied the application for extraction.

During the construction of the approved dam, the applicant has determined that the construction process would be better served if the dam were to be constructed in three (3) stages rather than the approved two (2) stages. It is proposed to amend the consent to modify the dam construction process accordingly. No change is proposed to the dimensions of the approved dam.

Sequence of Extraction

There is an approved sequence of extraction of the Site as shown in **Figure 1.6**.

During the extraction process, it has been determined that the approved method of extraction using the cells shown in **Figure 1.6** is neither an economic nor practical way to achieve that extraction.

The existing extraction process on the Site involves a similar cell by cell extraction process to that which is approved but one which is not as rigidly defined as that portrayed in **Figure 1.6**.

It is proposed to modify the approved sequence of extraction to reflect that which is now being undertaken on the Site such that the most efficient means of extracting the material on the Site is achieved.

Extraction Process

The approved extraction was to be undertaken in accordance with the method of extraction described in the abovementioned s.96(2) modification to the Consent where a *"Pumping Unit"* method of extraction was to be employed.

Since commencement of the extraction, it has been determined that the approved *"Pumping Unit"* method of extraction is not a practical means by which the resource can be extracted.

While the general concept of the *"Pumping Unit"* method of extraction remains, there have been modifications made to that method as follows:

1. The approved method of extraction is as follows:

   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.

   While the above is generally the case, there are instances where sandstone is encountered which is not able to be extracted using an excavator alone. In such circumstances, the sandstone material is ripped using a dozer and then removed using the excavator.

2. The approved method of extraction states:

   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.

   The introduction of extracted sand into the mixing tank is being undertaken, however, the approved process assumes that the mixing tank is mobile and can easily move around the active extraction cell with the excavator. This is physically not easily achieved. What actually occurs is that the mixing tank is located close to the processing plant and is

located there on a semi-permanent basis. The material won from the individual extraction cell is then loaded by the excavator to a dump truck which transports that material to a stockpile adjacent to the mixing tank. From there, a front end loader transfers the sand to the mixing tank.

It is proposed to modify the Consent to regularise the existing method of extraction.

Approved Volume of Material to be Extracted and Life of the Consent

The EIS relating to the Consent provided details of the sequence of extraction, the volume of material to be extracted from each cell, and the time for that extraction to be completed, those data having been provided by Woodward Clyde as part of the mine plan prepared for the approved extraction.

It has become apparent that the volume calculations undertaken by Woodward Clyde are flawed in that they do not provide accurate volumes of the material present on the Site.

To establish a more accurate figure of the volume of material contained on the Site, VGT Environmental Compliance Solutions (**VGT**) has undertaken detailed volume calculations utilising survey data obtained in December 2013. Using a computer generated model of the Site, VGT has determined that there is 4,607,822m^3 of material on the Site compared to the 2,144,000m^3 calculated by Woodward Clyde.

Advice from the applicant is that a conservative estimate of 2 tonnes per m^3 should be applied to determine the tonnage of material on the Site. Applying that conversion rate, there is 9,215,644 tonnes of material on the Site. The applicant has advised that a figure of 60% sand to 40% clay/gravel is generally obtained. As such, 5,529,386 tonnes of the volume calculated by VGT would be sand product.

The applicant has advised that approximately 1,000,000 tonnes of sand has been exported from the Site during the life of the extraction to date which means that approximately 4.5 million tonnes of sand product remains to be extracted.

In light of the above, the applicant seeks a modification to the life of the extraction from 31 May 2016 to 31 May 2025.

IMPACT OF THE PROPOSED MODIFICATION

Groundwater

By Notice of Determination dated 18 August 2015, consent was granted to Modification (3) of the Consent to, among other things, modify condition 9 to read:

> 9. *The duration of extraction under this Consent is until 31 May 2016. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

Condition 17 of the original consent stated:

17. Baulkham Hills Shire Council Development Control Plan for Extractive Industries (DCP 500) requires that the depth of extraction incorporate a 2m freeboard above the wet weather high groundwater level. To meet the objectives of this policy, the Applicant shall ensure that the depth of extraction is consistent with the depth as shown in the extraction plan in the EIS and follow the procedures in Condition 40 if groundwater is encountered during extraction.

As part of the assessment process of Modification (3), the NSW Office of Water made comment as follows:

The Office of Water has reviewed the information provided it and it requests that the Department of Planning and Environment notes the following:

- *That the highest water level measured beneath the site is at least 1 m above that which has been reported in the current documentation (i.e. at 184.08 m AHD, not 183.10 m AHD).*

- *That any excavation approved for the one year period requested must maintain additional freeboard accordingly (i.e. no excavation deeper than 186.08 m AHD).*

As a consequence of the above comments from the NSW Office of Water, the Consent was modified such that Condition 17 now reads:

The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.

The proposed modification does not seek to either alter the dimensions of the approved dam or increase the lateral extent of the approved extraction.

Acoustic Impact

The quarry will develop further to the west and north for modified Stages 1-5 over a period of approximately 8 years, at which time the processing plant would be relocated to allow for the extraction of modified Stage 6 to include a cell near the northern boundary and the material beneath where the existing processing plant is located. The lateral extent of the extraction will not exceed that of the approved development.

Operations also require further excavation and the emplacement of material to create the final landform. This would occur intermittently on a campaign basis, typically 2 weeks at a time, possibly once or twice per year, such that equipment / staff not needed to meet the supply of raw material would be utilised to haul material to the emplacement areas and an excavator would be used to form the final landform. It is possible that some sandstone will need to be ripped in this area at RL195 and below. Noise levels from this activity are not considered to be any higher than that experienced to date.

The modified extraction process requires an excavator and truck at surface level to remove the top soil and overburden which is initially formed into perimeter bunds and remaining material is stockpiled. From this point onwards, the excavator works occur from below the surface and

is able to pull material down from above.

The excavator and truck are, therefore, only at surface level for a small proportion of time (less than 10%) and most of this time it is operating behind a 5 metre bundwall relative to the nearest boundary.

In relation to hauling product off site between 6:00am and 6:00pm, it is considered that the typical "worst case" operating scenario would be when 3 truck movements overlap in the same 15-minute period. This assumption incorporates 2 trucks arriving and 1 truck subsequently leaving the Site. The selection of 3 truck movements is based on operational constraints as this is the maximum which can be loaded.

During typical operations, the predicted noise levels comply with the $L_{Aeq,15min}$ noise condition of 43dBA at all receivers, however, when dozers are required to operate in some areas, and the excavation of top soil occurs at the beginning of each new cell, noise levels are predicted to exceed the criterion at some receivers.

Exceedance for surface extraction works are up to 1dBA, typically for a total of 2-3 weeks during sandstone ripping within cells where rock is above approximately RL 200.

Exceedance for dozer ripping works are up to 10dBA at Receiver D, 2dBA at receiver B and 1dBA at receiver H, typically for 3-4 weeks during the initial top soil and overburden extraction of each cell.

Exceedance during these periods for emplacement works are up to 5dBA at Receiver A, 4dBA at Receiver G, 2dBA at receiver B and 1dBA at receiver H, typically 3 weeks per year on average.

Since the plant on site is considered to be modern and well maintained, there are no feasible or reasonable mitigation measures which can be applied to further reduce noise levels.

In addition to the exceedance above, there are also periods of a few days when perimeter bunding is required to be built and will require an excavator to be located at the surface without any shielding by a bund for a few days at a time. Predicted noise levels from this activity at these times are up to 57dBA at Location D, 48dBA at Location C and 40dBA at Location F. At other locations, the contribution is less than 30dBA.

At three of the receivers (C, D and F), noise levels are expected to increase compared with current levels over the remainder of the project as operations move closer. Two of these receivers (D and F) are located within 30m of Old Northern Road and L_{Aeq} noise levels from traffic are expected to be over 55dBA and, therefore, more than 10dBA higher than typical L_{Aeq} noise levels from the Site and similar or higher than noise levels in the short periods with an excavator at the surface.

Negligible impact is, therefore, expected at these two receivers. These receivers are also located closer to other sand extraction activities on the other side of Old Northern Road.

Location C is set further back from Old Northern Road so ambient noise levels are lower, but still

similar or higher than the predicted noise levels from the quarry of up to 44dBA during normal activities and 48dBA whilst the northern bund is being built.

The existing consent allowing the loading of trucks between 6:00am to 7:00am is not proposed to change, so no change in impact compared to the existing situation is expected. The potentially worst affected residence is Receiver B, closest to the site entrance on Roberts Road.

It is recommended that a short section of 4m bund is constructed from the weighbridge to join with the existing bund adjacent to Roberts Road.

The predicted noise level from this activity is 37dBA which meets the amenity criterion of 40dBA.

Traffic Impact

The EIS which accompanied the original application dealt with the impact of the then proposed development on the operation of the intersection of Roberts Road with Old Northern Road.

With regard to increased truck traffic in the main road system, the EIS stated:

> *The increase in heavy truck traffic generated by this development is estimated to be 30 truck movements per day (Monday to Friday) in Wisemans Ferry Road west of Old Northern Road and 20 truck movements per day in Old Northern Road south of Roberts Road. These increases amount to 14.25 per cent and 9.37 percent respectively.*
>
> *These increases are relatively small and will not reduce the Level of Service at either the intersection of Roberts Road with Old Northern Road or in Wisemans Ferry Road and Old Northern Road.*

Resulting from the above, condition 49 of the Consent relates to truck movements and states:

> *49. The applicant shall ensure that truck movements associated with the development do not exceed 100 movements per day (50 laden truck movements) or 20 (10 laden truck movements) movements per hour, during construction or operation.*

No modification to condition 49 is proposed as part of this modification application.

Notwithstanding, Lyle Marshall & Associates Pty Ltd has prepared a report (**the Marshall Report**) relating to the impact the existing approved development would have on the existing road network and, in particular, the intersection of Roberts Road with Old Northern Road, a copy of which is at **Appendix 13**. The Marshall Report concludes that the proposed modification to the extraction would have no additional impact on the local road network or the operation of the intersection of Roberts Road with Old Northern Road.

Air Quality

The EIS submitted with the original development application contained a detailed assessment of the then existing air quality together with details of the air quality impacts of the then extraction

activity on the Site.

To determine the impact the development as proposed to be modified would have on the air quality of the locality, Wilkinson Murray Pty Limited has prepared an Air Quality Assessment, a copy of which is at **Appendix 14**.

The air quality goals for the relevant particulate matter pollutants relate to the total pollutant burden in the air and not just the pollutant from the project. As such, consideration of background pollutant levels is required when using these goals to assess potential impacts.

The locality is predominantly agricultural and mining land, although areas to the east of the Site and the National Park are well vegetated. Sources of particulate matter in the area would include traffic on unsealed roads, mining activities, local building and construction activities, animal grazing activities and to a lesser extent traffic on roads.

As part of the extraction, there are various excavation and processing activities proposed to occur on-site for the continued operation. These would include:

- an excavator and truck at surface level to remove the topsoil and overburden;
- an excavator pulling material down from above or a dozer to rip sandstone, and excavator loading dump trucks;
- transportation of product using a dump truck to the processing feed area;
- front end loader managing a few stockpiles to blend the different grades of sand as required before tipping into the power screen, and
- transportation of sand off site.

The total amount of dust generated from the continued sand extraction would not be greater than the levels generated during past operations of the facility.

Having reviewed the potentially closest residential receivers to the proposed extraction areas, the predominate winds and the PM_{10} and dust deposition levels monitored from the Site from past operations, it would appear that dust from the continuation of sand extraction is unlikely to impact on the closest residential receivers as long as the dust mitigation methods in the existing air quality management plan continue.

Heritage

It is unlikely that heritage items or archaeological sites would be encountered should the modification be approved. Notwithstanding, Condition 56 would ensure that appropriate measures are employed to ensure the integrity of any such items of heritage or archaeological sites.

Rehabilitation

The EIS which accompanied the original development application contained an Environmental Management & Rehabilitation Plan (**EMRP**) for the Site which was based on the approved extraction sequence and the approved final landform plan.

Condition 57 of the Consent deals with rehabilitation of the Site and states:

> *57. The Applicant shall prepare a Plan for the staged rehabilitation of the site as part of the EMP. The Rehabilitation Plan shall:*
>
> *(a) outline procedures for the implementation of rehabilitation measures within an acceptable timeframe;*
>
> *(b) document the source of material for rehabilitation and methods to ensure that no contaminated of otherwise unsuitable material is brought onto the site;*
>
> *(c) detail the preferred option for the final landform and implementation of this landform.*
>
> *(d) detail proposals for the integration of the visual bund walls into the final landform of the site; and*
>
> *(e) provide evidence of consultation with Council in the design of the final landform for the site.*

The proposed modification seeks to modify the approved sequence and method of extraction. A consequence of the proposed modification is a modified final landform for the Site. A reduced copy of the modified final landform plan is at **Appendix 17**.

Due to the proposed modification, there is also a need to modify the approved Rehabilitation Plan for the Site. A revised Rehabilitation Plan has been prepared by Conzept Landscape Architects as part of the proposed modification, a copy of which is at **Appendix 11**.

The modified Rehabilitation Plan is discussed in detail in **Part 2.9** of the EA. The conclusions are:

> *It is proposed that if the methods outlined in the report and plans are followed, then:*
>
> - *The nominated extraction areas can be successfully rehabilitated, re-establishing an extensive endemic vegetation cover.*
> - *That vegetated bunds may be utilized to minimise the visual impact of the extraction works.*
> - *The proposed rehabilitation process can be staged in an effective manner so as to progressively rehabilitate areas of the site where extraction has been*

completed, final levels achieved, and all activity has ceased.

- *Appropriate standards will be set for the on-going monitoring of the rehabilitation process and maintenance works to ensure the successful establishment of rehabilitated areas on site, resulting in a sustainable, endemic landscape in character with the original Shale-Sandstone Transitional Forest vegetation Community.*

Soil and Water Management

A Soil and Water Management Plan (**SWMP**) was developed by Morse McVey and Associates Pty Ltd for the site in 1999 and was submitted with the original EIS. Notwithstanding, a revised SWMP has been prepared for the modified development, a copy of which is at **Appendix 19**. The executive summary of the revised SWMP states:

> *The water management of the site has been developed to comply with Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries. Sediment basins are designed for a 95th percentile, 5 day rainfall event whilst catch drains and diversions are designed for a 10 year Average Recurrence Interval.*
>
> *Clean water is currently diverted around the disturbed area via diversion bunds where possible and the natural topography assists. A portion of clean water from the undisturbed areas and properties adjacent to the quarry on Roberts Road does enter the main quarry area. Dirty water is collected in the disturbed areas into one of several dams to allow for settling to occur.*
>
> *Retained water is reused on site for dust suppression and material processing. For this reason water is generally retained as far as possible on site. No water is released off-site.*
>
> *If required Dams will only be discharged when quality limits are met. The proponent will undertake a regular monitoring and maintenance program to ensure water management goals are met.*

CONCLUSION

This Environmental Assessment has concluded that, with the proposed modification to Development Consent No.267-11-99, there would be no impact to the environment of the Site and its environs over and above that which was identified in the assessment of Development Application No.267-11-99.

The proposed modification, with commitments in place as described in **Part 4**, would ensure that a valuable resource is utilised to its economic capacity and ensure that the Site would be rehabilitated to be consistent with the agricultural landscape of the area.

Part One
INTRODUCTION

1.1 Introduction

Hodgson Quarries and Plant operates an extractive industry at Roberts Road, Maroota pursuant to Development Consent 267-11-99 (**the Consent**) issued by the then Minister for Urban Affairs and Planning.

It is proposed to modify the Consent to both regularise the existing extraction operation and to extend the life of the approved extraction.

1.2 The Site

The land to which the Consent relates (**the Site**) is:

Lots 1 & 2, DP 228308 and Lot 2, DP 312327
Roberts Road
MAROOTA

The Site is located on the northern side of Old Northern Road, at the intersection of Old Northern Road with Roberts Road. A small part of Lot 2, DP 228308, however, is located on the southern side of Old Northern Road, however, that part of Lot 2, DP 228308 was never part of the proposed extraction and, for the purposes of preparation of information below, that section of Lot 2, DP 228308 has been discounted.

Access to the Site is via Roberts Road.

The land is within The Hills Shire Council local government area and is zoned RU1 Primary Production pursuant to The Hills Local Environmental Plan 2012.

The land has been extensively disturbed by the extraction of sand, clay and pebble materials.

The Site is owned by:

- Dr Leonard Stanley Martin.

Figure 1.1 shows the Site location. **Figure 1.2** shows the Site in more detail. **Figure 1.3** is a plan showing the cadastral details of the Site and surrounding land and **Figure 1.4** is an aerial photograph of the Site.

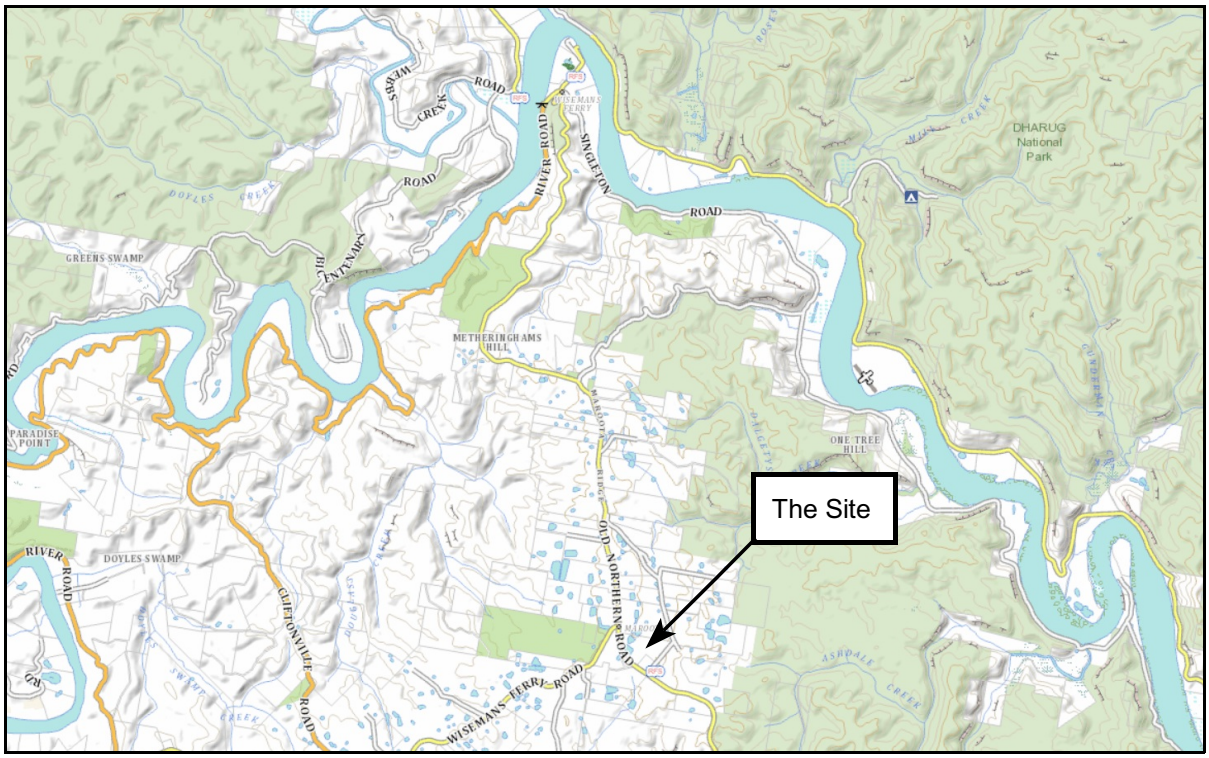

Figure 1.1: Regional Location of the Site. (© NSW Department of Lands 2014)

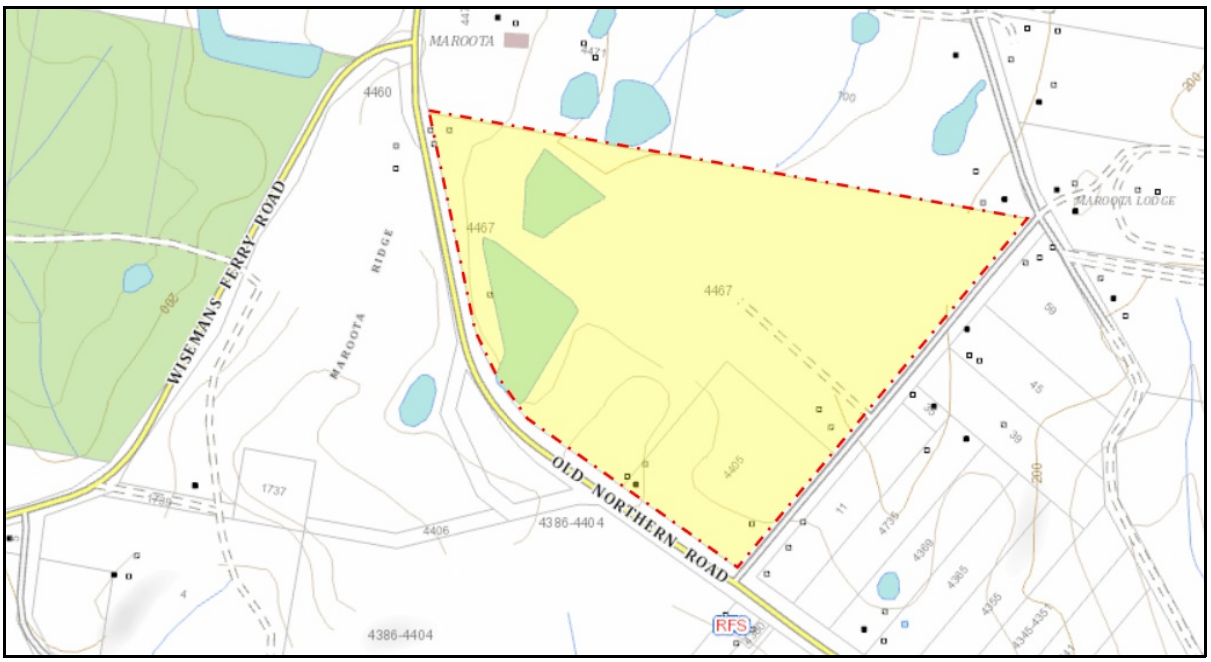

Figure 1.2: Site location highlighted in yellow. (© NSW Department of Lands 2014)

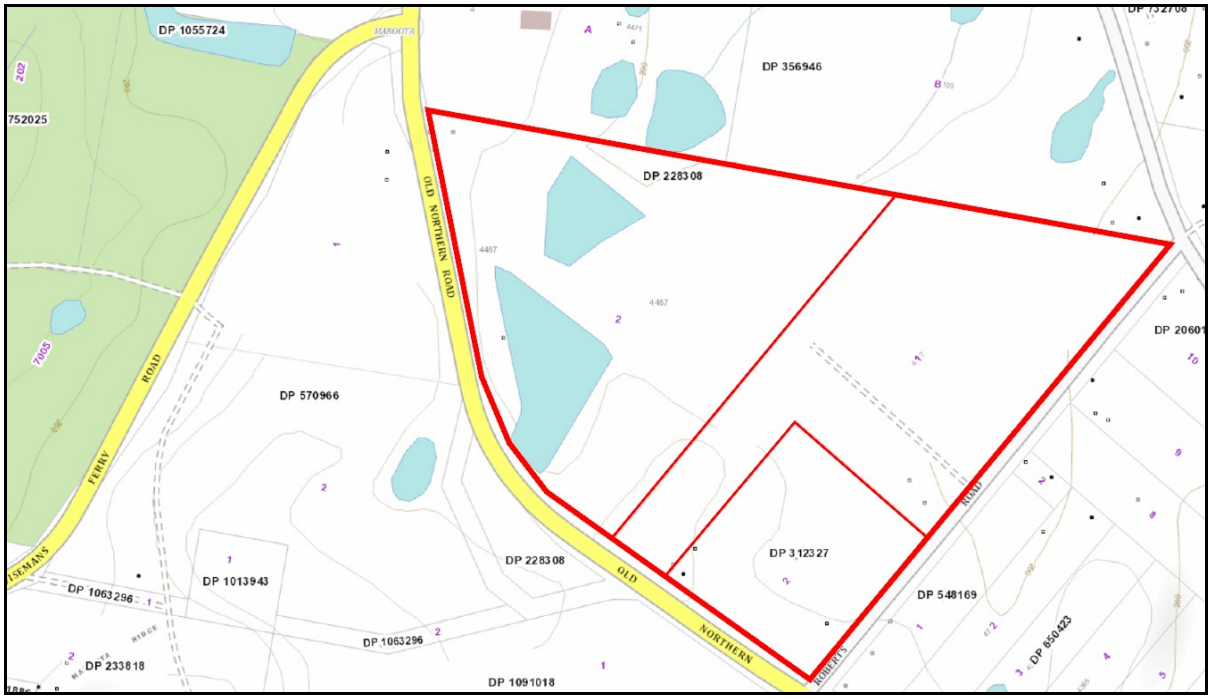

Figure 1.3: Cadastral details of the Site and surrounding land. (© NSW Department of Lands 2014)

Figure 1.4: Aerial photograph showing the boundary of the Site.

1.3 History of the Site

Prior to extraction, the Site had been used for agriculture and, in particular, as an orchard and plant nursery. The north western corner of the Site remains in use as a plant nursery.

The initial *"extraction activity"* on the Site related to the construction of a dam which was located on the northern boundary of the Site. The construction of the dam commenced in or around 1970.

The construction of the dam was dependent on the winning of clay material from the Site to provide for a comprehensive seal of that dam. The material available on the Site is a mix of clay materials suitable for the dam construction and sand which is important in the Sydney construction market.

The clay material on the Site was separated from the sand by washing the raw product which resulted in a significant amount of sand as a by-product of the winning of the clay material for the dam construction. The by-product sand material was exported from the Site to the Sydney construction market.

Notwithstanding the construction of the dam on the Site, the then Baulkham Hills Shire Council (**the Council**) commenced Class 4 proceedings in the Land and Environment Court which was based on the opinion of the Council that the construction of the dam was unlawful in that is was an unapproved extractive industry.

The Land and Environment Court, by Orders dated 29 May 1991, permitted the continuation of the construction of the dam. Order No.3(g) of the Court Orders stated:

> *(g) The construction of the dam and rehabilitation of the surrounding area is to be completed within ten (10) years. The respondent may apply to the Council for an extension of the period of time specified setting out reasons and the applicant Council shall give such application due and proper consideration.*

Having regard to the above Order No.3(g), the construction of the dam and the rehabilitation of the surrounding area was required to be completed by 29 May 2001, unless an extension of that period was granted.

It was always intended that the construction of the dam would cease on the granting of consent for the extraction of the remaining sections of the Site not covered by the Court Orders. In this regard, a Development Application (No.90/108) and an accompanying Environmental Impact Statement (**EIS**) were lodged with the Council for an extractive industry covering that part of the Site where sand and clay materials were to be extracted for the construction of the dam.

The Executive Summary to the EIS which accompanied Development Application No.90/108 states:

> *The landholders, Dr Martin and the Warrah School Society now require to extract the Maroota Sand deposit within an approximately rectangular area of about 16 ha. This area comprises the easternmost two thirds of the subject lands. Although there is in excess of 2 million cubic metres of commercial sand on the total site this application, which is partly aimed at regularising past operations addresses only the first stage of extraction. In this stage a total volume of about 300,000 m^3 of Maroota sand will be removed, processed into construction sand and aggregate and transported from the site over a 5 year period.*

By Notice of Determination dated 7 November 1990, the Council consented to Development Application No.90/108 for the operation of an extractive industry on the Site, subject to a number of conditions.

It had been the intention to extract sand in accordance with the abovementioned approval such that sufficient funds could be generated to prepare a second EIS and Development Application which would seek the approval of the Council for the extraction of the remaining sand resource on the Site. The commencement of the approved extraction operation was, however, dependant upon the completion of the water supply dam the subject of the Court Orders. The water supply was required in order to sustain sufficient water supply on the Site to wash the clay from the material won from the approved extractive operation.

In the years which followed, a number of events occurred which led the Council to conclude, rightly or wrongly, that Consent No.90/108 had not been commenced and, as such, the consent had lapsed. This was essentially due to the fact that the dam construction had not been fully completed to allow extraction to occur.

Following protracted discussions with the Council as to whether the consent had or had not lapsed, Dr Martin, the landowner, indicated to the Council that he would not, at that point in time, pursue that Consent further pending approval of a further Development Application for extraction of sand from the entire Site.

On 22 November 1999, an application for extraction of sand from the Site was submitted to the then NSW Department of Urban Affairs and Planning pursuant to the then State Significant Development provisions of the Environmental Planning and Assessment Act 1979. The application was DA 267-11-99. The EIS which accompanied that application stated:

> *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 .....*
>
> *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.*

Extracts from *"Figure 12: Proposed Water Dam Layout*, *Figure 15:Cell 1A Extraction"* and *"Figure 21: Final landform Contours"* of the EIS which accompanied DA 267-11-99 are **Figure 1.5, 1.6 & 1.7** below. **Figure 1.5** shows the location of Stage 1 and Stage 2 of the then proposed extraction.

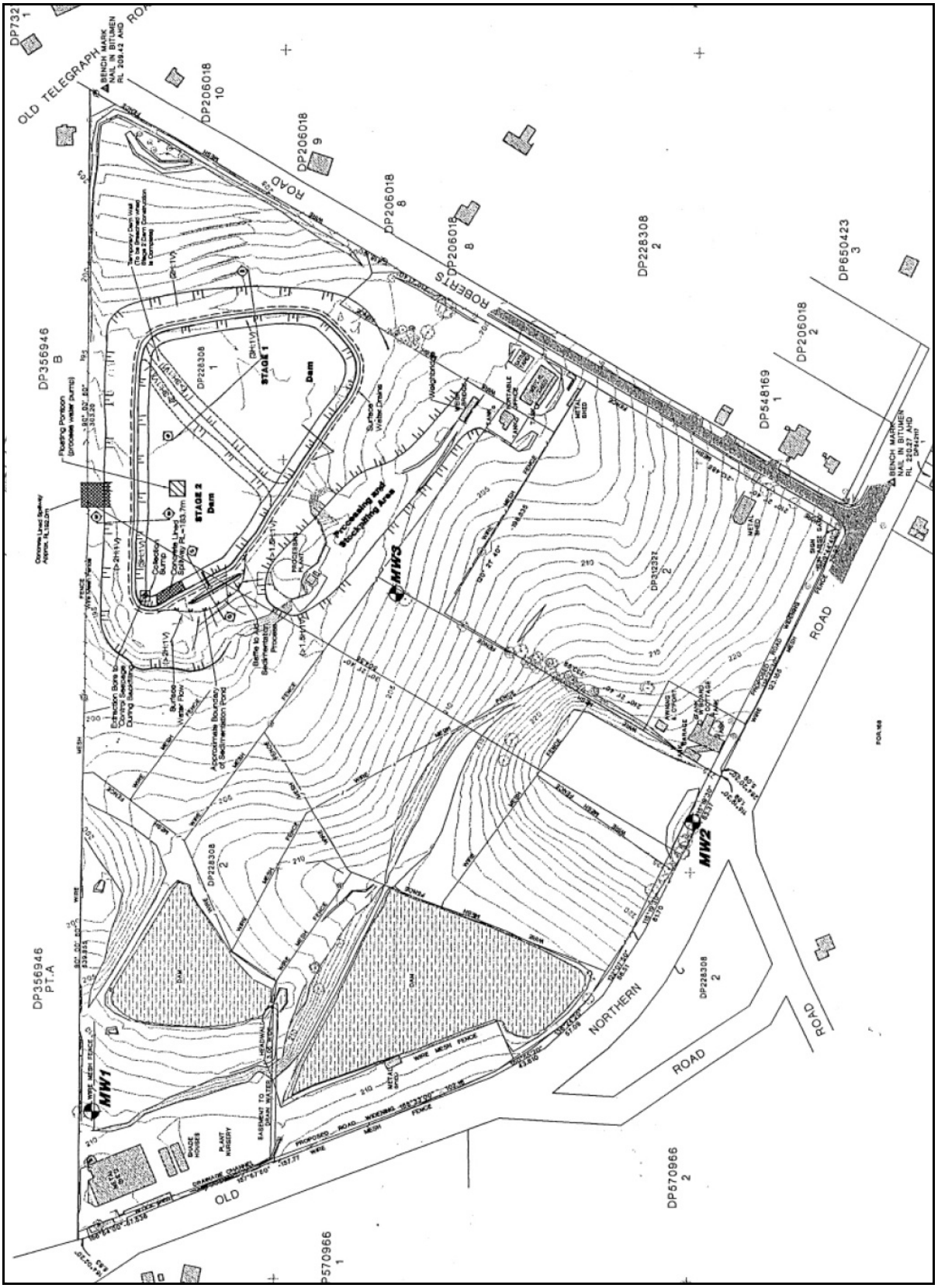

Figure 1.5: Extract from Figure 12 of the EIS which accompanied DA 267-11-99 showing the then proposed dam layout.

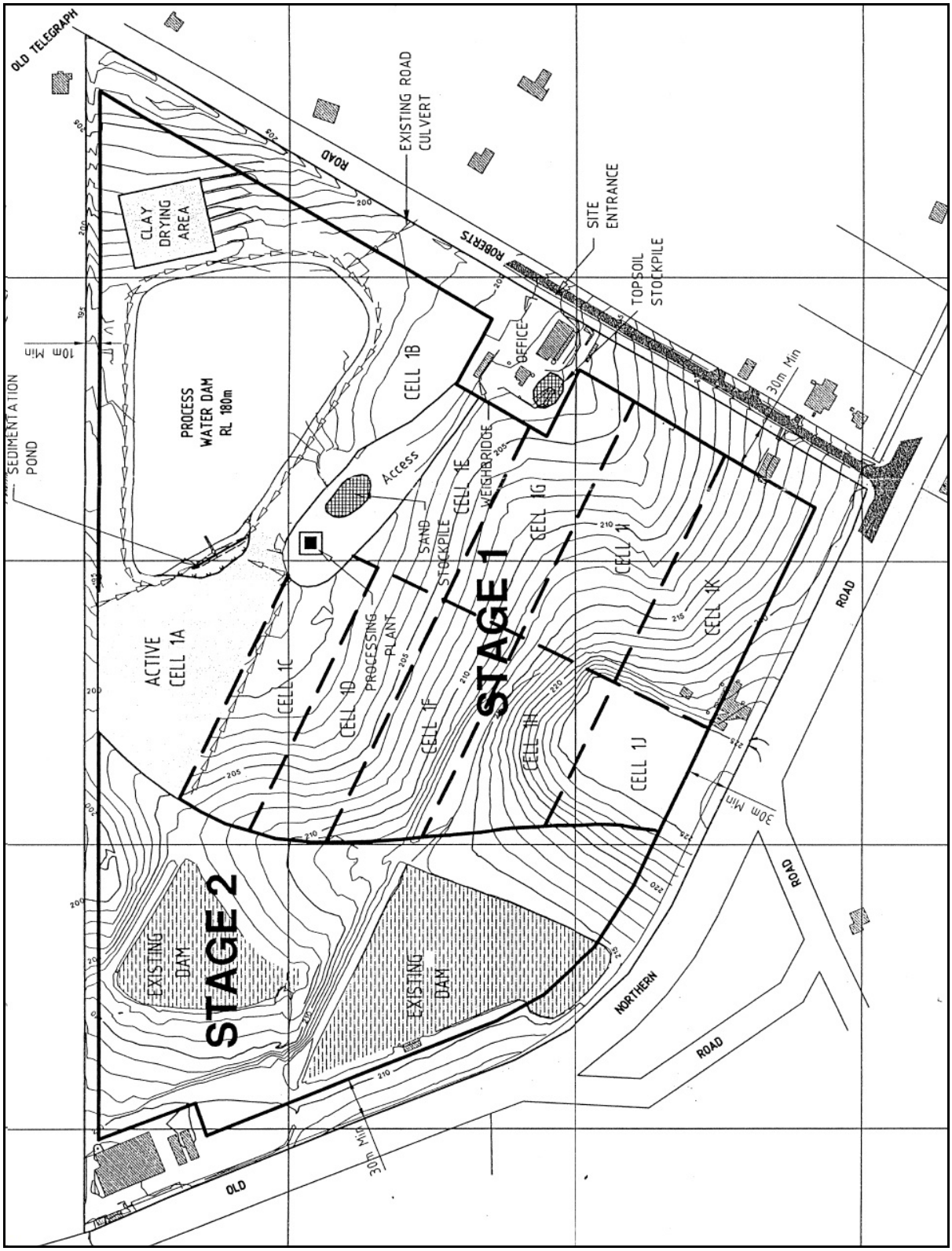

Figure 1.6: Extract from Figure 15 of the EIS which accompanied DA 267-11-99 showing Stage 1 and Stage 2 of the approved extraction and the location of the Cells of extraction for Stage 1.

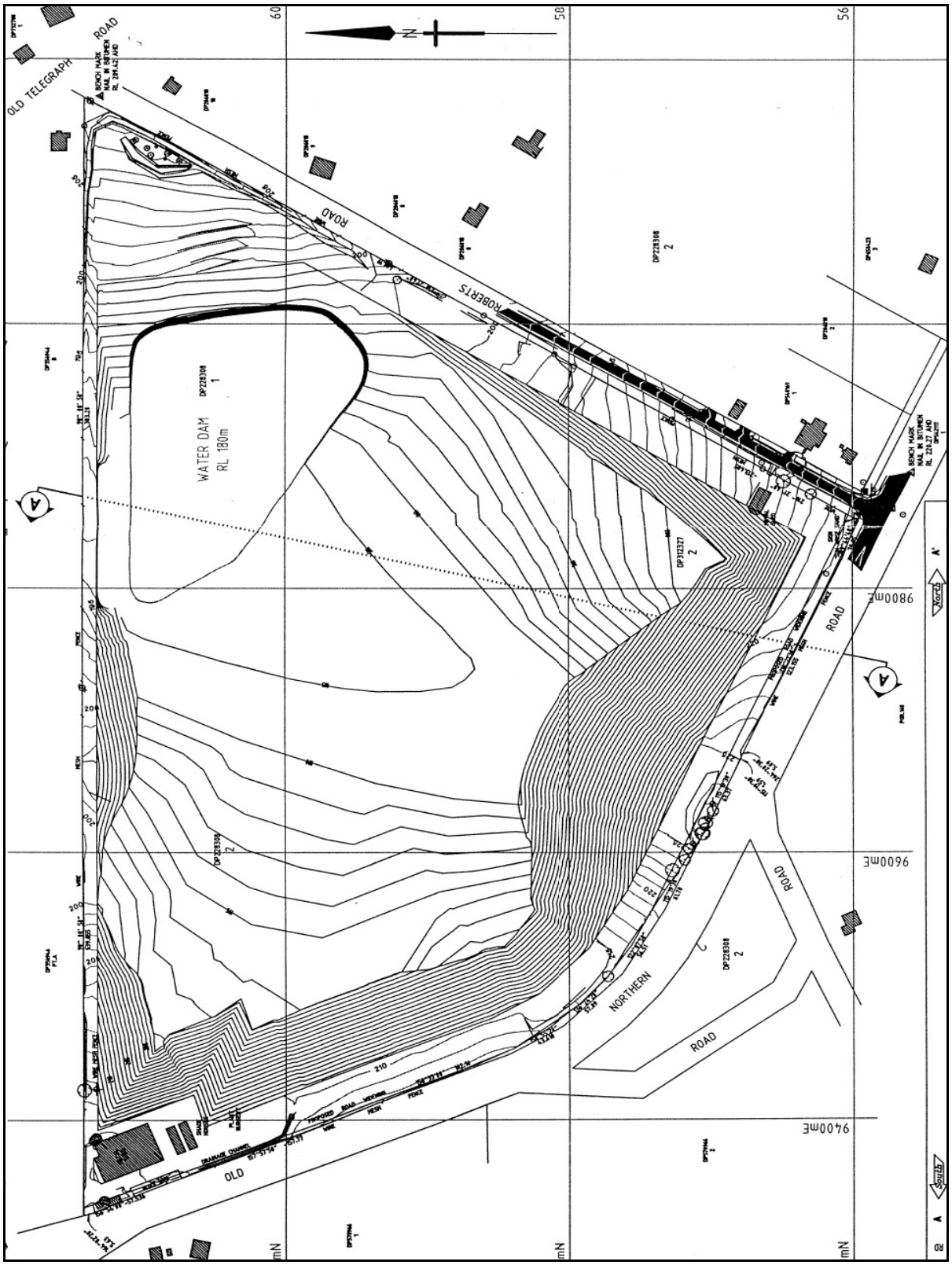

Figure 1.7: Extract from Figure 21 of the EIS which accompanied DA 267-11-99 showing the approved final landform.

Of particular note is the fact that the development proposed in DA 267-11-99 included the continuation of the construction of the dam on the Site.

The Minister for Urban Affairs and Planning, by Notice of Determination dated 31 May 2000, granted consent to DA 267-11-99 subject to conditions. A copy of the consent is at **Appendix 1.** As such, the construction of the dam on the Site was now included in this consent.

Of particular importance was Condition No.9 which stated:

> *9. The duration of extraction under this Consent is for a maximum period of 15 years. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

As such, Consent 267-11-99 required extraction on the Site to cease on 31 May 2015. This timeframe has now been modified to 31 May 2016 as discussed in **Part 1.3.2** of this Environmental Assessment.

1.3.1 Modification No.1 of Development Consent DA 267-11-09

On 21 July 2000, an application to modify consent DA 267-11-99 was made to the then Department of Urban Affairs and Planning pursuant to section 96(2) of the Environmental Planning and Assessment Act 1979. The planning report which accompanied the s.96(2) application stated:

> *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 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;"*

.... 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.

.... It is the Pumping Unit option which is now proposed by Dr Martin.

.... 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.

.... 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 .... 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.*

Of particular note is that the s.96(2) application stated that:

- *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.*

Notwithstanding the above proposal to remove the approved perimeter bunds, the s.96(2) application also included an assessment by Scott Murray & Associates of the proposed modification of the approval from a visual impact perspective. 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.*

In this regard the following statements were made by Scott Murray & Associates:

> *The removal of the bunds as recommended ... has the potential to impact on the visual and landscaping impact of the development as amended.*
>
> *The revised extraction process .... 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 .... 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.

*.... 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.*

Copies of plans **MP-02B** to **MP-05B** are included as **Appendix 2**.

A Notice of Modification dated 29 November 2000 was issued by the then Minister for Urban Affairs and Planning, a copy of which is at **Appendix 3**.

Modification to Condition 2(c) of consent 267-11-99 inserts reference to the report of Dick Benbow and Associates (Report No.10065 Issue 1) dated 26 June 2000 into the Consent. The Dick Benbow and Associates report details the modified extraction process as described above.

Figure 1.8 shows the location of the processing plant and loading area.

Figure 1.9 shows the existing entrance to the Site including the location of the weighbridge.

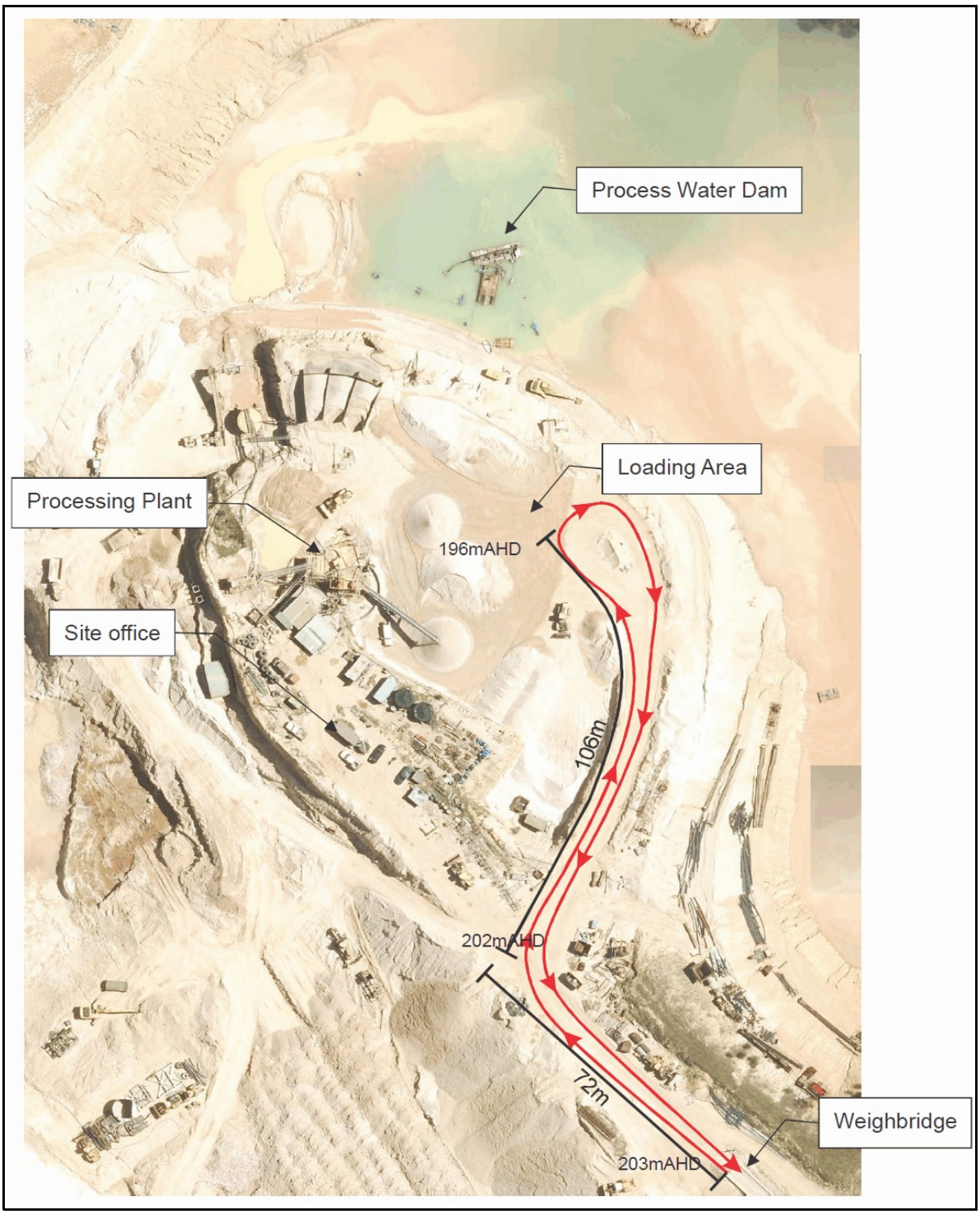

Figure 1.8: Aerial photograph showing the location of the existing processing plant and loading area together with the location of the weighbridge and process water supply source.

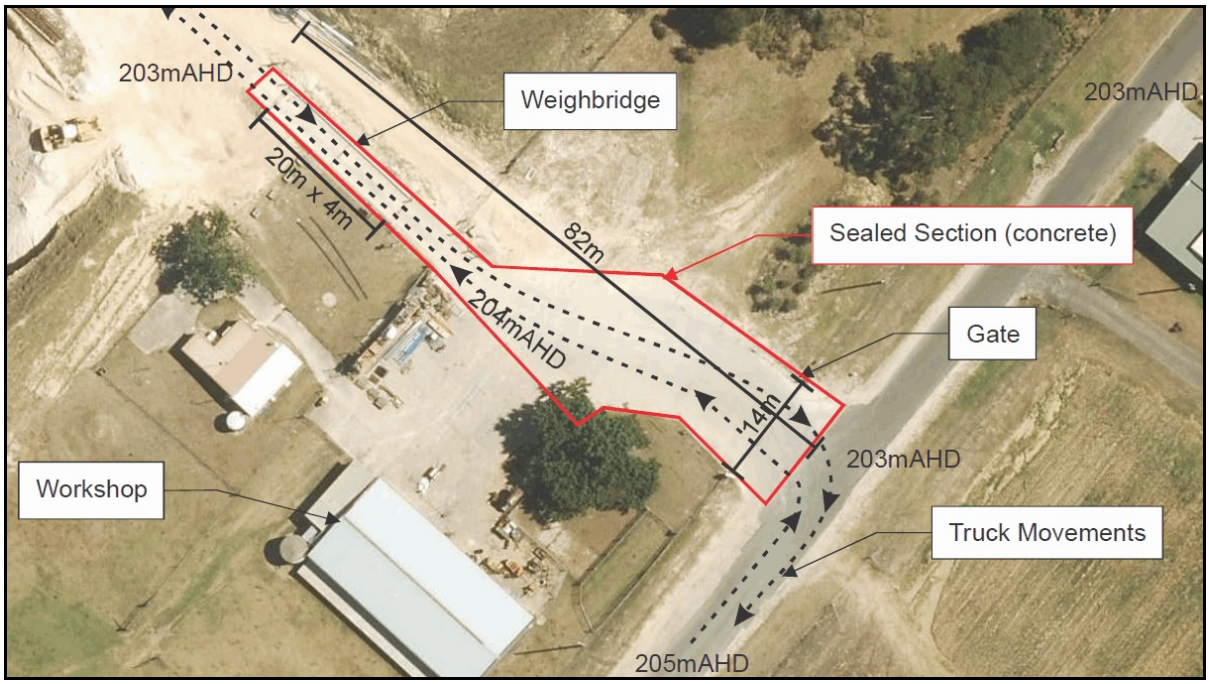

Figure 1.9: This figure shows, at the top view, an aerial photograph of the existing entrance to the Site and the existing weighbridge. At the bottom is a photograph of the existing sealed entrance to the Site with the weighbridge shown in the background of the photograph.

1.3.2 Modification No.3 of Development Consent DA 267-11-09

Condition No.9 of the Consent stated:

> *9. The duration of extraction under this Consent is for a maximum period of 15 years. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

The assessment process for Modification (2) has been such that the complex level of empirical detail which has been required with regard to groundwater, acoustic and air quality impacts has been such that the timeframe originally expected for the completion of the Environmental Assessment has been significantly exceeded. As such, the assessment of Modification (2) by the Department of Planning and Environment and other agencies involved in that assessment was not be completed by 31 May 2015.

As detailed in **Part 1.4.4** below, one of the modifications to the Consent proposed in Modification (2) is that the life of extraction on the Site be extended from 31 May 2015 to 31 May 2025.

If extraction activity ceased on 31 May 2015, pending the resolution of Modification (2), there would be an hiatus in the provision of Maroota Sand to the Sydney construction industry. In addition, less than half of the Site has been extracted, and, as such, it would be impossible to rehabilitate the Site in accordance with the Consent until such time as the Site is fully extracted as per the Consent. In order to cause the least disruption to the operation of the existing extraction, the continued employment of workers at the Site, and to maintain the supply of Maroota Sand to the local market, Modification (3) was submitted to extend the existing extraction of the Site for a period of up to 12 months while Modification (2) is comprehensively assessed and determined.

The extended period of extraction proposed as Modification (3) would allow the continued extraction of the Site in accordance with the current Consent as modified.

By Notice of Determination dated 18 August 2015, consent was granted to Modification (3) to, among other things, modify condition 9 to read:

> *9. The duration of extraction under this Consent is until 31 May 2016. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

Condition 17 of the original consent stated:

> *17. Baulkham Hills Shire Council Development Control Plan for Extractive Industries (DCP 500) requires that the depth of extraction incorporate a 2m freeboard above the wet weather high groundwater level. To meet the objectives of this policy, the Applicant shall ensure that the depth of extraction is consistent with the depth as shown in the extraction plan in*

the EIS and follow the procedures in Condition 40 if groundwater is encountered during extraction.

As part of the Environmental Assessment process for Modification (2), is has been determined that the wet weather groundwater level of the Site is higher than that predicted in the original EIS. As such, it was proposed that the continued extraction of the Site as proposed in Modification (3) would not involve extraction within 2 metres of the newly assessed groundwater level of 183.1m AHD.

Notwithstanding, as part of the assessment process of Modification (3), the NSW Office of Water made comment as follows:

The Office of Water has reviewed the information provided it and it requests that the Department of Planning and Environment notes the following:

- *That the highest water level measured beneath the site is at least 1 m above that which has been reported in the current documentation (i.e. at 184.08 m AHD, not 183.10 m AHD).*

- *That any excavation approved for the one year period requested must maintain additional freeboard accordingly (i.e. no excavation deeper than 186.08 m AHD).*

As a consequence of the above comments from the NSW Office of Water, the Consent was modified such that Condition 17 now reads:

The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.

A copy of the Notice of Determination for Modification (3) and a copy of the consolidated consent following Modification No.(3), are at **Appendix 20**.

1.4 The Proposed Modification

The Consent, as modified, permits:

(a) development for the purposes of an extractive industry on the Site, in accordance with details contained in the Environmental Impact Statement (**EIS**) prepared by Nexus Environmental Planning Pty Ltd, dated 1999 as submitted with the development application;

(b) extraction in accordance with an extraction plan prepared by Woodward Clyde which details both the sequence and depth of extraction, and

(c) extraction in accordance with the modified method of extraction as detailed in the documents prepared by Dick Benbow & Associates which were submitted with

the s.96(2) modification application.

(d) continuation of extraction on the Site until 31 May 2016 to a depth of RL 186.08m AHD.

The proposed modification would amend the Consent as follows, full details of which are provided in **Part 2** of this Environmental Assessment.

1.4.1 Dam Construction

Part of the Consent was for the continued construction of a water supply dam on the Site, that dam being required to provide sufficient water to maintain the life of the approved extraction.

The approved dam was to be constructed in two (2) stages, details of which were described in the EIS which accompanied the application for extraction.

During the construction of the approved dam, the applicant has determined that the construction process would be better served if the dam were to be constructed in three (3) stages rather than the approved two (2) stages. It is proposed to amend the Consent to modify the dam construction process accordingly.

1.4.2 Sequence of Extraction

There is an approved sequence of extraction of the Site as shown in **Figure 1.6**.

During the extraction process, it has been determined that the approved method of extraction using the cells shown in **Figure 1.6** is neither an economic nor practical way to achieve that extraction.

The existing extraction process on the Site involves a similar cell by cell extraction process to that which is approved but one which is not as rigidly defined as that portrayed in **Figure 1.6**.

It is proposed to modify the approved sequence of extraction to reflect that which is now being undertaken on the Site such that the most efficient means of extracting the material on the Site is achieved.

1.4.3 Extraction Process

The approved extraction was to be undertaken in accordance with the method of extraction described in the abovementioned s.96(2) modification to the Consent where

a *"Pumping Unit"* method of extraction was to be employed.

Since commencement of the extraction, it has been determined that the approved *"Pumping Unit"* method of extraction is not a practical means by which the resource can be extracted.

While the general concept of the *"Pumping Unit"* method of extraction remains, there have been modifications made to that method as follows:

1. The approved method of extraction is as follows:

   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.

While the above is generally the case, there are instances where sandstone is encountered which is not able to be extracted using an excavator alone. In such circumstances, the sandstone material is ripped using a dozer and then removed using the excavator.

2. The approved method of extraction states:

   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.

The introduction of extracted sand into the mixing tank is being undertaken, however, the approved process assumes that the mixing tank is mobile and can easily move around the active extraction cell with the excavator. This is physically not easily achieved. What actually occurs is that the mixing tank is located close to the processing plant and is located there on a semi-permanent basis. The material won from the individual extraction cell is then loaded by the excavator to a dump truck which transports that material to a stockpile adjacent to the mixing tank. From there, a front end loader transfers the sand to the mixing tank.

It is proposed to modify the Consent to regularise the existing method of extraction.

1.4.4 Approved Volume of Material to be Extracted and Life of the Consent

Table 4.3 of the EIS relating to the Consent provided details of the sequence of extraction, the volume of material to be extracted from each cell, and the time for that extraction to be completed, those data having been provided by Woodward Clyde as part of the mine plan prepared for the approved extraction.

It has become apparent that the volume calculations undertaken by Woodward Clyde, as detailed in Table 4.3 of the EIS, are flawed in that they do not provide accurate volumes

of the material present on the Site.

To establish a more accurate figure of the volume of material contained on the Site, VGT Environmental Compliance Solutions (**VGT**) has undertaken detailed volume calculations utilising survey data obtained in December 2013. Using a computer generated model of the Site, VGT has determined that there is 4,607,822m^3 of material on the Site compared to the 2,144,000m^3 calculated by Woodward Clyde.

Advice from the applicant is that a conservative estimate of 2 tonnes per m^3 should be applied to determine the tonnage of material on the Site. Applying that conversion rate, there is 9,215,644 tonnes of material on the Site. The applicant has advised that a figure of 60% sand to 40% clay/gravel is generally obtained. As such, 5,529,386 tonnes of the volume calculated by VGT would be sand product.

The applicant has advised that approximately 1,000,000 tonnes of sand has been exported from the Site during the life of the extraction to date which means that approximately 4.5 million tonnes of sand product remains to be extracted.

Having regard to the errors in the original calculations undertaken by Woodward Clyde, it is now proposed to modify the Consent based on the volume figures calculated by VGT. The EIS for the original development provided a formula to determine the rate of extraction. Using that formula, the following applies:

- maximum 50 trucks per day (approved).
- average load per truck 33.5 tonnes.
- 1,675 tonnes per day.
- 5.5 days per week extraction = 286 days per annum.
- maximum 479,050 tonnes per annum extracted.
- 9.4 years of extraction remaining.

In light of the above, the applicant seeks a modification to the life of the extraction from 31 May 2016 to 31 May 2025.

1.5 Need for an Environmental Assessment

Pursuant to **Schedule 3** of the Environmental Planning and Assessment Regulation 2000, the proposed development is Designated Development being *"Extractive industry"*.

Before being repealed, Section 75A of Part 3A of the Environmental Planning and Assessment Act 1979 (the **Act**) defined a *"project"* as:

project *means development that is declared under section 75B to be a project to which this Part applies.*

The then sub-section 75B (1) (a) of the Act stated:

Projects to which Part applies

(1) ***General***

This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:

(a) by a State environmental planning policy, or

Sub-clause 6 (1) of the then State Environmental Planning Policy (Major Development) 2005 stated:

Identification of Part 3A projects

(1) Development that, in the opinion of the Minister, is development of a kind:

(a) that is described in Schedule 1 or 2, or

(b) that is described in Schedule 3 as a project to which Part 3A of the Act applies, or

(c) to the extent that it is not otherwise described in Schedules 1–3, that is described in Schedule 5,

is declared to be a project to which Part 3A of the Act applies.

Schedule 1 of the then State Environmental Planning Policy (Major Development) 2005 contained the following definition:

Extractive Industries

(1) Development for the purpose of extractive industry that:

(a) extracts more than 200,000 tonnes of extractive materials per year, or

(b) extracts from a total resource (the subject of the development application (or other relevant application under the Act)) of more than 5 million tonnes, or

(c) extracts from an environmentally sensitive area of State significance.

(1A) Subclause (1) (c) does not apply to extraction:

(a) by a public authority in maintenance dredging of a tidal waterway, or

(b) in maintenance dredging of oyster lease areas, or adjacent areas, in Wallis Lake.

(2) Development for the purpose of extractive industry related works (including processing plants, water management systems, or facilities for storage, loading or transporting any construction material or waste material) that:

(a) is ancillary to or an extension of another Part 3A project, or

(b) has a capital investment value of more than $30 million.

The approved and proposed modified development would extract more than 200,000 tonnes per annum of sandstone material and, as such, is a *"Part 3A project"* for the purposes of the then State Environmental Planning Policy (Major Development) 2005.

NSW Planning and Environment has advised that the then Section 75W of the Act can be utilised to give effect to the proposed modification.

1.6 Local Government, Government and Statutory Authority Consultation

In the preparation of this Environmental Assessment, consultation was undertaken with:

- The Hills Shire Council.
- NSW EPA.
- The NSW Office of Environment and Heritage.
- NSW Office of Water.
- NSW Department of Industry and Investment.
- NSW Department of Resources and Energy.
- NSW Roads and Maritime Services.
- NSW Department of Primary Industries, Agriculture Land Use Planning.
- The Maroota Public School.

Copies of the responses received are provided as **Appendix 6**.

The **Hills Shire Council**, by letter dated 23 April 2014, provided the following comments for inclusion in the Secretary's Requirements:

1. *The submission of full details describing the proposal.*

2. *The submission of details confirming the proposal's relationship with the existing extractive industry operations upon the site*

3. *The submission of plans and supporting written evidence showing the proposed final landform configuration and end use of land having regard to the existing approvals in place and ensuring that the modified extraction methods will result in the extraction area being rehabilitated in a consistent manner with the existing approvals. This is to include details of the progressive rehabilitation works.*

4. *The submission of full details regarding the proposal's compliance with the requirements of SEPP Mining and Extractive Industries (2007), Council's Development Control Plan Part B Section 1 – Rural, Sydney Regional Environmental Plan No. 9 – Extractive Industry, Sydney Regional Environmental Plan No. 20 – Hawkesbury – Nepean River and Baulkham Hills Local Environmental Plan 2012, and other relevant legislation, including the Section 91 'Integrated Development' provisions of the NSW EP & A Act, 1979 if relevant.*

5. *The EIS is required to identify the maximum yearly extraction rate and the life of the extraction (based on resource within the quarry) and also the subsequent timeframe for the completion of rehabilitation works upon the site.*

6. *The submission of a detailed traffic impact assessment report addressing the increased maximum number of truck movements associated with the operation.*

7. *The submission of a comprehensive noise impact assessment report addressing the existing noise level and the likely noise levels associated with the modified extraction methods within the site, and including truck movements to / from the central processing plant.*

8. *Address the potential for increase amenity impacts to adjoining property owners given the additional ten year extraction period.*

NSW EPA, by letter dated 16 April 2014, stated:

... the EPA's key information requirements for the proposal include an adequate assessment of:

1. *Potential air pollution, including dust emissions from the site;*

2. *Potential surface and groundwater pollution from the site;*

3. *Potential noise and vibration impacts from the site;*

4. *Management of chemicals and wastes generated and/or stored at the site;*

5. *Rehabilitation of the site to its required usage after extraction has ceased.*

NSW Transport Roads & Maritime Services, by letter dated 28 April 2014, stated:

Roads and Maritime require the following issues to be included in the transport and traffic impact assessment of the proposed development:

1. *Daily peak traffic movements likely to be generated by the proposed development including the impact on nearby intersection and the need/associated funding for upgrade or road improvement works (if required).*

2. *Details of the proposed access and parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (ie: turn paths, sight distance requirements, aisle widths, etc).*

3. *Proposed number of car parking spaces and compliance with the appropriate parking codes.*

4. *Details of service vehicle movements (including vehicle type and likely arrival and departure times).*

5. *Roads and Maritime will require in due course the provision of a traffic management plan for all demolitions/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures.*

The **NSW Department of Primary Industries, Agriculture Land Use Planning**, by email dated 6 May 2014, advised that:

DGRs should cover:

Development Applications duly consider the following potential impacts and identify suitable mitigation responses for:

- *Impacts on agricultural resources;*
- *Transport and access changes;*
- *Rehabilitation plans;*
- *Consultation with rural stakeholders;*

- *Mitigation and monitoring.*

The **NSW Office of Water**, by email dated 8 July 2014 stated:

It is recommended that the EIS be required to include:

- *Details of water proposed to be taken (including through inflow and seepage) from each surface and groundwater source as defined by the relevant water sharing plan.*
- *Assessment of any volumetric water licensing requirements (including those for ongoing water take following completion of the project).*
- *The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased.*
- *Full technical details and data of all surface and groundwater modelling undertaken.*
- *A detailed and consolidated site water balance.*
- *A detailed assessment against the NSW Aquifer Interference Policy (2012) using the NSW Office of Water's assessment framework.*
- *Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.*
- *Proposed surface and groundwater monitoring activities and methodologies.*
- *Proposed management and disposal of produced or incidental water*
- *Details surrounding the final landform of the site, including final void management (where relevant) and rehabilitation measures.*
- *Assessment of any potential cumulative impacts on water resources, and any proposed options to manage the cumulative impacts.*
- *Consideration of relevant policies and guidelines.*
- *A statement of where each element of the SEARs is addressed in the EIS (i.e. in the form of a table).*

1.7 Community Consultation

As part of the consultation, notification of the proposed modification was given to surrounding landowners and the Maroota Public School. A copy of the consultation letters and details of those consulted is at **Appendix 18**.

No responses have been received as a result of the consultation process.

1.8 Secretary's Requirements

Pursuant to the then **Section 75F** of the Act, by letter dated 29 May 2014, the Secretary of NSW Planning & Environment provided the requirements for the Environmental Assessment.

A copy of the Secretary's Requirements is at **Appendix 5**.

A summary of the Secretary's Requirements is outlined in **Table 1-1** together with the relevant section of the Environmental Assessment which addresses those matters.

Table 1.1: Summary of the Secretary's requirements

Issue	Summary of matters to be addressed in EA	Reference in EA
A description of the development.	*A full description of the development, including:* - *the resource to be extracted, demonstrating efficient resource recovery within environmental constraints;* - *the site layout and extraction plan;* - *processing activities;* - *a waste (overburden, leachate, etc.) management strategy, dealing with the EPA's requirements;* - *a water management strategy, dealing with the EPA's and DPIs' requirements;* - *a rehabilitation strategy, having regard to the key principles in the Strategic Framework for Mine Closure; and* - *the likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site;*	Parts 2 & 3 Appendix 14
Approvals	*A list of the approvals that must be obtained before the*	No additional

	development may commence.	approvals required.
Likely Impacts	*An assessment of the likely impacts of the development on the environment, focussing on the specific issues identified below, including:* - *a description of the existing environment likely to be affected by the development, using sufficient baseline data;* - *an assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans and industry codes of practice;* - *a description of the measures that would be implemented to mitigate and/or offset the likely impacts of the development, and an assessment of:* • *whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented;* • *the likely effectiveness of these measures; and* • *whether contingency plans would be necessary to manage any residual risks;* - *a description of the measures that would be implemented to monitor and report on the environmental performance of the development if it is approved;*	Part 3
Environmental management and monitoring measures.	*A consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EA.*	Parts 3 & 4
Consideration of all environmental planning instruments.	*Consideration of the development against all relevant environmental planning instruments.*	Part 3
Reasons for approval.	*The reasons why the development should be approved having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.*	Parts 1, 2 & 5
KEY ISSUES		
Air	*An assessment of the likely air quality impacts of the development in accordance with the Approved*	Part 3.9 Appendix 14

	Methods for the Modelling and Assessment of Air Pollutants in NSW and the EPA's additional requirements.	
Noise	*An assessment of the likely operational noise impacts of the development (including construction noise) in accordance with the NSW Industrial Noise Policy and the EPA's additional requirements, and paying particular attention to cumulative noise impacts and the obligations in chapters 8 and 9 of the policy.* *If a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline.* *An assessment of the likely road noise impacts of the development under the NSW Road Noise Policy.*	Part 3.7 Appendix 15
Water	*An assessment of the likely impacts of the development on the quantity and quality of the region's surface and groundwater resources, having regard to the EPA's and DPI's requirements.* *An assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users.*	Part 3.5 Appendix 16 Appendix 19
Land	*An assessment of the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements in Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007, and having regard to the Department of Primary Industries' requirements.*	Part 3
Traffic	*An assessment of the likely traffic impacts of the development on the capacity, condition, safety and efficiency of the local and State road network, having regard to the RMS's requirements.*	Part 3.8 Appendix 13
Biodiversity	*Ongoing management of approved impacts on biodiversity.*	Part 3 & 4
Heritage	*Ongoing management of approved impacts on Aboriginal and historic heritage (cultural and archaeological).*	Part 3
Visual	*Ongoing management of approved visual impacts.* *An assessment of any additional visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain.*	Part 3
Social & Economic	*An assessment of the likely social impacts of the development (including any perceived impacts).*	Part 3.13

	An assessment of the likely economic impacts of the development, paying particular attention to: - *the significance of the resource;* - *economic benefits of the project for the State and region; and* - *the demand for the provision of local infrastructure and services.*	
Consultation	*During the preparation of the EA, you must consult with relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.* *The EA must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EA.*	Parts 1.6 & 1.7 Appendix 18

1.9 Structure of the Environmental Assessment

Part 2 Details the proposed modification and describes the modifications which would be required to Development Consent No.267-11-99 if approval is granted.

Part 3 Details the net impact of the proposed modification to Development Consent No.267-11-99.

Part 4 Contains a draft Statement of Commitments.

Part 5 A conclusion to the Environmental Assessment.

1.10 Project Team

Nexus Environmental Planning	Project Management and Planning.
Lyle Marshall & Associates	Traffic and Access.
Australian Groundwater Technologies	Groundwater Monitoring & Management.
Peter Dundon & Associates	Groundwater.
VGT Environmental Compliance Solutions	Site Layout and Extraction Plans, Modified Dam Design, Modified Resource Volumes.

Wilkinson Murray	Acoustic Impact Assessment, Air Quality Assessment.
Conzept Landscape Architects	Site Rehabilitation.

Part Two

DETAILS OF PROPOSED MODIFICATION

2.1 Introduction

As noted in **Part 1** of this Environmental Assessment, the Consent, as modified, permits:

(a) development for the purposes of an extractive industry on the Site, in accordance with details contained in the Environmental Impact Statement (**EIS**) prepared by Nexus Environmental Planning Pty Ltd, dated 1999, as submitted with the development application;

(b) extraction in accordance with an extraction plan prepared by Woodward Clyde which details both the sequence and depth of extraction, and

(c) extraction in accordance with the modified method of extraction as detailed in the documents prepared by Dick Benbow & Associates which were submitted with the s.96(2) modification application.

(d) extraction of the Site until 31 May 2016 to a depth at or above RL 186.08m AHD.

During the operation of the approved extraction, it has been determined that certain aspects of the approved development were either incorrectly estimated in the original application or alternative methods of extraction have been formulated to provide for a more cost effective and efficient extraction process. As a result, modification of the Consent is required to:

(a) correct errors in the original application relating to the volume of material on the Site,

(b) amend the approved process and sequence of extraction to the existing method of extraction employed on the Site,

(c) extend the life of the extraction on the Site to cater for the increase in the volume of material on the Site compared to that estimated in the original application,

(d) amend the approved rehabilitation strategy for the Site to reflect the modified sequence of extraction, and

(e) amend the approved method of construction of the dam on the Site from a two (2) stage process to a three (3) stage process.

This part of the Environmental Assessment:

1. Describes the proposed modifications, and

2. Describes the modifications which would be required to the Consent to give effect to the proposed modifications.

2.2 Dam Construction

Consent 267-11-99 includes the continued construction of a water supply dam on the Site, that dam being required to provide sufficient water to maintain the life of the approved extraction.

Figure 1.5 shows that the approved dam was to be constructed in two (2) stages, details of which were described in the Environmental Impact Statement (**EIS**) which accompanied the original application. Figure 13 and 14 of the EIS, which show the approved dam design, are reproduced as **Appendix 7** with the following being extracted from the EIS to explain the original dam design:

> *The extraction of sand in the Maroota area is generally dependant upon a quality water supply in order that the clay within the extracted material can be washed from the sand. The applicant is currently constructing a water supply dam on the site. It is proposed to utilise the work already undertaken in the construction of that dam to provide for a water supply for the proposed extraction of the total site.*
>
> *The development of the site will be undertaken as follows:*
>
> *1. Construction of the process water dam for the washing of sand in conjunction with Stage 1 extraction of material from the site;*
>
> *2. Stage 2 extraction of material from the site, and*
>
> *3. Extraction of the resource under the existing processing plant and the access road utilising mobile extraction equipment.*
>
> *The following sections describe the processes which will be undertaken to effect each of the above steps.*
>
> ***Process Water Dam***
>
> *The proposed process water dam is to be constructed to include the existing excavation pit located along the central northern boundary of the site. It is intended that the existing stockpiles of clay residue within the site will be used to construct the storage lining and perimeter embankments.*
>
> *The general design criteria for the process water dam are as follows:*
>
> • *to provide a reliable source of process water for current and future extraction operations, and*

- *to be suitably located to maximise the quantity of sand available for extraction and to maximise surface runoff inflows from the surrounding catchment.*

Storage Design Requirements

The water supply dam has been sized for future extractive operations at the site which is to involve conventional dry excavation methods. Process water for washing and screening of the sand would be sourced from the dam.

The following storage requirements and assumptions regarding the future operation process/layout have been adopted:

- *a sand production rate up to 1000 t/day is assumed plus 430 t/day of clay and pebble materials, but will vary depending on supply and demand during the life of the operation;*
- *operations will be carried out on 5.5 days per week for the life of the operation;*
- *the proportion of clay and pebbles is approximately 30% on average;*
- *the washing/screening process will be a closed system with free water returning to the dam storage for re-use;*
- *no discharge of water off the site is intended;*
- *sand is stockpiled nearby the plant with any free water able to be drained into the water dam;*
- *clay residue materials are discharged to nearby drying areas with free water able to be drained into the water dam;*
- *water from the dam will not be used to supplement the existing water ponds for use in the existing nursery operations;*
- *water from the existing dams may be used to supplement the extraction process.*

Based on the above, water inputs to the storage would be direct rainfall and surface runoff from the surrounding catchment, with outputs comprising evaporation and seepage losses from the storage and general process (i.e. stockpile) losses. The components to the overall water balance of the storage are discussed further below.

Water Balance Modelling

A monthly water balance was undertaken for the proposed process water dam to simulate storage level fluctuations during operation and to predict the likelihood and

frequency of overflow from the storage. The objective of the storage is to provide a reliable water source based on adopted future operation process requirements.

The model simulated the response in the storage of the water dam based on catchment yield (surface runoff) and storage losses (eg. evaporation, seepage and process outputs) ....

.... process water (i.e. stockpile) losses for a range of average sand production rates used in the model are summarised in the ***Table 4.1*** *below:*

Table 4.1
Stockpile Water Losses

Average Sand Production Rate (t/day)	*Average Clay Production Rate (t/day)*	*Sand Stockpile Water Loss (m^3/day)*	*Clay Stockpile Water Loss (m^3/day)*	*Total Stockpile Water Loss*	
				(m^3/day)	*(ML/month)*
600	*257*	*30*	*90*	*120*	*2.6*
800	*343*	*40*	*120*	*160*	*3.5*
1000	*429*	*50*	*150*	*200*	*4.4*

The water balance was run with average sand production rates of 600, 800 and 1000 t/day for the extraction operation. For each production rate, the number of "shortfall" months were recorded (i.e. the number of months when storage losses exceeded the dam storage volume for the month) and subsequently the storage "reliability" was calculated over the 63 year rainfall sequence.

The water balance modelling results are summarised in ***Table 4.2****.*

Table 4.2
Water Balance Modelling Results

Average Sand Production Rate (t/day)	*Number of Shortfall Months*	*Storage Reliability (%)*	*Frequency of Additional Water Requirements (%)*	*Average Monthly Shortfall Volume (ML)*	*Average Storage Depth (m)*
600	*214*	*75*	*25*	*2.0*	*0.8*
800	*356*	*60*	*40*	*2.7*	*0.6*
1000	*460*	*40*	*60*	*3.4*	*0.5*

The above modelling results (based on 63 years of rainfall record) indicate the following:

- *for an average sand production rate of 1000 t/day, a storage reliability of 40% is predicted to supply water for the washing/screening process;*

- *for an average sand production rate of 600 t/day, the storage reliability predicted increases to 75%;*

- *when "shortfall" is predicted within the storage, the average monthly shortfall volume is predicted to be 2.0 ML (or 0.8 L/sec) and 3.4 ML (or 1.3 L/sec) for 600 and 1000 t/day average production rates respectively, and*

- *average storage depths should range between 0.5 to 0.8 m for the range of sand production rates modelled.*

Since the preparation of the process water dam report, the Applicant has sunk two (2) bores into the Hawkesbury Sandstone aquifer which are generating 1.9 L/sec and 1.3 L/sec respectively which is more than the "shortfall".

The sensitivity of the model on storage area and capacity with respect to the storage reliability was also examined by increasing the storage area and depth by 50% and re-running the model to predict the storage reliability. The results indicated that for an increase in storage area of 50% (i.e. resulting in a modelled storage area of 30, 000 m^2), the storage reliability is decreased by an average of 25% for the range of sand production rates modelled. This is due to a substantial increase in evaporation loss from the storage as a result of the increase in the storage surface area, thus reducing the overall storage reliability.

Also, for an increase in storage depth by 50% (i.e. resulting in a storage depth of 4.5 m), the storage reliability only increases by an average of 4% for the range of sand production rates modelled. This is due to the relatively low predicted frequency of overflow occurring from the storage in the "base" case and, therefore, the effects of additional storage capacity on storage reliability would only be minimal.

The above model sensitivity analysis indicates that substantially increasing the storage area and capacity has only minimal (or negative) impact on the predicted storage reliability.

The storage reliability could be increased by dividing the storage area into separate cells and transferring water from one cell to the other during periods of low inflow. In this manner, the surface area would be reduced and the evaporation minimised, thus increasing the reliability factor. Such a water management scheme will be investigated more thoroughly during detail design. Surface evaporation will also be reduced by covering of the surface area with floating plastic spheres.

Based on the water balance modelling results, the following conclusions are provided:

- *a nominal 60 ML water storage (approximate dimensions of 140 x 140 x 3 m deep) should provide a storage reliability of at least 40% assuming an*

average (maximum) sand production rate of 1000 t/day is achieved during the extraction operation;

- *the storage reliability increases to around 60 to 75% if average sand production rates between 600 and 800 t/day are achieved during the extraction operation;*

- *substantially increasing the storage area and capacity has only minimal (if not negative) impact on the predicted storage reliability;*

- *an alternative water supply source would, therefore, be required to supplement the process water dam between 25 to 60% of the months (for the range of sand production rates modelled) during extended periods of low or no rainfall. For example, 2 deep groundwater bores constructed into the Hawkesbury Sandstone with a combined capacity of 2.5 L/sec could supply up to 6.5 ML/month, which is above the calculated total stockpile water loss of 4.4 ML/month outlined in* ***Table 4.1****. As indicated above, these bores have now been sunk on the site with a combined capacity of 3.2 L/sec, and*

- *storage reliability could be increased by the adoption of appropriate water management strategies at the dam, including the introduction of possible evaporation control measures.*

Preliminary Engineering Design

The proposed preliminary dam design has been carried out based on the results of the above water balance modelling. The main objectives of the design were to provide details on:

- *liner properties and thickness;*

- *required batter slopes for pond perimeter embankments and pit batter slopes;*

- *constructability, and*

- *surface water control measures.*

....

The following criteria have been adopted for preliminary design of the water storage dam:

- *a storage capacity of approximately 60 ML (approximate dimensions 140 x 140 x 3 m deep);*

- *the base level of the dam (top of liner) to be at 180 m AHD (this ensures that there is always a net outward water pressure gradient from the pond and that the potential leakage from the pond acts as a local source of recharge to the*

Maroota Sand, i.e. no groundwater loss from the Maroota Sand);

- *full supply level in the dam to be at 183 m AHD;*
- *a 2.0 m exclusion zone above the water table for extraction operations;*
- *maximum use of on site materials, and*
- *design and construction of the dam in accordance with good engineering practice.*

To enable the approved sand production to continue during construction of the process water dam, it is proposed to adopt a two stage construction method.

Stage 1 *(approximate dimensions = 110 x 110 x 2.5 m) will comprise the construction of the first portion of the storage dam to a clay liner top level of 181 m AHD .... whilst the existing dam continues to supply water to the processing plant. The Stage 1 dam will have a temporary northern wall with batters of 3(H):1(V). Once completed, the Stage 1 dam will be filled by pumping from the existing dam and used for continued supply to the processing plant during construction of the Stage 2 portion of the dam.*

Stage 2 *(approximate dimensions = 100 x 100 x 3 m) will comprise the construction of the remainder of the dam and will start with emptying the existing dam into Stage 1. The clay liner will be constructed to a top level of 180 m AHD.*

Upon completion of overall construction, the temporary wall separating the two portions of the dam could be breached to form one large storage, however, it may be preferable to retain two separate dams during the quarry life to improve the storage efficiency and for water management purposes.

During the construction of the approved dam, the applicant has determined that the construction process would be better served if the dam were to be constructed in three (3) stages rather than the approved two (2) stages. It is proposed to modify the consent to modify the dam construction process accordingly.

Figure 2.1 below shows the now proposed three (3) stage construction of the approved dam together with the location of sections through the modified staged construction. Full copies of this diagram, together with Section AA' and BB' are provided in **Appendix 8**.

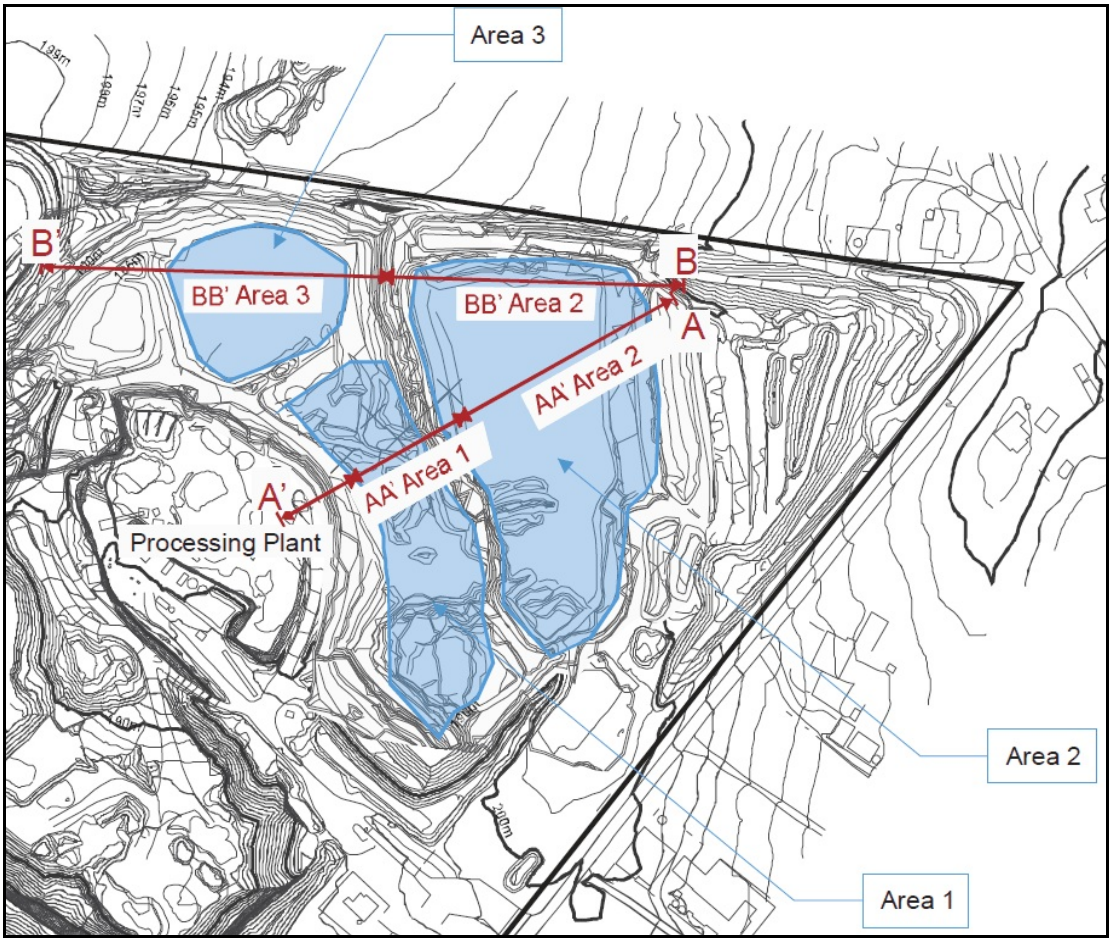

Figure 2.1 Plan showing location of three (3) stage dam construction with location of cross sections.

It is proposed to construct the dam as follows:

Stage 1 Area 1

Stage 2 Area 2

Stage 3 Area 3.

The final dimensions and depth of the approved dam would not alter as a result of this modification.

2.2.1 Three Stage Dam Construction Process

Having regard to **Figure 2.1**, the following construction process is proposed.

AREA 1

Existing Area 1 is currently part of the existing dam construction and comprises a wet silt component.

Figure 2.2 shows Section A'A through Area 1 depicting the existing wet area and RLs.

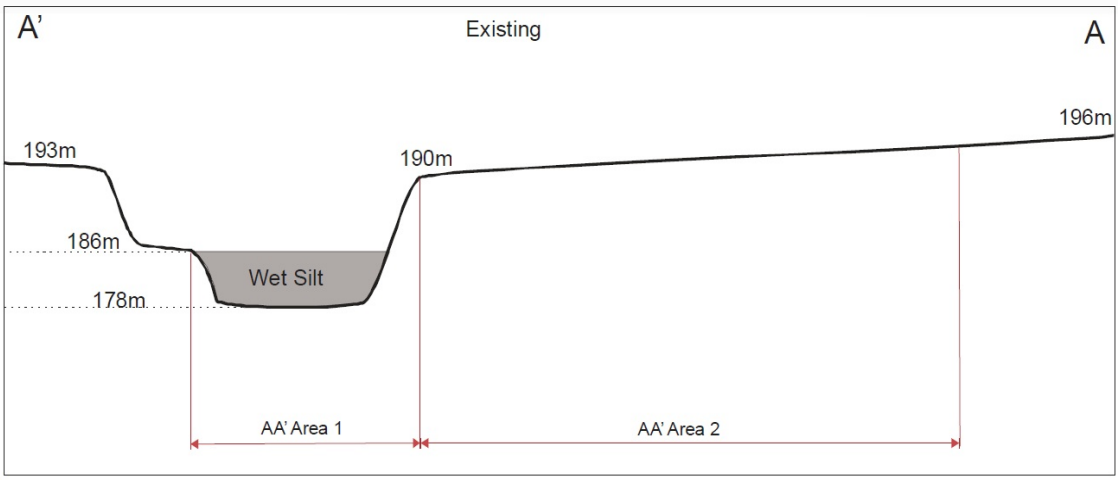

Figure 2.2: Existing section through Area 1.

Step 1 Step 1 of the construction process would see the existing wet silt pumped from Area 1 to the existing sediment ponds on the Site.

Although the actual depth of the existing wet silt is not known, it is estimated that pumping would be required to the approved level of approximately RL 178 metres.

Figure 2.3 depicts the proposed pumping of the existing wet area at the bottom of the existing dam construction.

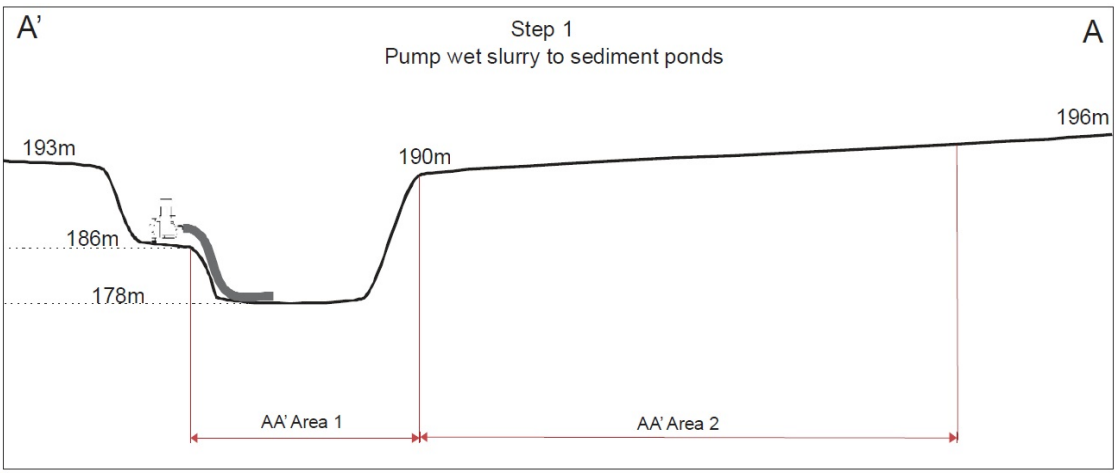

Figure 2.3: Stage 1 pumping.

Step 2 Once the existing wet silt has been pumped from Area 1, Area 1 would be clay lined to a floor level of RL180m as per the existing approved dam (refer **Figure 2.4**).

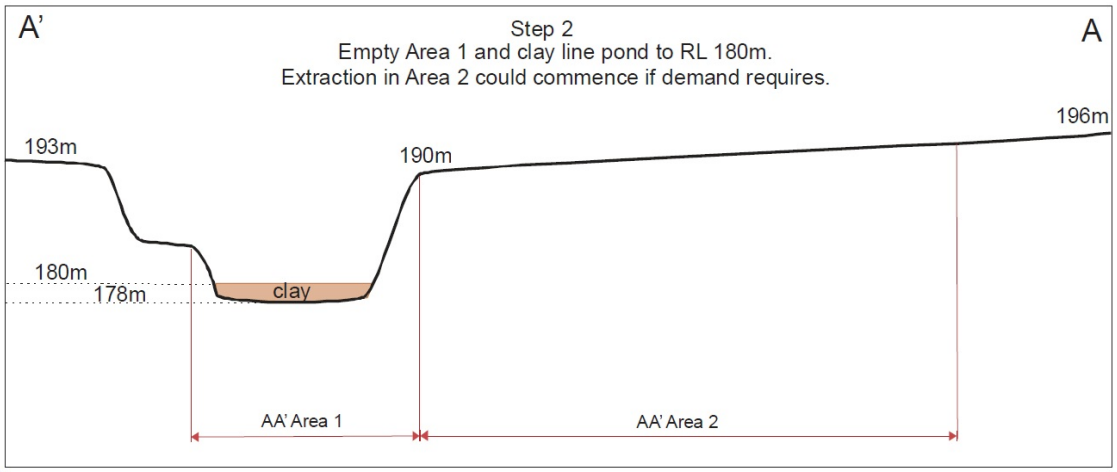

Figure 2.4: Section showing the location of the clay deposit to seal the floor of the dam.

If demand in the marketplace exists, commencement of extraction of material located within proposed Area 2 could be undertaken at the same time as the Area 1 works are completed. If Area 2 is extracted during this time, a wall would be constructed between Area 1 and Area 2.

Step 3 Following the completion of Area 1, water is allowed to flow into this area of the dam and that water would be used as process water for the extraction process (refer **Figure 2.5**).

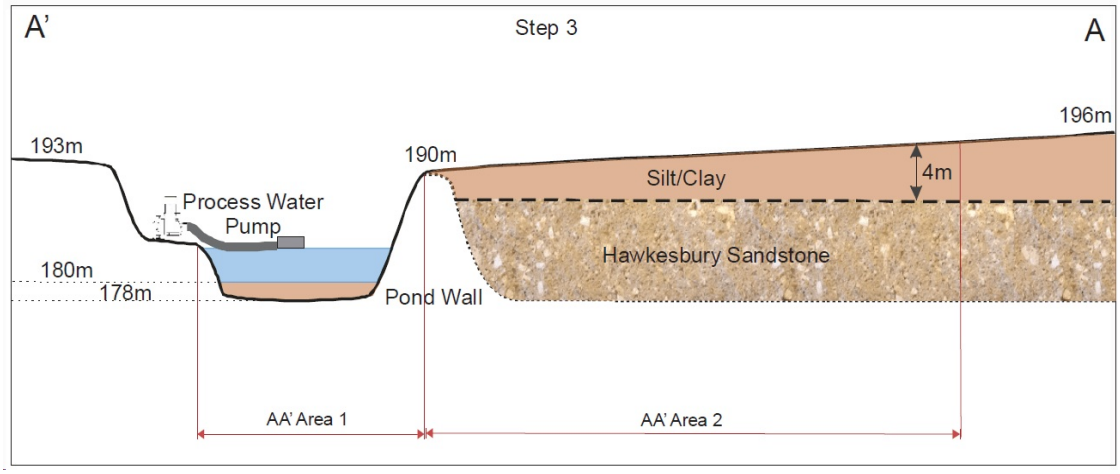

Figure 2.5: This section shows the Step 3 process and the material in the AA' portion of Area 2.

While Area 1 is being constructed, the remaining sections of the existing water supply ponds on the Site would be utilised in the extraction process to ensure continuity of the extraction of the Site.

AREA 2

Existing Area 2 comprises a clay drying area which has been used as part of the existing dam construction process. This area has a top layer of approximately 4 metres which comprises a silty/clay product underlain by Hawkesbury

Sandstone.

Step 4 Area 2 would be extracted to a depth of RL178m to exposed the base of the dam. This area would be clay lined to a depth of RL180m as per the approved dam as shown on **Figure 2.6**.

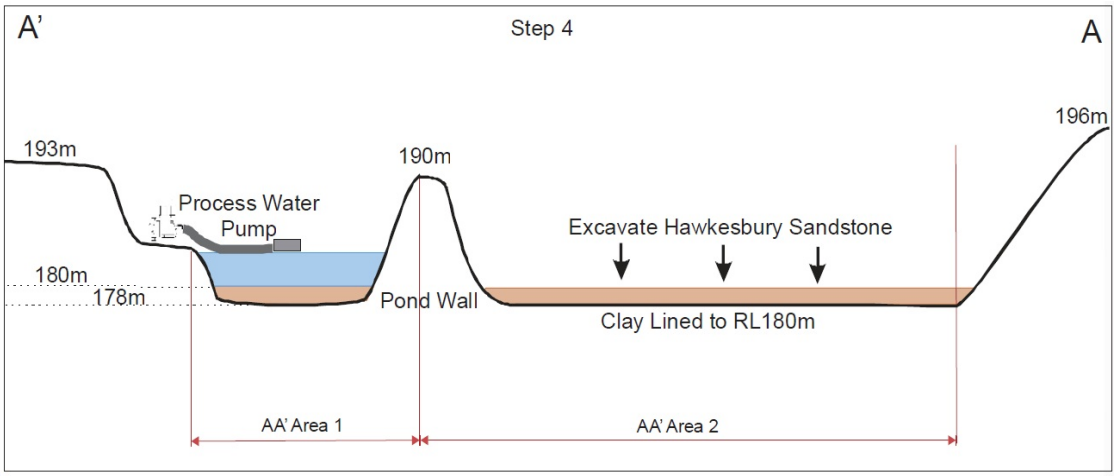

Figure 2.6: Step 4 in the dam construction process.

Step 5 Area 2 would be utilised as a surge pond with the water used as part of the approved extraction process (refer **Figure 2.7**).

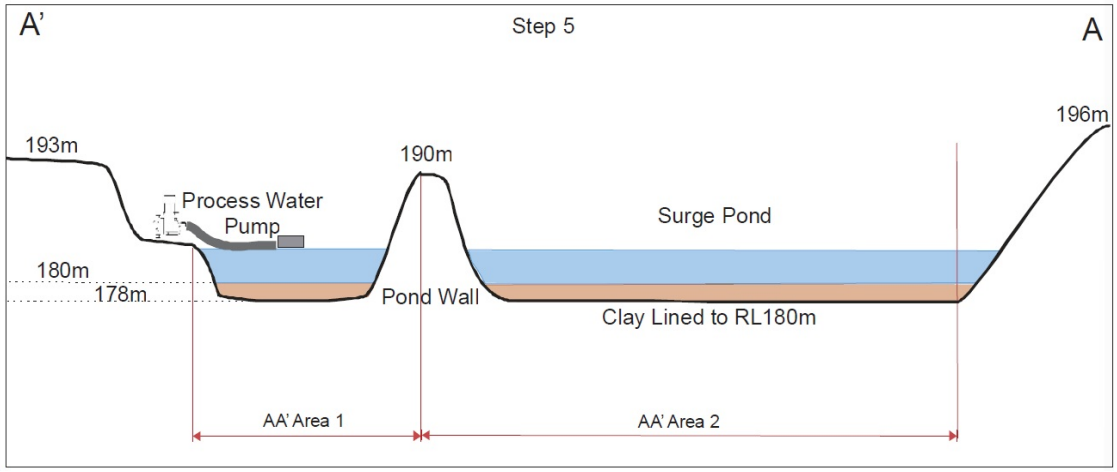

Figure 2.7: Step 5 in the dam construction process.

AREA 3

Existing Area 3 comprises part of the existing dam construction and contains water.

Section BB (refer **Figure 2.8** below) shows the existing Area 3 together with the extracted Area 2.

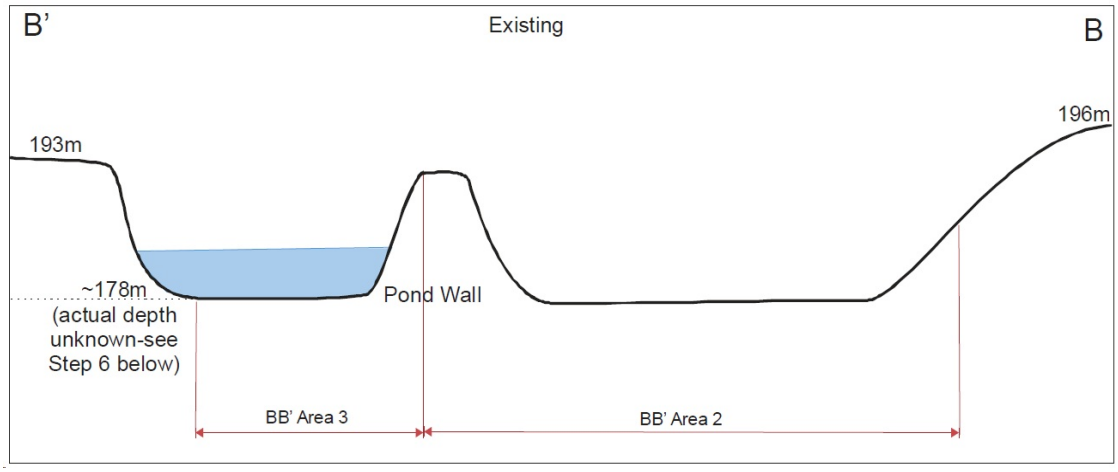

Figure 2.8: Existing Section B'B.

Step 6 Step 6 would involve pumping water and silt from Area 3 to the existing silt ponds and/or to the excavated Area 2 if completion of extraction of Area 2 has occurred (refer **Figure 2.9**).

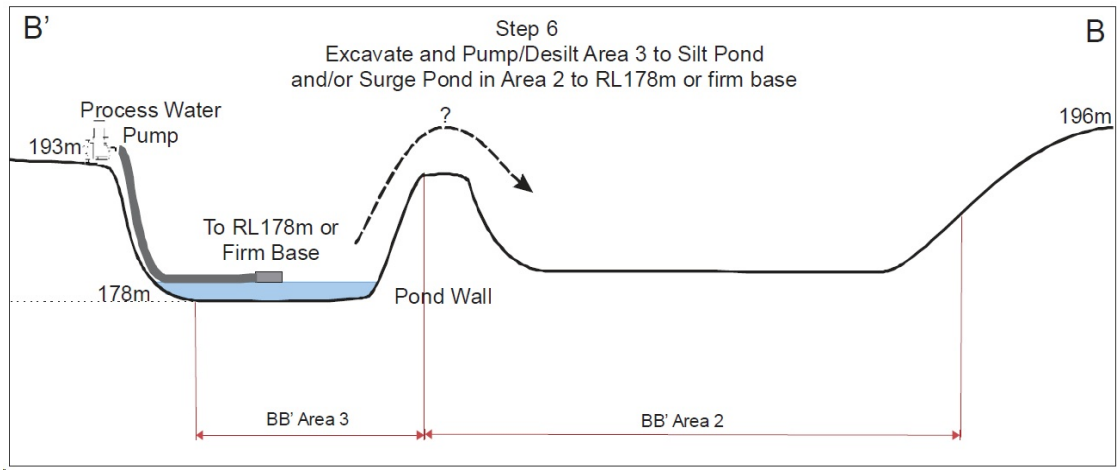

Figure 2.9: Step 6 of the dam construction process.

The depth of Area 3 is unknown but would need to be pumped to a depth of approximately RL178 metres or to a firm base to allow lining.

Step 7 Area 3 (refer **Figure 2.10** below) would be clay lined to a depth of RL180 metres as per the approved dam.

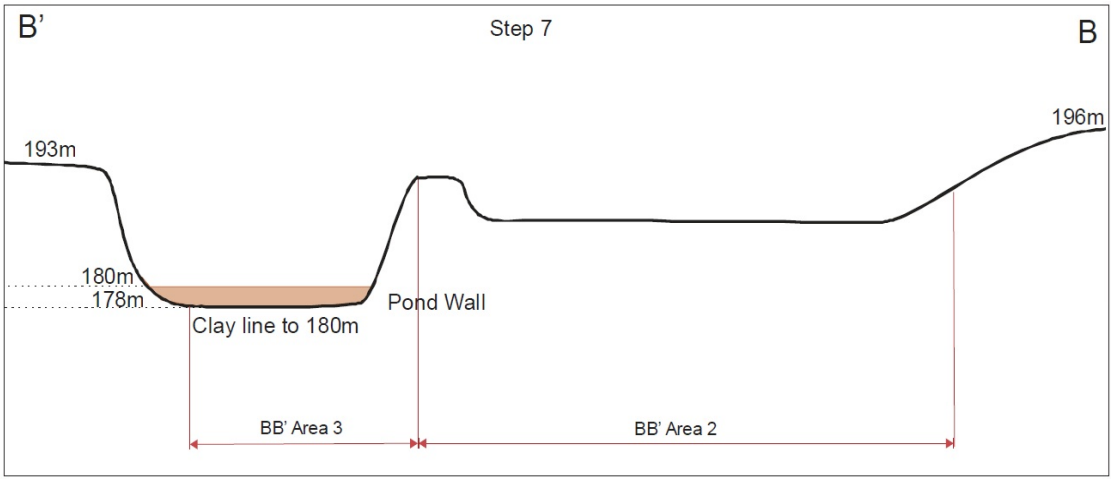

Figure 2.10: Step 7 in the dam construction process.

Step 8 The pond wall would be reduced in height to approximately RL181 metres or removed (refer **Figure 2.11**)

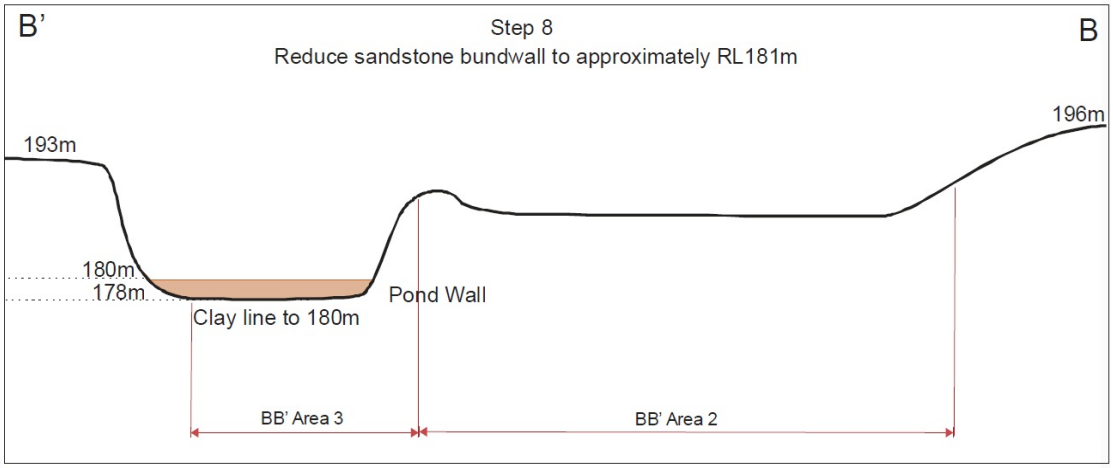

Figure 2.11: Step 8 of the dam construction process.

As per the approved dam construction, upon completion of overall construction, the temporary walls separating the three stages of the modified dam could be breached to form one large storage, however, it may be preferable to retain two or three separate dams during the quarry life to improve the storage efficiency and for water management purposes.

2.3 Sequence of Extraction

There is an approved sequence of extraction of the Site as shown on **Figure 1.6** and is described in detail in the EIS which accompanied the original development application 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.

During the extraction process, it has been determined that the approved method of extraction using the cells shown in **Figure 1.6** is neither an economic nor practical way to extract material from the Site.

The existing extraction process on the Site involves a similar cell by cell extraction process

but one which is not as rigidly defined as that portrayed in **Figure 1.6**. **Figure 2.12** shows the general location of the approved extraction cells overlain over the existing contours of the Site which depict the existing areas of extraction, a complete copy of which is at **Appendix 9**. It can been seen that the extraction which is being undertaken is not strictly in accordance with the approved extraction sequence.

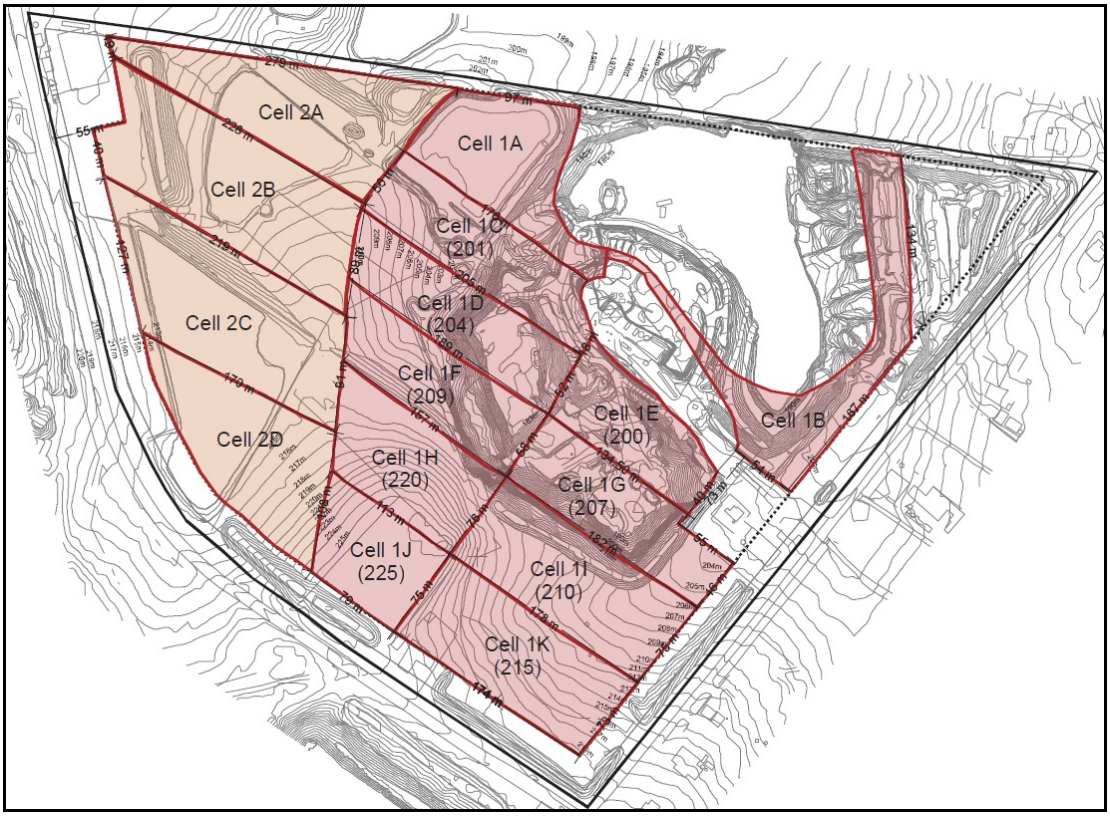

Figure 2.12: Plan showing the location of the approved stages of extraction overlain over the existing contours of the Site. A full copy of this plan is at **Appendix 9**.

It is proposed to modify the approved sequence of extraction to reflect that which is now being undertaken on the Site such that the most efficient means of extracting the material on the Site is achieved.

The proposed modified sequence of extraction is shown on **Figure 2.13**.

The proposed modification would see extraction undertaken in six (6) Phases, although the Phases shown are indicative only and will depend on market demand. **Figure 2.13** shows the indicative location of all Phases with plans showing each of the six (6) Phases at **Appendix 10**.

Figure 2.13: Plan showing the proposed modified sequence of extraction. A full copy of this plan, together with a plan of each Phase, is at **Appendix 10**.

2.4 Extraction Process

The approved extraction was to be undertaken in accordance with the method of extraction described in the s.96(2) modification to the Consent where a *"Pumping Unit"* method of extraction was to be employed (refer to **Part 1.3.1** of this Environmental Assessment).

Since commencement of the extraction, it has been determined that the approved *"Pumping Unit"* method of extraction is neither a practical nor an efficient means of extraction.

Whilst the general concept of the *"Pumping Unit"* method of extraction remains, there have been modifications made to that method as follows:

1. The approved method of extraction is as follows:

   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.

While the above is generally the case in the Maroota Sand, there are instances where sandstone is encountered which is not able to be extracted using an excavator alone. In such circumstances, the sandstone material is ripped using a dozer and then removed using the excavator.

2. The approved method of extraction states:

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.

The introduction of extracted material into the mixing tank is being undertaken, however, the approved process assumes that the mixing tank is mobile and can be easily moved around the active extraction cell with the excavator. This is physically not easily achieved. What actually occurs is that the mixing tank is located close to the processing plant and is located there on a semi-permanent basis. The material won from the extraction cell is loaded by the excavator to a dump truck which transports that material to a stockpile adjacent to the mixing tank. From there, a front end loader transfers the extracted material to the mixing tank.

2.4.1 Extraction of Maroota Sand

Prior to the commencement of extraction for each Phase, a temporary bundwall would be constructed around the perimeter of the Phase as depicted in the diagrams at **Appendix 10**. The geometry of the bundwall would be as shown in **Figure 2.14**.

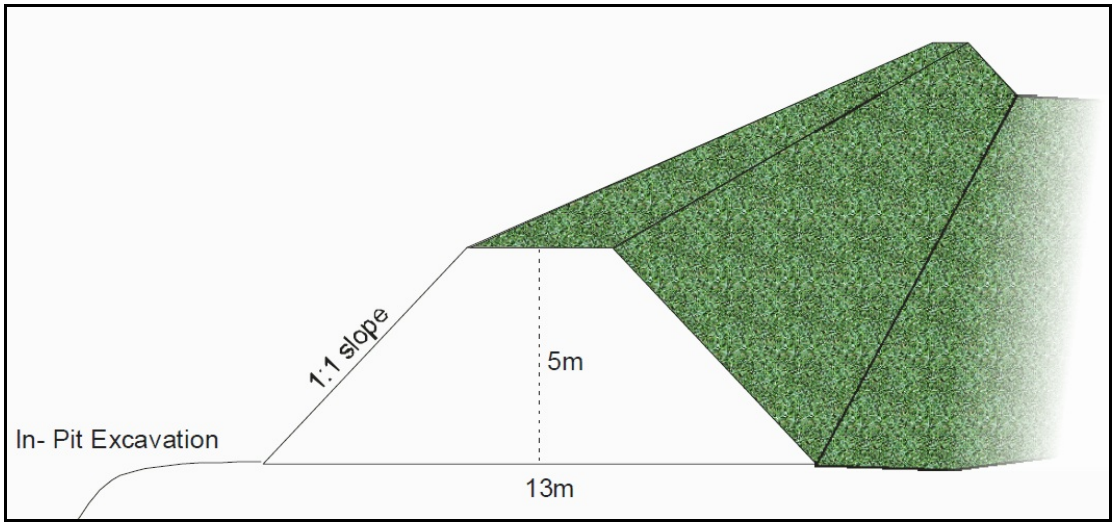

Figure 2.14: Diagram showing the geometry of the proposed bundwalls for each Phase of the extraction as shown in **Appendix 10**.

The bundwall would be constructed using an excavator with a water cart used to suppress dust while the bundwall is constructed. It is estimated that each bundwall would take

approximately three (3) weeks to construct.

Bundwalls would be approximately 5 metres in height with batter slope of 1:1.

During the construction, grass layers would be peeled back and relaid over the disturbed slope face. Water falling on the bundwall would be directed to the sedimentation ponds on the Site.

Once the bundwall is constructed, the Maroota Sand would be extracted using an excavator which would then push the extracted material over the active extraction face to the pit floor below. This process is shown in a schematic which is **Figure 2.15** below.

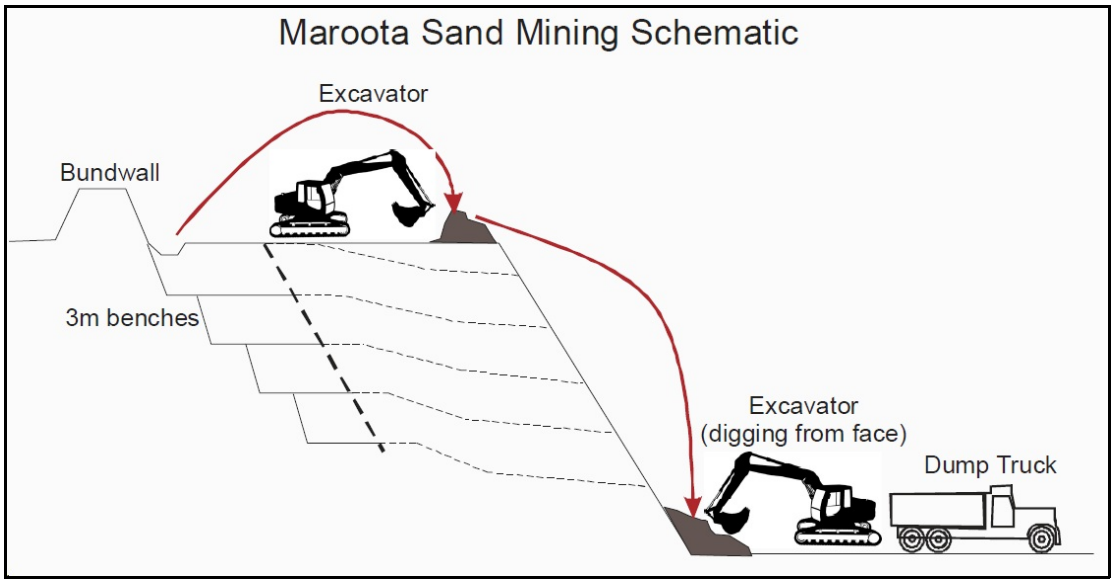

Figure 2.15: Diagram showing a schematic of the general extraction procedure for the Maroota Sand.

Once sufficient material has been pushed to the pit floor, the excavator would load the extracted material into a dump truck for transportation to the mixing tank near the processing plant. Water would be added and the material pumped to the processing plant where clay material is washed from the extracted material utilising the existing processing plant.

Benches would be approximately 3 metres in depth with slope of 1:1.

2.4.2 Extraction of Hawkesbury Sandstone

In certain Phases of the extraction process, the Maroota Sand will be situated on Hawkesbury Sandstone. The Maroota Sand would be extracted and processed as described above.

The Hawkesbury Sandstone is generally not able to be removed using an excavator and, as such, this material requires ripping using a bulldozer. A schematic of this process is at **Figure 2.16**.

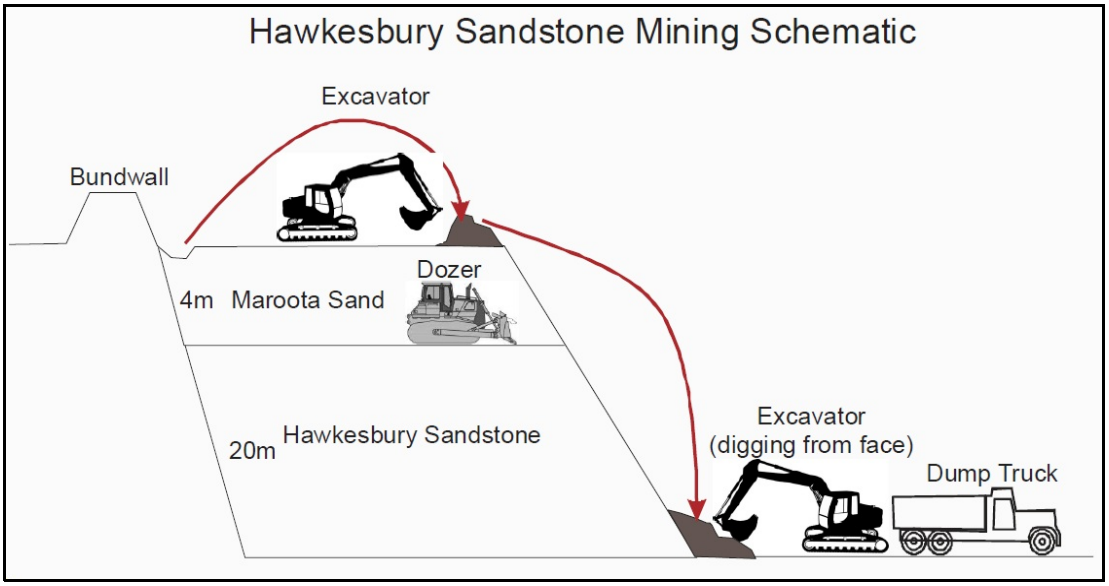

Figure 2.16: Diagram showing a schematic of the general extraction procedure for the Hawkesbury Sandstone.

As with the Maroota Sand, extracted Hawkesbury Sand is transported by dump truck to the processing plant.

The proposed modification would not alter the approved lateral extent of the approved extraction.

All other aspects of the extraction process are as per the existing modified consent except for the depth of extraction which will not be as great due to changes established in the wet weather groundwater level at the Site as discussed in **Part 3.5** of this Environmental Assessment.

It is proposed to modify the Consent to regularise the existing method of extraction as described above.

2.5 Approved Volume of Material to be Extracted

Table 4.3 of the EIS (a copy of which is reproduced below) provided details of the sequence of extraction, the volume of material to be extracted from each cell, and the time for that extraction to be completed.

The staging of the extraction contained in Table 4.3 is that which is provided for in **Figure 1.6**.

Table 4.3
Preliminary Extraction Schedule (Maroota Sand)

Stage Area	***Cell Number***	***Approximate Cell Volume (m^3)***	***Approximate Completion Time Following Commencement[1] (years)***
Stage 1	*Cell 1A*	*89,500*	*0.4*
	Cell 1B	*38.500*	*0.5*
	Cell 1C	*122,200*	*1.1*
	Cell 1D	*144,400*	*1.7*
	Cell 1E	*83,100*	*2.0*
	Cell 1F	*196,200*	*2.9*
	Cell 1G	*131,500*	*3.4*
	Cell 1H	*265,700*	*4.5*
	Cell 1I	*193,900*	*5.4*
	Cell 1J	*89,700*	*5.7*
	Cell 1K	*102,700*	*6.2*
Stage 2	*Cell 2A*	*103,100*	*6.6*
	Cell 2B	*183,800*	*7.4*
	Cell 2C	*208,500*	*8.3*
	Cell 2D	*138,600*	*8.9*
Plant and Stockpile Pad Area	-	*52,600*	*9.1*
Total		***2,144,00*** *[sic]*	***9.1***

[1] *Assumes constant extraction of 1,000 t/day for the life of the project.*

The schedule is based on the following assumptions and criteria:

- *future maximum sand production rate of 1000 t/day on average;*
- *a total excavation rate of approximately 1,430 t/day (assuming 70% is sand and 30% is clay/silt reject materials);*
- *production continuous for 5.5 days per week;*

- *an average bulk density of sand/clay materials of 1.6 t/m^3, and*
- *progressive extraction in a series of "cells" for Stage 1 and 2 areas.*

The above data were extracted from the Conceptual Mine Plan dated June 1999 prepared by Woodward Clyde.

Based on the above figures from Woodward Clyde, the EIS states:

> *The Applicant seeks approval for fifty (50) laden truck movements from the site per day with extraction to occur 5.5 days per week. During preparation of many of the technical reports which form the appendices of this EIS, it has been conservatively assumed that an average load of 20 tonnes will leave the site and as such the maximum volume of product leaving the site would be 1,000 t/day or 286,000 t/annum. In recent times, however, load limits for individual trucks have been increased significantly to allow a maximum of 33.5 tonnes per load. Thus, under existing maximum load limit regulations, it is expected that a maximum of **1,675 t/day** of extracted material will be taken from the site per day which equals **479,050 t/annum**. As such, with this maximum rate of product leaving the site daily, the resource on the site could be extracted in a period of 8-9 years allowing for time for commencement of operations.*
>
> *The above estimate, due to inclement weather, fluctuations in the demand for product and other limiting factors, may not occur each and every day during the life of the extraction. As such, a conservative average production of thirty (30) laden truck movements per day is anticipated over the life of the extraction which, with an average load of 33.5 tonne per load, represents **1,000 t/day** or **286,000 tonnes per annum**. On the basis of this rate of extraction, the total extraction of the resource could take up to 12-13 years to complete.*
>
> *On the basis of the above, the applicant seeks approval to complete the extraction at the rate of 50 laden trucks per day (**479,050 tonnes/annum**) and it is this figure upon which the impact of the proposed development has been assessed. For the purposes of determining the life of the extraction, however, and hence the life of any approval for that extraction, the above conservative estimate of 30 trucks per day is adopted. Allowing for contingencies and delays in the processing of approvals and the like after the initial consent has been given, an **approval for a 15 year period is sought**.*

It has become apparent that the volume calculations undertaken by Woodward Clyde, as detailed in Table 4.3 of the EIS, are flawed in that they do not provide accurate volumes of the material present on the Site. It is not known how Woodward Clyde obtained the volume figures contained in Table 4.3 of the EIS.

To establish a more accurate figure of the volume of material contained on the Site, VGT Environmental Compliance Solutions (**VGT**) has undertaken detailed volume calculations utilising survey data obtained in December 2013. Using a computer generated model of the Site, VGT has determined that there is 4,607,822m^3 of material on the Site in the approved extraction area compared to the 2,144,000m^3 calculated by Woodward Clyde.

A conservative estimate of 2 tonnes per m^3 should be applied to determine the tonnage of material on the Site. Applying that conversion rate, there is 9,215,644 tonnes of material on the Site. A figure of 60% sand to 40% clay/gravel is generally obtained. As such, 5,529,386 tonnes of the volume calculated by VGT would be sand product.

Approximately 1,000,000 tonnes of sand has been exported from the Site during the life of the extraction to date which means that approximately 4.5 million tonnes of sand product remains to be extracted. VGT has prepared a diagram which shows the calculated volume of material which has been extracted from the Site, both by the current operator and Dr Martin in the construction of the dam on the Site. A copy of that VGT drawing is at **Appendix 4**, with an extract provided as **Figure 2.17**.

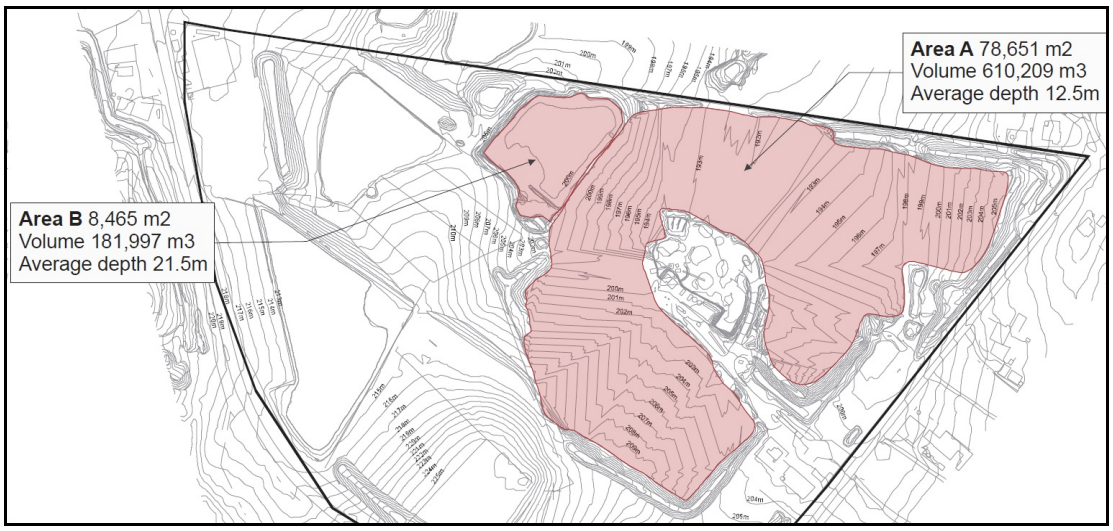

Figure 2.17: Extract from the plan at **Appendix 4** which shows the approximately volumes of materials extracted from the Site.

Using the approved formula for the rate of extraction as contained in the EIS, the following applies:

- maximum 50 laden trucks per day.
- average load per truck 33.5 tonnes.
- 1,675 tonnes per day.
- 5.5 days per week extraction = 286 days per annum.
- maximum 479,050 tonnes per annum extracted.
- 9.4 years of extraction remaining.

It is estimated that a further 10 years of extraction would be required after 31 May 2015 to complete the extraction of the Site.

Having regard to the errors in the original calculations undertaken by Woodward Clyde, it is

now proposed to modify the Consent based on the volume figures calculated by VGT. The applicant seeks a modification to the life of the extraction from 31 May 2015 to 31 May 2025.

2.6 Proposed Modifications to Development Consent No.267-11-99

To achieve the proposed modifications, a number of amendments would be required to the Consent.

Following are details of the proposed modifications to the Consent.

Condition 2

Condition 2 is proposed to be amended to:

(a) remove the word *"and"* at the end of the line *"the letter from Woodward-Clyde dated 21 December 1999"*.

(b) insert after *"the letter from Woodward-Clyde dates 16 December 1999"*, the following:

"• *the Environmental Assessment dated [add date] prepared by Nexus Environmental Planning Pty Ltd"*.

Condition 9

Condition 9 states:

> *9. The duration of extraction under this Consent is until 31 May 2016. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

As detailed in **Part 2.5** of this Environmental Assessment, the EIS which accompanied the original development application contained data from Woodward Clyde which incorrectly calculated the volume of material present on the Site to be 2,144,000m^3. VGT has determined that there is actually 4,607,822m^3 of material on the Site.

Having regard to the errors in the original calculations undertaken by Woodward Clyde, it is now proposed to modify the Consent based on the volume figures calculated by VGT. The applicant seeks a modification to the life of the extraction from 31 May 2016 to 31 May 2025. As such, Condition 9 would be amended to read:

> *9. The duration of extraction under this Consent is until 31 May 2025. The Applicant shall ensure that rehabilitation of all disturbed areas is completed within six months of completion of extraction.*

2.7 Hours of Operation

Condition 16 of the Consent states:

> *16. Unless prior written approval of the EPA is obtained, the hours of operation are:*
>
> - *construction: 7.00am to 6.00pm Monday to Friday*
> - *extraction and processing of materials: 7.00am to 6.00pm, Monday to Friday and 7.00am to 1.00pm on Saturdays*
> - *vehicle loading: 6.00am to 6.00pm, Monday to Friday and 6.00am to 1.00pm on Saturdays.*
>
> *No work shall be undertaken on Sundays or Public Holidays.*
>
> *These restrictions do not apply to routine maintenance work, such as the repair of machinery, provided the work does not result in exceedance of noise limits in Condition 47.*

The above approved hours of operation would not be modified as part of the proposed modification.

2.8 Limits on Production

The EIS submitted with development application 267-11-99 states:

> *The Applicant seeks approval for fifty (50) laden truck movements from the site per day with extraction to occur 5.5 days per week. During preparation of many of the technical reports which form the appendices of this EIS, it has been conservatively assumed that an average load of 20 tonnes will leave the site and as such the maximum volume of product leaving the site would be 1,000 t/day or 286,000 t/annum. In recent times, however, load limits for individual trucks have been increased significantly to allow a maximum of 33.5 tonnes per load. Thus, under existing maximum load limit regulations, it is expected that a maximum of **1,675 t/day** of extracted material will be taken from the site per day which equals **479,050 t/annum**.*

The above is reflected in Condition 50 of the Consent which states:

> *50. The Applicant shall ensure that truck movements associated with the development do not exceed 100 movements per day (50 laden truck movements) or 20 (10 laden truck movements) movements per hour, during construction or operation.*

No modification is proposed to the above approved limits on truck movements.

2.9 Rehabilitation

Condition 58 of the Consent requires the preparation of a Staged Rehabilitation Plan which forms part of the Site Environmental Management Plan.

It is proposed to modify the sequence of extraction of the approved development and, as such, there will be modification to the rehabilitation plan for the Site.

A modified sequence of rehabilitation has been prepared by Conzept Landscape Architects, a copy of which is at **Appendix 11**.

The objectives of the modified rehabilitation plan are to:

- *Coordinate with the current application and associated reports and plans*
- *Update the proposed rehabilitation methodology in line with the proposed modified staging, regularised extraction process and final extraction levels*
- *Propose a temporary landscape rehabilitation process for temporary Bunding associated with the delineation of staged extraction cells*
- *Propose a permanent landscape rehabilitation process and methodology for permanent Bunding associated with the final extraction cells and completing perimeter Bunding to the site*
- *Propose a final rehabilitation treatment and methodology to suit the proposed final extraction levels and profile of the site*
- *Implementation of a landscape maintenance programme which will help assure the success of the proposed rehabilitation works*

The Rehabilitation Strategy proposed as part of this modification is as follows.

2.9.1 Protection of Existing Vegetation

The Site is proposed for sand extraction in its entirety. As such, the focus of tree and vegetation protection would be limited to the existing vegetation at the perimeter of the Site, including the vegetated earth bunds, which were created as part of the initial approval of the extraction works. These bunds will be extended in accordance with the proposed Bund Rehabilitation Plans, revegetated, and the resulting area shall be treated as a no go zone.

Temporary chain mesh style fencing may be erected to protect these bunds, however, as they

are at the perimeter of the Site, and will be completed in line with the latter stages of staged cell extractions, it is unlikely the areas will be disturbed once planted.

2.9.2 Cell Extraction and Revegetation

Figure 2.13 shows the modified extraction for the Site, which modifies and regularises the process outlined in the existing approval.

The updated process and methodology proposes that the extraction works will occur across the face of a number of active cells. The resulting extracted cells will primarily allow access for heavy machinery to extract from cells behind those extracted.

As a result, the proposed landscape rehabilitation of areas within the Site can only occur when the active cells have been fully extracted to the Site perimeter and are no longer being utilised by machinery to access further cells, or for stockpiling.

As soon as areas within the Site have been fully extracted, these areas shall be made available for rehabilitation in accordance with the detailing and specification outlined in the rehabilitation plans (refer **Appendix 11**), and fenced off to allow for undisturbed regeneration.

2.9.3 Top Soil Stripping and Storage

Areas of the Site approved for extraction works will have the topsoil level (**Topsoil**) stripped and stockpiled for later reuse.

Following topsoil stripping, approximately 500mm of the next layer of soil (**Subsoil**) shall also be stripped and stockpiled, in a similar manner to the topsoil. The purpose of stripping this additional layer of soil is for reuse in temporary and permanent Bunding and also to replicate the soil profile in rehabilitated areas as close to the existing growing conditions of the vegetation community to be re-established.

It is proposed to stockpile the Topsoil and Subsoil in a convenient location away from daily activity, however, easily accessed for reuse in the creation of bunds and for preparation of rehabilitation areas as necessary.

The Stage 5 extraction cell, as identified in **Figure 2.13**, and as identified on the Final Rehabilitation Plan at **Appendix 11**, is the location nominated for initial stockpiling.

The location of stockpiled material may change depending on the of nature extraction works on site, and the reuse of stockpiled material will occur in line with modified extraction operations.

2.9.4 Bunding Construction and Staging

There will be two types of Bunding associated with the proposed staging of the extraction works. These will be Temporary Bunds and Permanent Bunds. Both type of bunds will essentially be built in the same way, with the same form and profile as detailed in **Figure 2.14**, however, the top profile layer and final planting treatments shall vary as follows:

Temporary Bunds

Temporary bunds shall be constructed with a profile as detailed in **Figure 2.14** from site material, including stockpiled Subsoil material where available.

The finished layer for planting will consist of a 300mm layer of site Topsoil, which shall be laid with turf stripped from Site.

The completed turfed bund will then be the subject of landscape maintenance in accordance with the Landscape Maintenance Schedule detailed in Landscape Maintenance Schedule (refer **Appendix 11**).

Permanent Bunds

Permanent bunds will be constructed with a profile as detailed in the **Figure 2.14** from site material, including stockpiled Subsoil material where available, as per the temporary bunds. Material from temporary Bunding may also be used.

The finished surface for planting will consist of a 300mm layer of site Topsoil, over which will be pegged a layer of approved jute matting material.

Jute matting will be pocket planting with specified planting as detailed in **Figure 2.18** and **Figure 2.19**.

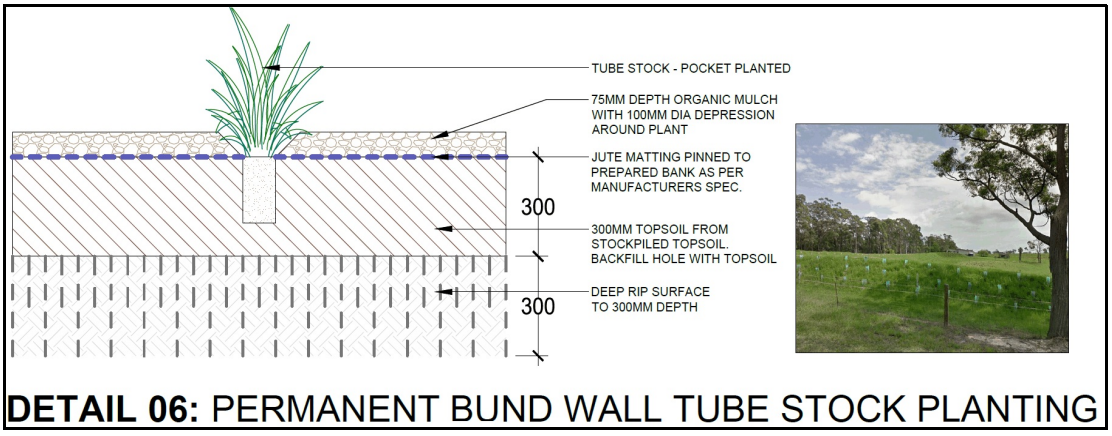

Figure 2.18: Permanent bund wall tube stock planting detail.

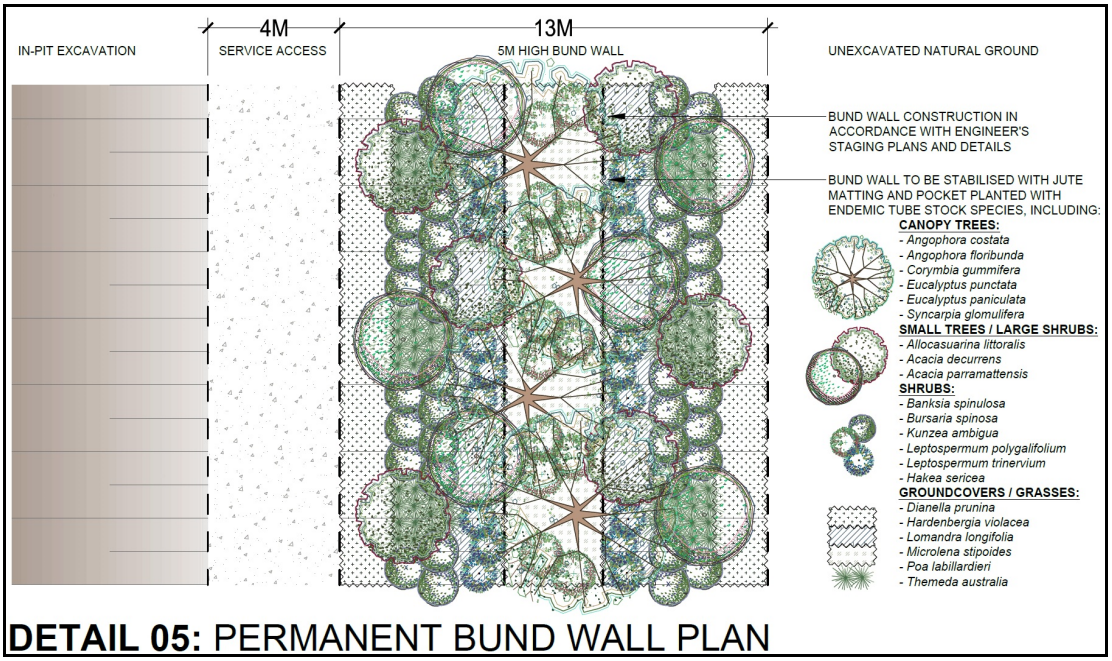

Figure 2.19: Permanent bund wall planting plan.

The completed landscaped bund will then be the subject of landscape maintenance in accordance with the Landscape Maintenance Schedule (refer **Appendix 11**).

2.9.5 Final Rehabilitation Treatment

Seed Collection / Certified Stock

To ensure the re-establishment of plant communities which are indigenous to the area, native seed and plant cuttings will be collected at appropriate times from the Site and surrounding areas by a qualified and experience horticulturalist or bush regeneration specialist who has knowledge and proven experience in this work.

The majority of seed collected from the area will be utilised in the hydromulch mix to be sprayed on Site in accordance with the Final Rehabilitation Plan at **Appendix 12**. The remainder of the seed, together with site cuttings, will be propagated under appropriate nursery conditions, and maintained until the resultant seedlings are ready to be planted on site in line with the proposed planting schedules and finishes.

Seed and cuttings will be collected treated, stored and propagated by an approved specialist to ensure the quality, quantity and viability of the seed and plant stock for planting on site.

The approved horticulturalist will ensure that the seed and cutting quantities are in line with those required for the areas made available for rehabilitation on an on-going basis.

If the seed and cutting quantities and quality collected and propagated cannot be achieved, or the range of specified species available using collection techniques, plant material may be

sourced from a local supplier, who is able to certify seed or plant stock has been locally sourced and grown.

Rehabilitation Treatment

There are three (3) types of landscape rehabilitation treatments proposed:

- hydromulching,
- pocket planting in natural material, and
- pocket planting in jute matting (for steeper grades).

Hydromulching This treatment is proposed for the open, general flat areas of the Site, located centrally. The process is detailed in Detail 10 of the Final Rehabilitation Details (refer **Appendix 12**), which includes preparation and specification for the proposed hydromulching works.

Pocket planting (natural materials) This treatment is proposed for the finished embankments located around the perimeter of the Site. This treatment is proposed for embankments up to a maximum grade of 1 in 3. The process is detailed in Details 7 and 8 of the Final Rehabilitation Details, which includes preparation and plant schedules for this process.

Pocket planting in Jute Matting This treatment is proposed for the finished embankments located around the perimeter of the Site. This treatment is proposed for embankments which exceed a grade of 1 in 3. The process is detailed in Details 7 and 11 of the Final Rehabilitation Details, which includes preparation and plant schedules for this process.

2.9.6 Vegetation Cover & Progressive Rehabilitation

Following the establishment of soil profiles, the specified vegetation cover is to be established through the following process:

Areas nominated for hydromulching

The central (level) areas of the Site identified as areas suitable for hydromulching will be prepared in accordance with Detail 10 of the Final Rehabilitation Details. The hydromulch mix will be prepared and applied in accordance with the specification provided.

The hydromulch seed stock shall have two (2) components:

1. A grass seed component which is intended to produce a temporary vegetation cover to ensure surfaces are stabilised as the specified native seed mix germinates. The grass seed component has either an Autumn & Winter Mix, or a Spring & Summer mix to suit the period of the year for the application.

2. A native seed mix, which is made up of locally sourced and collected seed stock and will be applied in the quantities and species outlined in the hydromulching specification.

All surfaces which fail to germinate following this application shall be re-seeded.

Areas nominated for pocket planting

The perimeter embankment areas of the Site have been identified as areas requiring pocket planting, and shall be prepared in accordance with Details 7, 8 & 11 of the Final Rehabilitation Details.

The pocket planting mix, layout and intended finish will be in accordance with the schedules and sections shown on the Final Rehabilitation Details. All planting sizes for pocket planting will be tube stock.

All areas of pocket planting and rehabilitation will be subject to on-going landscape maintenance.

The proposed landscape rehabilitation of areas within the Site can only occur when the active cells have been fully extracted to the Site perimeter and are no longer being utilised by machinery to access further cells, or for stockpiling. Once such areas within the Site become available, these areas will be subject to rehabilitation in accordance with the detailing and specification outlined in the rehabilitation plans.

Once these areas have been hydromulched or planted, they will be fenced off to allow for undisturbed regeneration. Temporary fencing of these areas will be 1.8m star picket with galvanised wires to support plastic high visibility mesh fencing.

Part Three

IMPACT OF THE PROPOSED MODIFICATION

3.1 Local Planning

3.1.1 The Hills Local Environmental Plan 2012

The Site is zoned RU1 Primary Production pursuant to The Hills Local Environmental Plan 2012 (**LEP 2012**).

Extractive industries are permitted, with consent, in the RU1 Primary Production zone.

Sub-clause 2.3(2) of LEP 2012 states:

> *(2) The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.*

Although the subject modification application is not a development application, the objectives of the RU1 Primary Production zone are:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To facilitate the economic extraction of materials from land and the subsequent rehabilitation of that land.*

The Site is currently subject to the Consent for extraction of sand, clay and pebble resources.

The proposed modification would be consistent with the above objectives of the zone in that a valuable resource would be extracted and the final landform following extraction would be that which would facilitate sustainable primary production.

3.1.2 The Hills Development Control Plan 2012

Part B, Section 1, Appendix B of The Hills Development Control Plan 2012 **(DCP 2012)** relates to extractive industry and has as its principal objectives:

(i) To consider the social, economic and environmental issues in the assessment and management of extractive industries; implement the objectives of international and nationally recognised environmental standards;

(ii) To encourage community participation in all phases of extractive industry development;

(iii) To provide sound technical parameters to facilitate the orderly development of extractive resources within environmentally sensitive regions;

(iv) To conserve the biological and cultural diversity and quality of the Baulkham Hills Shire; and

(v) To implement the requirements of the Environmental Planning & Assessment Act 1979 and other relevant environmental statutes.

The approved extractive industry on the Site has been conducted in accordance with the principal objectives of DCP 2012 and is continually monitored to ensure that those objectives are met. The proposed modification would continue extraction of the Site within the principal objectives of DCP 2012.

Section B1.2 of Part B, Section 1, Appendix B of DCP 2012 relates to extractive industry in the Maroota area and has as its objectives:

(i) To facilitate and ensure extraction occurs in a controlled and environmentally acceptable manner.

(ii) To facilitate Community participation and encourage local employment.

(iii) To maintain and upgrade the safety and efficiency of the existing external road networks.

(iv) To protect and maintain the safety and amenity of the Maroota Public School and residences not associated with extraction.

(v) To conserve the biological and cultural diversity of Maroota.

(vi) To conserve and protect the integrity pattern and quality of the Maroota ground water regime.

The proposed modification would be undertaken in accordance with the existing conditions of the Consent which have been designed to ensure that extraction of the Site is undertaken in an environmentally responsible manner.

Comprehensive environmental monitoring programs are in place to provide both the public and the relevant authorities with data which are used to ensure that the extraction of the Site is undertaken in an environmentally responsible manner. Those monitoring programs would remain following the proposed modification to ensure the integrity of the environment of the Site and its surroundings.

The proposed modification would:

(a) Maintain and not alter the existing approved access to the Site from Old Northern Road and Roberts Road.

(b) Ensure that the approved rehabilitation plan, as proposed to be modified as part of this modification application, is implemented to provide a finished landform which would be in keeping with the rural character of the area and provide a platform for agricultural pursuits.

(c) Maintain the approved buffers to adjoining development and native species as per conditions of the modified consent.

(e) Maintain approved internal access ways.

Section 2.6 of Part B, Section 1, Appendix B of DCP 2012 relates to flora and fauna. Conditions of the Consent which relate to flora and fauna and hence biodiversity are:

51. The Applicant shall conserve the six Acacia bynoeana plants in the following manner:

(a) a conservation area is to be established, containing the six plants and incorporating a 30 metre buffer;

(b) the boundary of the conservation area shall be surveyed and marked by a suitably qualified surveyor, with the assistance of a botanist/ecologist;

(c) the surveyed boundary shall be fenced to prevent vehicles entering the area;

(d) no clearing, construction or extraction shall occur within 30 metres of any plant identified in the EIS until steps (a) to (c) have occurred.

52. The Applicant shall not clear the strip of remnant vegetation along the southern fence line (Old Northern Road) and the vegetation to the north of the site entrance (Roberts Road) containing BlueMountains Mahogany

(Eucalyptus notabilis). This area shall be fenced off to prevent vehicles entering the area.

53. *In construction of the bund walls at the corner of Roberts Road and Old Northern Road, the Applicant shall minimise disturbance to existing native vegetation. In constructing the perimeter bund wall, the Applicant shall minimise disturbance to existing native vegetation.*

Flora and Fauna Management Plan

54. *The Applicant shall prepare a Flora and Fauna Management Plan as part of the EMP.*

The Plan shall be prepared in consultation with National Parks and Wildlife Service and Council, and shall:

(a) describe the characteristics and location of species, populations and communities that the proposal may impact upon;

(b) consider the feasibility and practicality of salvaging trees removed for the development for relocation to conserved or rehabilitated areas, for the purposes of reconstructing habitat for ground fauna

(c) contain a program for the active management and maintenance of all conserved and rehabilitated vegetation (as detailed in the EIS and required under this Consent) including consideration of:

- *post-extraction land use objectives for the site;*
- *utilisation of local endemic species or species naturally occurring in the Maroota area;*
- *planting around the Acacia bynoeana conservation area to further buffer this species and enhance its long term viability as a bushland ecosystem;*
- *connection of existing areas and future areas of revegetation to form a network of wildlife corridors throughout site and to adjoining lands to facilitate species recruitment through natural immigration;*
- *provision of rocks of varying sizes to provide refuge and basking sites for herpetofauna;*
- *fencing of revegetated areas to prohibit grazing by stock; and*
- *provision of artificial nest boxes for a range of arboreal fauna.*

(d) mitigation measures to be implemented should operations compromise the significant flora and fauna communities identified in the EIS; and

(e) an ongoing monitoring program of the existing and proposed revegetated areas to assess their floristical structure and diversity, resilience and robustness to disturbance, and fauna species diversity. The information obtained from the monitoring shall be used to guide future revegetation and management efforts.

55. The Applicant shall maintain the revegetated areas for the duration of the Consent.

Maintenance may include:

- *replanting failed or unsatisfactory areas*
- *repairing erosion problems*
- *fire management - fire suppression or fire encouragement*
- *pest and weed control*
- *control of feral animal populations*
- *maintain and repair fencing*
- *fertiliser application*
- *watering plants in drier areas, especially in the establishment phase*
- *application of lime or gypsum to control pH and improve soil structure.*

The proposed modification would not alter the above existing conditions of consent and would have no impact on flora and fauna.

3.2 Regional Planning

3.2.1 Sydney Regional Environmental Plan No.9 - Extractive Industry (No.2 - 1995)

The Site is located within the area to which Sydney Regional Environmental Plan No.9 - Extractive Industry (No.2 - 1995) (**SREP 9)** applies.

The Consent was issued having regard to SREP 9 with the conclusion that the approved development was consistent with the aims of SREP 9.

The proposed modification would not expand the previously approved lateral extent of extraction on the Site nor the approved depth of extraction. The proposed modification to the Consent would not result in any adverse impacts to the environment which would offend the aims of SREP 9.

Clause 7 of SREP 9 states that a person may, with consent, carry out extractive industry on land specified in Schedule 1 or 2 of SREP 9. In this regard, the consent authority:

... must not grant such a consent unless:

(a) it has considered the effect of the development on flood behaviour, the water quality, quantity and hydrodynamics of any watercourse or underground waters and also the effect of flood behaviour on the development and operations associated with the development in the vicinity, and

(b) it has considered a rehabilitation plan prepared in accordance with the Guidelines for Rehabilitation Plans in the Extractive Industry Report, and

(c) it is satisfied that, while the development is being carried out, noise and vibration levels will generally be in accordance with the guidelines in the State Pollution Control Commission Environmental Noise Manual (1985 edition) available at the offices of the Environment Protection Authority and the councils of the areas specified in Schedule 4, and

(d) it is satisfied that rehabilitation measures will be carried out in accordance with the guidelines in the Urban Erosion and Sediment Control Handbook (1992) prepared by the Department of Conservation and Land Management and available at the offices of the Department of Land and Water Conservation.

The approved extraction of the Site has been the subject of thorough environmental assessment procedures. The general conclusion has been that the extraction activity which has been undertaken on the Site has been undertaken within the environmental parameters which govern environmentally responsible extractive activities.

The approved extraction on the Site is subject to a comprehensive rehabilitation and management regime. The proposed modification would be undertaken in accordance with that approved management and rehabilitation regime, albeit with modification to the final landform plan as provided for in this modification application (refer **Appendices 10, 11 and 12**).

Detailed assessment of the approved extraction with regard to acoustic impact was undertaken as part of the original approval process which has resulted in appropriate conditions of consent which require continued monitoring of the acoustic impact of the development. An acoustic impact assessment has been undertaken to determine the impact the proposed modification would have on the acoustic environment (refer **Appendix 15**). This aspect of the proposed modification is also discussed in detail in **Part 3.7** of this EA. The proposed modification would alter the approved process of extraction being undertaken on the Site and would be subject to the existing conditions of consent and the on going monitoring regime which operates on the Site.

The proposed modification would extend the life of the approved extraction on the Site.

Clause 11 of SREP 9 states:

Special requirements for extractive industry at Maroota

(1) This clause applies to land described in Schedule 2.

(2) The council must not grant consent to the carrying out of development for the purpose of extractive industry on land to which this clause applies unless the council is satisfied that the proposed development:

(a) is unlikely to have a significant adverse impact on the Maroota groundwater resource or on other groundwater users in the region, and

(b) will conserve the environmentally sensitive and significant areas and features of the Maroota locality, including the environment of threatened species, populations and ecological communities, and

(c) will involve controlled and limited access points to main roads, and

(d) will result in a final landform capable of supporting sustainable agricultural production or other post-extraction land uses compatible with the established character and the landscape and natural quality of the Maroota locality.

The proposed modification seeks to extend the life of the approval and modify the approved method of extraction and dam construction. The approved development was the subject of an extensive groundwater impact assessment which concluded that the approved development would not impact the groundwater of the area.

As part of the Environmental Assessment for this modification, it has been determined that the originally approved depth of extraction to RL 182m would potentially impact groundwater on the Site. Modification (3) places a Reduced Level of 186.08m AHD on the depth of extraction. The proposed modification does not seek approval to alter the approved depth of extraction. A groundwater impact assessment has been undertaken, a copy of which is at **Appendix 16**. The impact the proposed modification would have on groundwater is discussed in more detail in **Part 3.5** of this Environmental Assessment.

The proposed modification would not increase the previously approved lateral extent of extraction and no impact is expected to either the flora and fauna of the area or any environmentally sensitive areas.

The proposed modification would not alter the approved access to the Site and would not involve any amendment to the approved number of truck movements to and from the Site.

An approved rehabilitation plan has been established for the Site which has as its aim to rehabilitate the Site such that it can be utilised mainly for agricultural purposes. A

revised rehabilitation process is proposed as part of this modification application which relates to the proposed modified final rehabilitated landform, details of which are provided in **Part 2.9** of this Environmental Assessment.

A Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19.**

3.2.2 Sydney Regional Environmental Plan No. 20 Hawkesbury-Nepean River (No. 2 - 1997)

Sydney Regional Environmental Plan No. 20 Hawkesbury-Nepean River (No. 2 - 1997) (**SREP 20**) applies to The Hills local government area.

The aim of SREP 20 is:

> *to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.*

Clause 6 of SREP 20 identifies specific planning policies and recommended strategies for development. Those specific strategies applicable to extractive industries are reproduced below with comments.

(1) Total catchment management:

(b) Consider the impact of the development concerned on the catchment.

(c) Consider the cumulative environmental impact of development proposals on the catchment.

Comment: The impact of the extraction of resources from the Site on the hydrology and ecology of the area was considered at the time of the assessment of the original development application. The proposed modification would not result in additional impacts.

(2) Environmentally sensitive areas

(b) Minimise adverse impacts on water quality, aquatic habitats, riverine vegetation and bank stability.

Comment: The existing extraction incorporates approved erosion, sediment and stormwater controls to divert clean runoff away from disturbed areas, and dirty runoff into sediment basins and ponds. A revised Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19**.

(c) Minimise direct and indirect adverse impacts on land reserved or dedicated under the National Parks and Wildlife Act 1974 or the Forestry Act 1916 and conservation area sub-catchments in order to protect water quality and biodiversity.

Comment: The proposed modification would not have adverse impact on these areas.

(d) Protect wetlands (including upland wetlands) from future development and from the impacts of land use within their catchments.

Comment: The proposed modification would not impact either the quality or amount of surface water leaving the Site nor would it affect the integrity of wetland areas in the catchment. A revised Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19**.

(e) Consider the need to include buffer zones (such as adequate fire radiation zones) for proposals on land adjacent to land reserved or dedicated under the National Parks and Wildlife Act 1974 or the Forestry Act 1916.

Comment: The proposed modification would not impact on these areas.

(g) Consideration should be given to the impact of the development concerned on the water table and the formation of acid sulphate soils.

Comment: The proposed modification, with existing conditions in place requiring extraction not to proceed below RL 186.08m AHD, would not affect the water table or potential acid sulphate soils.

(3) Water quality:

(a) Quantify, and assess the likely impact of, any predicted increase in pollutant loads on receiving waters.

Comment: The approved erosion, sediment and stormwater controls would be maintained and the proposed modification would not result in an increase in any pollutants leaving the Site. A revised Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19**.

(f) Consider the need for an Erosion and Sediment Control Plan (to be in place at the commencement of development) where the development concerned involves the disturbance of soil.

Comment: An erosion and sediment control plan has been approved for the Site. A

revised Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19**.

(4) Water quantity:

(b) Ensure the amount of stormwater run-off from a site and the rate at which it leaves the site does not significantly increase as a result of development. Encourage on-site stormwater retention, infiltration and (if appropriate) reuse.

Comment: The proposed modification would not increase the amount of stormwater runoff leaving the Site. A revised Soil and Water Management Plan has been prepared for the modified development, a copy of which is at **Appendix 19**.

(d) Consider the impact of development on the level and quality of the water table.

Comment: Modification (3) places a Reduced Level of 186.08m AHD on the depth of extraction. The proposed modification does not seek approval to alter the approved depth of extraction. A groundwater impact assessment has been undertaken, a copy of which is at **Appendix 16**. The impact the proposed modification would have on groundwater is discussed in more detail in **Part 3.5** of this Environmental Assessment.

(5) Cultural heritage:

(b) Protect Aboriginal sites and places of significance.

Comment: The proposed modification would not impact on any protected Aboriginal sites or places of significance.

(c) Consider an Aboriginal site survey where predictive models or current knowledge indicate the potential for Aboriginal sites and the development concerned would involve significant site disturbance.

Comment: The proposed modification would not allow disturbance of any land which has not already been disturbed as part of the previous approvals for extraction or covered by previous archaeological surveys.

(6) Flora and fauna:

(a) Conserve and, where appropriate, enhance flora and fauna communities, particularly threatened species, populations and ecological communities, aquatic habitats, wetland flora, rare flora and fauna, riverine flora, flora with heritage value, habitats for indigenous and migratory species of fauna, and existing or

potential fauna corridors.

Comment: The proposed modification is such that threatened species, populations or ecological communities, or existing conservation areas would not be affected.

(c) Minimise adverse environmental impacts, protect existing habitat and, where appropriate, restore habitat values by the use of management practices.

Comment: The proposed modification would not increase any environmental impact to existing habitats. The approved rehabilitation plan, as modified, would ensure that appropriate rehabilitation of the Site is undertaken as extraction ceases.

(e) Consider the range of flora and fauna inhabiting the site of the development concerned and the surrounding land, including threatened species and migratory species, and the impact of the proposal on the survival of threatened species, populations and ecological communities, both in the short and longer terms.

Comment: The proposed modification would not impact threatened or migratory species, populations or ecological communities of the area or impact their long term survival.

(f) Consider the need to provide and manage buffers, adequate fire radiation zones and building setbacks from significant flora and fauna habitat areas.

Comment: The proposed modification would not alter existing approved buffers and setbacks.

3.3 State Environmental Planning Legislation

3.3.1 State Environmental Planning Policy No.55 - Remediation of Land

State Environmental Planning Policy No.55 - Remediation of Land (**SEPP 55**) aims:

.... to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

There has been no contamination identified as part of the existing extraction to date and the nature of the Site is such that it is unlikely that any contamination exists on the Site.

3.3.2 State Environmental Planning Policy No.44 - Koala Habitat Protection

State Environmental Planning Policy No.44 - Koala Habitat Protection (**SEPP 44**) applies in The Hills Shire local government area.

SEPP 44 aims to encourage the proper conservation and management of areas of natural vegetation which provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.

An assessment pursuant to SEPP 44 was been undertaken as part of the original development application process and stated:

> *SEPP No.44 provides a number of Steps which must be followed in the determination of a Development Application on land to which the Policy applies. Step 1 is a determination of whether the land is potential koala habitat. In this regard the SEPP states:*
>
> > *"7 (1) Before a council may grant consent to an application for consent to carry out development on land to which this Part applies, it must satisfy itself whether or not the land is a potential koala habitat.*
> >
> > *(2) A council may satisfy itself as to whether or not land is a potential koala habitat only on information obtained by it, or by the applicant, from a person who is qualified and experienced in tree identification.*
> >
> > *(3) If the council is satisfied:*
> >
> > > *(a) that the land is not a potential koala habitat, it is not prevented, because of this Policy, from granting consent to the development application;"*
>
> *The flora and fauna assessment of the site which has been undertaken as part of the EIS process ... has concluded that:*
>
> > *"The land is not potential koala habitat as Grey Gum the only listed feed tree on site comprises less than 15% of the total number of trees present on the site."*
>
> *As such, the remaining provisions of SEPP No.44 do not apply.*

The proposed modification is such that no additional assessment is required pursuant to SEPP 44.

3.3.3 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (**SEPP Infrastructure**) has as its aim:

> *... to facilitate the effective delivery of infrastructure across the State by:*
>
> *(a) improving regulatory certainty and efficiency through a consistent planning regime for infrastructure and the provision of services, and*
>
> *(b) providing greater flexibility in the location of infrastructure and service facilities, and*
>
> *(c) allowing for the efficient development, redevelopment or disposal of surplus government owned land, and*
>
> *(d) identifying the environmental assessment category into which different types of infrastructure and services development fall (including identifying certain development of minimal environmental impact as exempt development), and*
>
> *(e) identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure development, and*
>
> *(f) providing for consultation with relevant public authorities about certain development during the assessment process or prior to development commencing.*

The existing extractive industry on the Site has access to Roberts Road and then to Old Northern Road. The assessment of the impact that the approved development would have on the intersection of Roberts Road with Old Northern Road was canvassed in the assessment of the original development application by Lyle Marshall and Associates Pty Ltd. That assessment stated:

> *This intersection has been up-graded recently to provide a sheltered right turn bay in Old Northern Road .... The pavement striping continues on the northern side of Roberts Road .....*
>
> *An INTANAL analysis shows that the current intersection, which has been upgraded recently to include a sheltered right turn bay, will continue to operate at Level of Service A to the end of the project.*
>
> *The sight distance in Old Northern Road and south of Roberts Road are considered satisfactory for a speed of 100 km/hour.*
>
> *No intersection improvements, except for double centreline markings in Roberts Road for 30 metres from Old Northern Road, are required.*

To ascertain the existing impact of the approved extraction and to determine if the proposed modification would have any additional impact, Lyle Marshall and Associates Pty Ltd has updated its original assessment, a copy of which is at **Appendix 13**. Details of that assessment are discussed in **Part 3.8** of this EA.

3.3.4 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The aims of the State Policy are:

> *.... in recognition of the importance to New South Wales of mining, petroleum production and extractive industries:*
>
> *(a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
>
> *(b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
>
> *(b1) to promote the development of significant mineral resources, and*
>
> *(c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources, and*
>
> *(d) to establish a gateway assessment process for certain mining and petroleum (oil and gas) development:*
>
> *(i) to recognise the importance of agricultural resources, and*
>
> *(ii) to ensure protection of strategic agricultural land and water resources, and*
>
> *(iii) to ensure a balanced use of land by potentially competing industries, and*
>
> *(iv) to provide for the sustainable growth of mining, petroleum and agricultural industries.*

Clause 12 of the Policy states:

> ***Compatibility of proposed mine, petroleum production or extractive industry with other land uses***

Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

(a) consider:

(i) the existing uses and approved uses of land in the vicinity of the development, and

(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and

(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and

(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

The proposal is for modification of an existing consent and, as such, is not an application for consent for development. Notwithstanding:

1. The existing uses in the vicinity of the Site are a mixture of agricultural, sand extraction, service facilities and rural residential development.

2. The sand extraction on the Site has been operating for many years and there has been no record of concerns with the impact of the sand extraction on other land uses in the vicinity of the Site.

3. There is potential for the extraction on the Site to be incompatible with other land uses in the vicinity of the Site by way of acoustic and air quality impacts. The existing development is undertaken generally in accordance with the Consent and the proposed modification has been assessed with regard to its potential impact from noise and dust (refer **Appendices 14 and 15** and **Part 3.7** and **Part 3.8** of this EA.) The conclusions of those assessments is that, with suitable conditions in place as per the existing consent, and monitoring in accordance with the Consent and the Environment Protection Licence, the modified extractive industry would be compatible with land uses in the vicinity of the Site.

4. The end use of the Site following completion of extraction would be for rural purposes consistent with the adjoining land to the north.

3.3.5 Protection of the Environment Operations Act 1997

Section 43 of the Protection of the Environment Operations Act 1997 (**POEO Act**) requires an Environment Protection Licence to be obtained for the carrying out of *"scheduled development works"* which would enable a *"scheduled activity"* to be carried out.

The existing extractive industry on the Site operates within Environment Protection Licence No.6535. The proposed modification would fall within the existing Environment Protection Licence and no modification would be required to that licence.

3.4 Commonwealth Legislation

The **Commonwealth Environment Protection and Biodiversity Conservation Act 1999** (**EPBC Act**) came into force from 16 July 2000. The EPBC Act requires actions which are likely to have a significant impact on matters of National Environmental Significance or which have a significant impact on Commonwealth land to be referred to the Commonwealth Minister for the Environment for approval.

The Site is not listed as a national heritage place and the proposed modification would not impact on any national heritage places.

The proposed modification would not impact on any threatened species and communities.

No National Environmental Significance matters would be impacted by the proposed modification. As such, the proposed modification has not been referred to the Commonwealth Minister for the Environment and approval pursuant to the EPBC Act is not required.

3.5 Groundwater

As part of the preparation of the EIS for the original development application for extraction, extensive assessment of groundwater on the Site was undertaken. Following is an extract from the documentation contained in the EIS.

> *A groundwater assessment of the site has been undertaken as part of the EIS process.....*
>
> *The scope of the groundwater investigations was:*
>
> *1. a review of the existing groundwater environment;*

2. *the establishment of three groundwater monitoring bores at selected locations;*

3. *the performance of falling head tests at these bores to assess the hydraulic conductivity of the formation surrounding the bores;*

4. *the collection of groundwater samples for analysis of a number of parameters, and*

5. *the collation and assessment of these data and the preparation of a report to be included in the EIS document.*

Additional to this work, was the setting out of a groundwater monitoring program. For this purpose, automatic data loggers were installed in the three bores to record fluctuations in the water table in the Maroota Sand aquifer, the principal geological unit underlying the property.

According to the Baulkham Hills Shire Council Development Control Plan No.500, the position of the water table in that aquifer determines the depth to which the excavation can be carried out.

Monitoring Bores

.... three monitoring bores were drilled ....

The sites were chosen on the basis of existing available information in order to intersect the greatest thickness of the Maroota Sand. The geological and construction logs of the bores are presented in Appendix A of the groundwater impact assessment .... and relevant details are given in ***Table 3.13*** *below.*

Bore PT84MW1 was located near the nursery building at the northern corner of the property and at the apex of a triangle formed with the two other bores to provide hydraulic gradients and geological confirmation of the expected thickness of the Maroota Sand formation.

Bore PT84MW2 was drilled at the site of the Department of Land and Water Conservation (DLWC) Maroota Groundwater Study, Stage 2 monitoring bores (Nos.75003 & 75004) in order to supplement data on the Maroota Sand from that location. The results of the drilling indicate that the Maroota Sand at this location may be of a greater thickness than initially estimated by Etheridge (Etheridge, 1980).

Bore PT84MW3 was located in a central position within the property and at a location along the palaeochannel identified by Etheridge where the thickest section of Maroota Sand is found. The bore was drilled to a depth comparable with the depth of the current excavation within the property.

Table 3.13
Bore Statistics

Bore No.	East.	North.	Surface Elevation m AHD	Top of Casting Elevation m AHD	Total Depth m b.g.	Screened Interval m b.g.	SWL m b.g.	TDS mg/L	Hydraulic Conduct. m/sec
PT84MW1	9422.49	6132.88	213.43	214.24	11.89	4.9-10.9	5.34	186	$6.7x10^{-7}$
PT84MW2	9637.10	5698.76	226.80	227.63	26.50	18.6-24.6	24.52	NA	$1.4x10^{-6}$
PT84MW3	9802.78	5916.37	202.43	203.25	21.90	14.9-20.9	18.84	266	$2.9x10^{-6}$

Drilling has confirmed the presence of substantial clay layers within the Maroota Sand, which may give rise to perched water tables at different levels within the formation.

Groundwater Sampling and Analysis

Upon completion of drilling, construction and development, the bores were purged and sampled. The samples were submitted to Australian Laboratory Services under chain of custody procedures.

Of the three bores, bore PT84MW2 could not be adequately sampled because of both the small volume of water which could be obtained and its slow rate of recovery observed during purging.

....

The groundwater from the two sampled bores is somewhat similar in nature although bore PT84MW1 has a lower ionic concentration, reflecting its perched nature, its shallower depth, higher elevation and consequent rainfall recharge effects.

The analyses reveal that a small amount of nutrients are present in the groundwater, particularly in bore PT84MW1, in the form of ammonia, nitrate and phosphate, most likely the result of the agricultural pursuits of the area. Nutrients have also been found in several bores during the DLWC Maroota Groundwater Study, Stage 2.

The water samples were also analysed for the presence of Total Petroleum Hydrocarbons (TPH), a broad test which includes an array of organic compounds, not all necessarily associated with petroleum products. This was done in the event that the dredging operations at the site may have had an impact on the groundwater, although, in consideration of the geology encountered during drilling, and of the low permeability of the formation, this was considered unlikely. A small amount of TPH was recorded in the results. Upon further checks, the chromatographs of the analyses .... indicated that the recorded peaks related to chlorinated products. The results are explained with the use of

chlorinated breakdown agents used to disperse the drilling mud during development of the bores.

Hydraulic Tests

The completed bores were subjected to a falling head test in order to evaluate the hydraulic conductivity of the formation around each bore. The tests are performed by the injection of a slug of water in the bore, which causes a rise in the water level, and in the measurement of the rate of fall of that level with time. Water level data were recorded using a Solinst automatic data logger and pressure transducer.

The tests results were analysed by the Bower and Rice method using the computer program "Aquitest" developed by Waterloo Hydrogeologic. Plots of the tests are presented in Appendix C of the groundwater impact assessment and the applicable values included in ***Table 3.13*** *above.*

The results indicate hydraulic conductivity values ranging from 0.25 m/day to 0.05 m/day, with a most probable average value of 0.14 m/day. These values, which are typical of clayey sands, together with the small saturated thickness of the Maroota Sand indicate that this aquifer has only a limited water supply capacity.

Automatic Data Loggers

The three monitoring bores have been equipped with Dataflow Systems Pty Ltd automatic data loggers of the same type used in the area by the DLWC. ....
Data collected in this manner from these bores will help in the delineation of the water table in the Maroota Sand and, hence, in the determination of the allowable depth of mining.

Hydrogeology

The formations present in the Maroota area have dissimilar hydrogeological characteristics. The high degree of lithological variability (i.e., sands, clays, shale, sandstone, etc.) often results in the establishment of perched water tables in both the Maroota Sand and in the Hawkesbury Sandstone and, possibly within the latter, between the weathered profile and the fresher sandstone.

Under these conditions, three separate aquifers can be identified, although the extent of their hydrogeological separation or, conversely, interconnection, is sometimes uncertain. These aquifer units are:

- *the Maroota Sand;*
- *the eluvial/weathered profile of the underlying Hawkesbury Sandstone, and*

- *the fresh Hawkesbury Sandstone.*

The more significant aquifers are the Maroota Sand and the deeper Hawkesbury Sandstone. The description of the hydrogeological characteristics of the two aquifers presented in this EIS is based on records held by Woodward-Clyde, by the Department of Land and Water Conservation (DLWC) and others contained in EIS documents available in the Maroota area.

Department of Land and Water Conservation (DLWC) Bore Records

A review of the bore records held by the DLWC for the Maroota area is summarised in Table 4 and their location plotted in Figure 1 of the groundwater impact assessment at Appendix 6 [of the EIS]. The table and figure include observation bores recently established by the DLWC during its Stage 2 Maroota Groundwater Study, by other sand mining companies, and by the applicant during the preparation of this EIS.

Maroota Sand

The Maroota Sand, where it occurs below water table (such as in the deeper section of sands along the palaeochannels), constitutes an unconfined, or water table aquifer. It is open to direct rainfall infiltration and, as a consequence, is subject to seasonal variations in response to rainfall patterns and climatic cycles.

The aquifer derives its permeability (its ability to store and transmit groundwater), from the open pore spaces between its constituent sand grains. The permeability of the Maroota Sand aquifer is variable and is limited by its clay content, the degree of cementation of the ferricrete and ferruginous bands and the presence of substantial clay layers. Although the storativity of the Maroota Sand aquifer is considered greater than that of the underlying Hawkesbury Sandstone, its total storage capacity is reduced by its limited saturated thickness, particularly north of Maroota, and by its relatively small areal extent.

The natural groundwater flow (underflow) within the Maroota Sand aquifer is dictated by its position at the top of the Maroota Ridge along Old Northern Road and Wisemans Ferry Road. The underflow, therefore, follows the topographic relief pattern and, where this relief intersects the base of the aquifer, seepages can be expected to occur at the contact with the less permeable underlying material. These seepage points, identified by Etheridge at the margins of the Maroota Sand outcrop, supply water to a number of perennial creeks at the margin of the Maroota Sand outcrop.

Where the water table in the Maroota Sand aquifer is at a higher elevation than that of the underlying Hawkesbury Sandstone, a potential exists for groundwater flow and recharge to the Hawkesbury Sandstone aquifer to occur from this source.

The commercial extraction of groundwater from the Maroota Sand aquifer requires large diameter excavations and dams, due to the relatively low permeability and

storage capacity of the aquifer, even in the deeper sections of the buried palaeochannels. Irrigation supplies to orchards and market gardens in the area are drawn in this manner.

In addition to the regional water table within the Maroota Sand aquifer, perched water tables occur above the extensive clay layers and ferricrete bands present within the formation.

From a resource viewpoint, the perched water tables have limited value due to their small extent and storage, but they may be significant in the maintenance of vegetation capable of tapping this source. Where sand mining will take place, however, by necessity the vegetation will be removed and the local aquifer excavated, so that the vegetation-perched water table interdependence will no longer be an issue.

Similar geological conditions as described above for the regional area were also encountered during the investigations at the subject site.

In bore PT84MW1, the Maroota Sand attains a thickness of approximately 9.5 m and the aquifer is represented by a thin layer of gravelly material. It is considered that the aquifer at this location is perched above the Hawkesbury Sandstone.

In bore PT84MW2, the Maroota Sand was expected to be between 20 m and 25 m thick, with substantial clay layer in the upper sequence. The aquifer was found below a thick sequence of clay at a depth of approximately 24.5 m.

In bore PT84MW3, the Maroota Sand was also represented by a sequence of clays and sands and mixes of both.

The overall nature of the Maroota Sand aquifer has been summed up in the conclusions of the recently completed Maroota Groundwater Study, Stage 2 Final Draft Report, in which the DLWC has stated that: "The Maroota Sand aquifer has limited water supply potential, based upon the saturated thickness of the formation at the time of the investigation".

Eluvial Sand/Weathered Sandstone Profile

Small aquifer zones have developed in the eluvial sand, which comprises the leached and weathered profile of the Hawkesbury Sandstone. These zones often form perched aquifer systems above the deeper regional water level of the Hawkesbury Sandstone.

In the majority of cases, these perched aquifer systems have limited resource value because, like the Maroota Sand, they have small extent and storage. They act as temporary storage of groundwater prior to release to streams or leakage to underlying aquifers. Dams and large diameter wells constructed into this material can provide a source of farm water supplies, but generally the permeability is too low to yield significant supplies to small diameter boreholes.

Hawkesbury Sandstone

The Hawkesbury Sandstone is generally an impermeable rock, due to the large degree of grain cementation resulting from the development of secondary minerals in the interpore spaces, such as kaolinitic clay and iron oxides. The presence of these minerals in the groundwater gives the characteristic red-brown staining of the rock visible in road cuttings and building stone. Although the rock has negligible primary permeability, fracturing and jointing, where open and interconnected, provide secondary permeability and storativity.

Estimates of transmissivity (i.e. permeability times aquifer thickness) for the Hawkesbury Sandstone, calculated from the available bore records by Australian Groundwater Consultants (now AGC Woodward-Clyde) and more recently by Woodward-Clyde, range from 0.06 m^2/day to 3.6 m^2/day. These values support the overall low permeability characteristics of this formation as understood from geological interpretation. Storativity is estimated to be in the order of 0.001, due to the secondary permeability characteristics of the aquifer.

Available records show that different water tables are intersected during drilling into the Hawkesbury Sandstone, due to the different degree of fracturing and the presence of confining layers (such as the shale lenses) within the rockmass. Because most bores in the Hawkesbury Sandstone are completed open hole, however, an equilibrium water table is eventually established with time, often coinciding with the deeper water table intersection, through drainage from the upper strata.

Groundwater Quality

Maroota Sand

The quality of the groundwater in the Maroota Sand aquifer in the area within and around the proposed development is dependent upon direct rainwater infiltration and the chemical processes and exchanges occurring with the minerals contained in the formation. This process is reflected in the generally low salinity of the groundwater ....

Water quality data presented in the DLWC Stage 2 Final Draft report indicate TDS values between 76 mg/L and 195 mg/L for the Maroota Sand aquifer to the northeast and to the southwest of the subject site. During the DLWC Stage 2 investigations at site 3, located within the subject site, the Maroota Sand aquifer was considered to be dry and no monitoring bore was constructed at this site.

Data collected during the current investigations indicate TDS values of 186 mg/L for bore PT84MW1 and 266 mg/L for bore PT84MW3 and thus fall within the upper end of the observed range of values for this formation. A water sample could not be collected from bore PT84MW2 because of the low yield of this bore.

Hawkesbury Sandstone

Water quality in the Hawkesbury Sandstone in the Maroota area is generally good. Because the Hawkesbury Sandstone is not in outcrop in the subject site, this formation is not discussed in greater detail here.

Groundwater Levels

Maroota Sand

The determination of the position of the water table in the Maroota Sand (the shallow aquifer of the DLWC report) and in the Hawkesbury Sandstone has been the focus of the recent studies conducted in the area. A generally agreed position of the water table in the shallow aquifer under the subject property will be the basis for the final level to which extraction will be allowed in the future. The DLWC has recommended and adopted as its policy in the Stage 1 of the Maroota Groundwater study that:

> *"the base of the excavations made for the purpose of sand mining should be maintained at least 2 m above the seasonally highest elevation of the shallow water table."*

The report did not provide guidelines for the recognition of the seasonally highest elevation of the shallow water table.

The Extractive Industries Development Control Plan No. 500 adopted by Baulkham Hills Shire Council in December, 1996 states that:

> *"Extraction should not occur within 2 m of the wet weather high groundwater level or otherwise to the requirements of the Department of Land and Water Conservation."*

Again, no method of determining the wet weather high water table was provided.

....

Water levels in the groundwater monitoring bores on the site recorded by the automatic data loggers are presented in Figures 3, 4 and 5 of the groundwater impact assessment at ***Appendix 6*** [of the EIS].

Bore PT84MW1 is shallow with a Maroota Sand thickness in the order of 9.5 m. Groundwater in the bore has been found in a gravelly layer at around 6 m below ground and above a clay base.

Bore PT84MW2 shows a water level which, based on the geological log of the DLWC bores next to it, may be also considered perched above a significant clay layer. The recent records show that the water table at this site is deeper than originally anticipated and deeper than the depth of the bore (25.6 m) as the flat plot of the data shows that the water level in the bore is at the top of the casing sump (202.2 m AHD) or at the base of the screens.

Bore PT84MW3 is considered representative of the water table in the deeper Maroota Sand. The data plot shows that the water level in this bore has moved within a 0.6 m range, possibly in response to weather patterns.

Outside the subject site, bore PF166MW1 is also considered to display a perched water table.

With the exclusion of the above perched levels, it appears that the water table within the Maroota Sand aquifer ranges between 178.58 m AHD to 183.59 m AHD, with an average of around 180 m AHD.

The licensed dam in Portion 167, excavated to the base of the Maroota Sand, reportedly has a water level close to 180 m AHD, which is considered a representative shallow aquifer level as it is located in the palaeochannel and was excavated to the top of the Hawkesbury Sandstone initially.

A surveyed peg has been placed in the excavation of the current pit at the site and a water level of 180.29 m AHD was measured in February 1999. A regular program of water level monitoring has been initiated.

In summary, it appears that the Maroota Sand aquifer, in its deeper sequence, has a water table mostly at or below 180 m AHD, with perched water tables at various locations depending on elevation and geology. The data show the high degree of variability in aquifer thickness and water table depth in the Maroota Sand.

Several of the bores in the area tapping both aquifers are located at high elevations along the Maroota Ridge, which represents both a surface divide and a groundwater divide. The low density and the distribution of the groundwater monitoring points on either side of a surface and groundwater divide makes the production of a reliable water table contour map difficult. Groundwater gradients measured in recent investigations in closely spaced bores are variable and steep in places due to the low permeability of the rockmass, particularly in the Hawkesbury Sandstone. Groundwater flow directions are expected to be generally to the northwest, east and south, away from the main axis of the groundwater divides, which coincide with the main surface divides. In specific areas, the presence of excavations and dams in the Maroota Sand used for irrigation is likely to cause local distortion of hydraulic gradients.

Conditions 17 and 39 of the Consent deal with the impact of the approved development on groundwater and state:

DEPTH OF EXTRACTION

17. The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.

Groundwater Management

> *39. The Applicant shall immediately notify DPI-Water in the event of groundwater being encountered during excavation. The location and elevation of such intersections is to be reported to allow determination by DPI-Water whether the water table occurs within a perched aquifer or if it is at a regional level. In the event of breaching of the groundwater table, operations are to cease and DPI-Water consulted immediately to determine the basis upon which extraction may recommence. If no response is received from DPI Water within 24 hours, the Applicant shall implement the emergency contingency plans as described in the Soil and Water Management Plan (Condition 38). The Applicant shall advise the Director-General of the results of any such incidents under this Condition.*

Based on the above, the approved construction of the dam on the Site is to have a base level of 180 m AHD with the approved extraction not to be undertaken below RL 186.08m AHD.

The proposed modification does not seek to either change the approved dimensions of the dam or increase the lateral extent of the approved extraction, however, the proposed modification presents an opportunity to review the maximum wet weather elevation for the Maroota Tertiary Sands Groundwater Source (**MTSGS**). In this regard, Australian Groundwater Technologies (**AGT**) has prepared a report titled *"Hodgson Quarry Groundwater Assessment, Roberts Road, Maroota"* (**the AGT Report**), a copy of which is at **Appendix 16**.

As stated in the AGT Report:

> *Since quarrying commenced, policy changes have seen the introduction of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan (WSP) (2011) and Aquifer Interference Policy (AIP) (2012). As part of the modification, the New South Wales Office of Water (NOW) requires evidence that the proposed modifications adhere to the above mentioned plans.*

The purpose of the AGT Report was to:

- *Evaluate the approved depth (from the original EIS) in context of the proposed modification.*
- *Update the original groundwater assessment, including review of groundwater levels to confirm the extraction depth limit.*
- *Assess the quarry modifications against the Greater Metropolitan Region Water Sharing Plan (GMRWSP) and the aquifer interference policy (AIP).*
- *Outline a strategy for groundwater monitoring and management that will ensure compliance against the WSP / AIP.*

Bores in the locality are shown on Figure 1 of the AGT Report, and extract from which is at **Figure 3.1**.

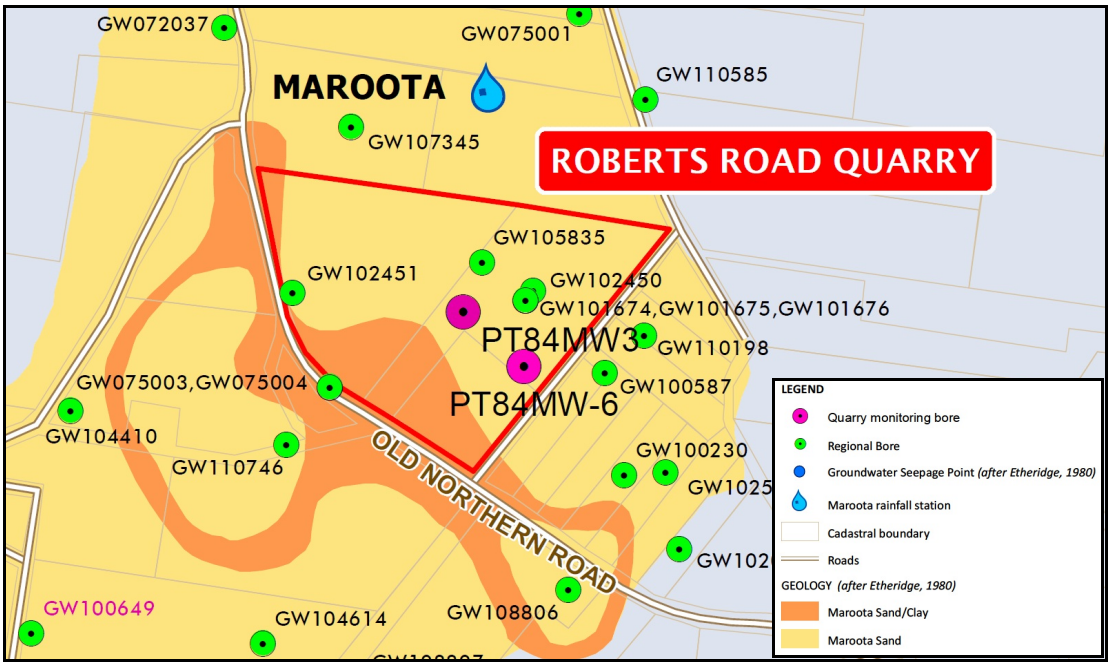

Figure 3.1: Extract from Figure 1 of the AGT Report showing the location of bores in the locality. Bores PT84MW3 and PT84MW-6 are located on the Site, however, bore PT83MW3 has been decommissioned.

Bore PT84MW-6 was drilled in January 2015. The bore has been drilled to a total depth of 273.46 mAHD.

Groundwater monitoring information was collated from the following 3rd party bores located off site in the surrounding Maroota Area:

- Water level time series data was obtained from bore PF167MW-1 (GW100649) located on the quarry to the south-west (quarry owned by PF Formation).

- Standing water level was obtained from NOW bore GW75000/1. Readings from this well allow comparison with the original recordings taken prior to the original approval.

On 28 October 2014, an in-pit investigation was conducted to determine whether groundwater inflows could be identified within the current pit footprint. The investigation included in-pit surveys and observations from quarry faces.

Rainfall for the month of October was recorded at 47.6mm at the Old Telegraph Rainfall Station, Maroota (BoM station No.67014). The following observations were recorded during the investigation:

- In-pit elevations were recorded between 215m and 183.7m AHD.

- Inspection across the pit faces and quarry floor did not identify pit seepages or pooled water.

- An unwanted clay band was recorded at 183.7m AHD.

The following conclusions were drawn from the investigation:

- No groundwater inflow was occurring at the current extraction depth of 183.7m AHD.

- The unwanted clay band at 183.7m AHD is of low permeability and is classed as an aquitard. Based on data from observation well PT84MW-6, the regional MTSGS is located below this depth.

Hydrographs of Reduced Standing Water Level (**RSWL**) and cumulative deviation from mean monthly rainfall are presented in Figure 5 of the AGT Report. The hydrographs incorporate RSWL readings from the commencement of quarrying representing approximately 14 years of data.

The following general comments can be made with regard the RSWLs:

- Recently installed PT84MW-6 recorded a RSWL of 183.10m AHD on 3 March 2015. This well represents the most accurate recording for the MTSGR and corresponds with a period of above average rainfall. Water level in the well remains below the current quarry depth (183.7m AHD) and is likely confined by the "unwanted clay band".

- Private monitoring well PF167MW-1 (GW100649) recorded RSWL between 179.50m AHD and 182.50m AHD. Groundwater levels fell during the period February 2002 and September 2004 coinciding with below average rainfall. The most recent water level was recorded at 180.10m AHD on 13 April 2005.

- Recent groundwater monitoring at 75000/1 (22 September 2014), located 1.3 km to the south west of the Site, recorded a water level of 181.09m AHD. This level is marginally higher than that recorded during the original EIS (180.19m AHD) recorded in January 1998. There is no time series data between the two readings but the data confirms that water levels have not significant deviated over a 15 years period.

- Private monitoring bore H6, located approximately 2 km to the south west of the Site, recorded groundwater levels between 179.14m AHD and 184.23m AHD. Groundwater levels exhibit a general correlation with rainfall patterns. A sharp rise was observed in June 2007 and April 2012 in response to above average rainfall. Water levels declined from 2002 to 2004 and from mid to late 2012 in response to below average rainfall.

The AGT Report concludes:

> *Based on well data .... local and regional bores correlate with the water levels recorded from the EIS assessment (Woodward-Clyde, 1999). Monitoring from 1999 record water levels in the regional MTSGS between 178.64.5 and 184.23 mAHD.*

For the purpose of this assessment PT84MW-6 is the most representative well and a maximum wet weather groundwater elevation of 183.10 mAHD is proposed. This would restrict the quarry pit depth to 185.10 mAHD. It should be noted however that the clay band identified at 183.7 mAHD locally confines the regional MTSGR, and quarrying to the preferred depth of 183.7 mAHD will not intersect groundwater.

A cross section showing the current landform and the proposed landform is presented as Figure 6. The wet weather elevation adopted by the original EIS assessment (existing consent) together with the revised wet weather elevation 2015 (this modification) are also shown on Figure 6 for comparison.

An extract from Figure 6 of the AGT Report is at **Figure 3.2**.

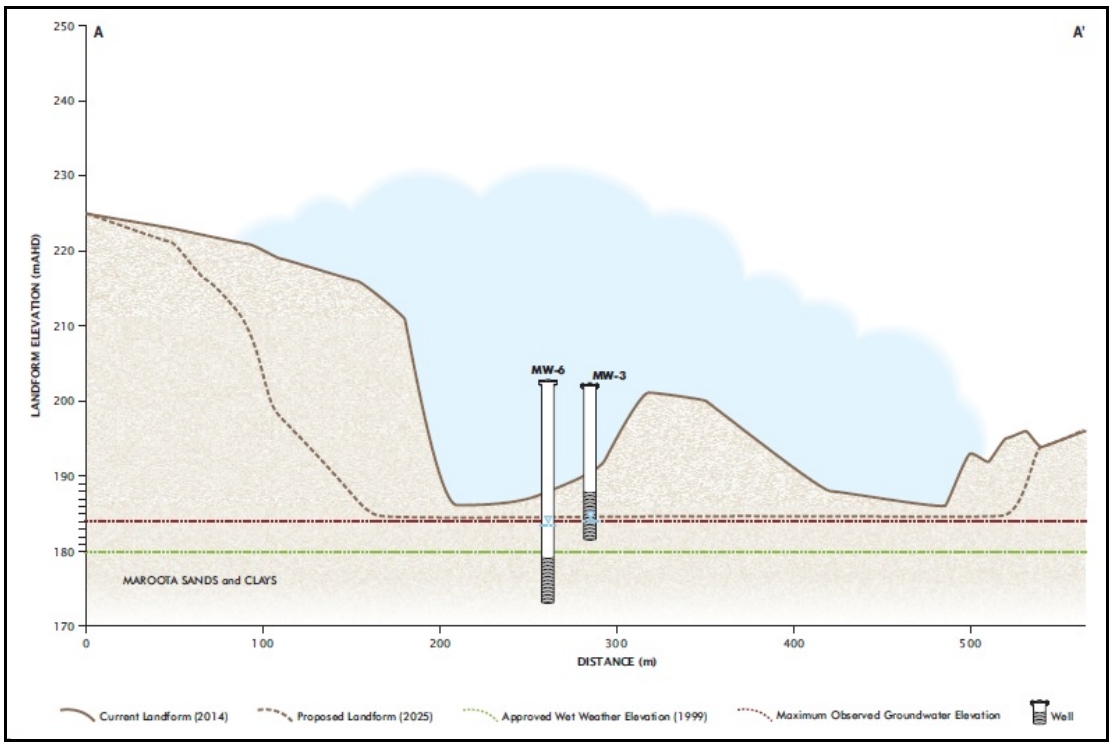

Figure 3.2: Extract from Figure 6 of the AGT Report.

In response to the findings of the AGT Report, it could be argued that approved depth of extraction should be raised from 182m AHD to 185.1m AHD.

Notwithstanding, as discussed in **Part 1.3.2** of this Environmental Assessment, as part of the assessment process of Modification (3), the NSW Office of Water made comment as follows:

The Office of Water has reviewed the information provided it and it requests that the Department of Planning and Environment notes the following:

- *That the highest water level measured beneath the site is at least 1 m above that which has been reported in the current documentation (i.e. at 184.08 m AHD, not 183.10 m AHD).*

- *That any excavation approved for the one year period requested must*

maintain additional freeboard accordingly (i.e. no excavation deeper than 186.08 m AHD).

As a consequence of the above comments from the NSW Office of Water, the Consent was modified such that Condition 17 now reads:

The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.

No change to Condition 17 is proposed as part of this modification.

3.5.1 Assessment against the AIP and WSP

Aquifer Interference Policy (2012)

As detailed in the AGT Report, the depth of extraction will not extend to the depth of the groundwater level for the MTSGR and the final landform depth will be restricted to 186.08m AHD. For this reason aquifer interference will not occur and the project is compliant with the rules of the AIP. For clarity however, all of the rules and requirements stipulated in the AIP have been summarised in Table 7 of the AGT Report with reasons why rules are satisfied. Table 8 of the AGT Report provides additional data to support the assessment of

Table 7: Minimal impact considerations for aquifer interference activities. NB Table based on Table 1 of AIP (2012)

	Highly Productive Groundwater Sources					
	Water Table	**Summary of impact and monitoring**	**Water Pressure**	**Summary of impact and monitoring**	**Water Quality**	**Summary of impact and monitoring**
1. Alluvial Water Sources	1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. A maximum of a 2 m decline cumulatively at any water supply work. 2. If more than 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies(6) will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2 m decline cumulatively at any water supply work then make good provisions should apply.	**Mitigation Measure:** Quarrying will be maintained 2 m above the wet weather regional groundwater level for the MTSGS. There will be no groundwater extraction or mine inflows during or post quarrying activities from the regional water table. This will mitigate any drawdown impact to high priority GDE's or culturally significant assets. **Monitoring**: Groundwater monitoring will be conducted on and off site. These wells will monitor groundwater level trends and detect any unforeseen impacts including detection of impacts > 40 m from the site.	1. A cumulative pressure head decline of not more than 40% of the "post water sharing plan" pressure head above the base of the water source to a maximum of a 2 m decline at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1.(a) above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	**Mitigation Measure:** Quarrying will be restricted to the MTSGS unit and will maintained 2 m above the wet weather regional groundwater level. The confined fractured rock Sydney Basin Central Groundwater Source is at depth and will not be intercepted or extracted during quarry activities. For this reason this principle is not applicable. **Monitoring**: Deep monitoring bores are already on site (GW75003, GW75004) that monitor the Sydney Basin Central Groundwater Source. These bores will be monitored and maintained during quarry operations to detect any unforseen groundwater impacts. This will be in addition to the shallow monitoring bore that targets the MTSGS.	1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. 2. If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.	**Mitigation Measure:** Quarrying will be maintained 2 m above the wet weather regional groundwater level for the MTSGS. There are no water quality impacts as a result of the project. Mitigation measures such as those listed in Table 6 will be implemented to prevent contamination to the groundwater source. There are no GDE or Water supply works identified in the greater area that could be impacted. **Monitoring**: Suitably constructed monitoring bores will be maintained on to detect any unforeseen groundwater quality impacts.

"minimal impact" as stipulated in the AIP.

Copies of Tables 7 and 8 of the AGT Report are reproduced below.

Table 8: Summary of AIP requirements to support notion of "minimal impact" from quarry activities

Requirement	Summary of compliance	Reference of compliance
Establishment of baseline groundwater conditions including groundwater depth, quality and flow based on sampling of all existing bores in the area potentially affected by the activity, any existing monitoring bores and any new monitoring bores that may be required under an authorisation issued under the Mining Act 1992 or the Petroleum (Onshore) Act 1991	Baseline groundwater and quality data has been captured since 1998 for shallow and deep bores, over a range of climatic variations	Section 4 of this report; Woodward-Clyde (1999);
A strategy for complying with any water access rules applying to relevant categories of water access licences, as specified in relevant water sharing plans. For example, returning water of an acceptable quality to the affected water source during periods when flows are at levels below which water users are not permitted to pump	Project is in accordance with the rules of the WSP, in particular meets the criteria stipulated for both the MTSGS and The Sydney Basin Central Groundwater Source.	Section 4 and 5 of this report.
Details of potential water level, quality or pressure drawdown impacts on nearby water users who are exercising their right to take water under a basic landholder right. Consideration will need to be given to any relevant distance restriction requirements that may be specified in any relevant water sharing plan or any remediation measures to address these impacts	No impact to existing users as the MTSGS will not be intercepted as part of mining activities, nor will the Sydney Basin Central Groundwater Source.	Section 4 and 5 of this report.
Details of potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources	No impact to existing users as the MTSGS will not be intercepted as part of mining activities, nor will the Sydney Basin Central Groundwater Source.	Section 4 and 5 of this report.
Details of potential water level, quality or pressure drawdown impacts on groundwater dependent ecosystems	No GDE's identified in the study area	Woodward-Clyde (1999); Section 3.3 (this report).
Details of potential for increased saline or contaminated water inflows to aquifers and highly connected river systems	Mitigation measures for contamination are in place	Section 6, Table 6 of this report
Details of the potential to cause or enhance hydraulic connection between aquifers	Quarrying will be above the MSTGS, therefore there is no opportunity for hydraulic connection to the underlying Sydney Basin Central Groundwater Source.	Section 4 of this report
Details of the potential for river bank instability, or high wall instability or failure to occur	Mining will not be carried out near any creek or river.	Woodward-Clyde, 1999
Details of the method for disposing of extracted water (in the case of coal seam gas activities)	N/A	N/A

Compliance with Water Sharing Plan (2011)

The MTSGS and the Sydney Basin Central Groundwater Source are the gazetted groundwater resources underlying the development area. Geological mapping conducted by the Geological Survey of NSW (Etheridge, 1980) confirms that the proposed development is fully encapsulated by outcropping Maroota Sands, with the Hawkesbury Sandstone located further to the west (see Figure 1 of the AGT Report) and at depths beyond the proposed final landform depth. For this reason, rules in the WSP have only been considered against the Maroota Tertiary Sands Groundwater Source as detailed in Table 9 of the AGT Report, a copy of which is reproduced below.

Table 9: Summary spreadsheet of WSP rules and compliance for the MTSGS.

Access Rules	Relevance for this Development	Reason why rule is not applicable	Reference
Granting of access licenses may be considered for a listed number of activities	Not applicable	-The proposed work modifications do not seek an application license because the regional Maroota Sands aquifer will not be intercepted. Excavations from quarrying will extend to a maximum depth of 185.10 mAHD, 2 m above the approved 'wet weather' groundwater elevation (183.10 mAHD).	Section 4
Rules for managing water allocation accounts			
Carryover	Not applicable	-no application license is being sought therefore amendments to license conditions are not required -The Maroota Tertiary Sands Groundwater Source will not be intercepted during site operations.	Section 4
Rules for Managing Access Licenses			
Managing surface and groundwater connectivity	Not applicable	-the existing pit is >40 m from the high bank of any river or creek as indicated in Figure 1 of this report. -The nearest groundwater seepage points are over 1 km to the south-west and north-east of the quarry site. -the MTSGS will not be intercepted over the life of quarrying therefore surface water impacts from groundwater related activities cannot occur. -groundwater is not abstracted as part of site operations. Water use is restricted to surface run-off captured in dams.	Groundwater seepage points are located on Figure 1 of this report
Rules for granting or amending water supply works approvals			
to minimise interference with neighbouring water supply networks	Not applicable	for the above reasons interference with neighbouring bores cannot occur.	
To protect bores located near contamination		-No application licence is being sought; -The development does not intercept or abstract groundwater and therefore will not impact hydraulic gradients, or facilitate the mobilization of any contamination in the vicinity; -The development remains entirely in the unsaturated zone. -No areas of contamination have been identified within 500m of DP 228308 and	
To protect bores located near sensitive environmental areas	Not applicable	-No groundwater supply works are being carried out as part of the development; -No interception of the groundwater source will take place. Groundwater will not be intercepted or taken during quarrying either through pumping or inflows from open voids. -The development remains entirely above the 'wet weather' groundwater elevation and will not impact on any discharges to / from sensitive environmental areas.	Figure 1 shows the nearest environmental receptors are > 1 km from the quarry site.
To protect groundwater dependent culturally significant sites	Not applicable	-No groundwater supply works are being carried out as part of the development; -No interception of the groundwater source will take place. Groundwater will not be intercepted or taken during quarrying either through pumping or inflows from open voids. -The development remains entirely above the 'wet weather' groundwater elevation and will not impact on any discharges to / from sensitive environmental areas.	
Rules for replacement groundwater supply works	Not applicable	- groundwater replacement works are not being conducted. The proposed work modifications relate specifically to the mining plan, extraction methods and the estimated mine life.	
Rules for the use of water supply works approvals			
To manage bores located near contaminated sites	Not applicable	-The proposed work modification does not involve groundwater extraction or interception of gazetted groundwater sources for any purpose. -no contaminated site exists within 500 m of the proposed operation	
To manage the use of bores within restricted distances	Not applicable	-The proposed work modification does not involve groundwater extraction or interception of gazetted groundwater sources for any purpose.	
To manage the impacts of extraction	Not applicable	-The proposed work modification does not involve groundwater extraction or interception of gazetted groundwater sources for any purpose.	
Limits to the availability of water			
Available water determinations (AWD's)	Not applicable	-The proposed work modification does not involve groundwater extraction or interception of gazetted groundwater sources for any purpose.	

3.6 Surface Water

A Soil and Water Management Plan (**SWMP**) was developed by Morse McVey and Associates Pty Ltd for the site in 1999 and was submitted with the original EIS. The SWMP indicated that the general drainage pattern of the Site is in the northerly direction along a natural creek line which joins a tributary of Coopers Creek approximately 2 km to the north, which eventually flows into the Hawkesbury River. Drainage within the Site is characterised by two separate catchments. The western catchment (some 8.9 ha) contains two dams which provide a water supply to the existing nursery operations. The eastern catchment (some 20.7 ha) drains the remaining area of the Site with generally all runoff directed into the existing dam construction area. The dam construction area also collects runoff from the small catchment to the east of Roberts Road (approximately 10.5 ha). Runoff from this catchment enters the Site via a road culvert beneath Roberts Road, located some 60 m north of the Site entrance. The total catchment area of the current dam construction area is 31.1 ha.

The current dam construction area is located at the lowest point within the Site and it is possible that, during exceptionally high rainfall periods, the excavation area could overfill. During such events, overflow from the construction area would occur via a natural low point in the pit northern wall into the existing natural watercourse.

Water balance modelling was undertaken as part of the EIS for the original development application, extracts from which are provided as **Part 2.2** of this EA.

During the construction of the approved dam, the applicant has determined that the construction process would be better served if the dam were to be constructed in three (3) stages rather than the approved two (2) stages. It is proposed to amend the Consent to modify the dam construction process accordingly. There is no change to the modelled water balance as a result of the proposed modification.

Notwithstanding, a revised SWMP has been prepared for the modified development, a copy of which is at **Appendix 19**. The executive summary of the revised SWMP states:

> *This document has been prepared to discuss the proposed Soil and Water Management system within the Maroota Quarry, located at Maroota.*
>
> *The water management of the site has been developed to comply with Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries. Sediment basins are designed for a 95th percentile, 5 day rainfall event whilst catch drains and diversions are designed for a 10 year Average Recurrence Interval.*
>
> *Clean water is currently diverted around the disturbed area via diversion bunds where possible and the natural topography assists. A portion of clean water from the undisturbed areas and properties adjacent to the quarry on Roberts Road does enter the main quarry area. Dirty water is collected in the disturbed areas into one of several dams to allow for settling to occur.*
>
> *Retained water is reused on site for dust suppression and material processing. For*

this reason water is generally retained as far as possible on site. No water is released off-site.

If required Dams will only be discharged when quality limits are met.

The proponent will undertake a regular monitoring and maintenance program to ensure water management goals are met.

3.7 Acoustic Impact

The Consent, as modified, contains conditions 45, 46 and 47 relating to the acoustic impact of the approved development, as modified.

The proposed modification seeks to amend the approved method of extraction of sand on the Site. There is potential that the amended extraction process would impact the acoustic amenity of the locality.

Wilkinson Murray Pty Limited has reviewed the proposed modification to determine the likely impact the modified development would have on the acoustic environment. The report of Wilkinson Murray Pty Limited (**the Wilkinson Murray Report**), a copy of which is at **Appendix 15**, states:

The existing consent allows 50 laden truck movement per day. The approved hours are 6.00am and 6.00pm, Monday to Friday and 6.00am to 1.00pm on Saturday with the extraction and processing commencing at 7.00am. Loading of trucks only is permitted in the period 6.00am to 7.00am on all days. The present operation, which involves extraction of material, stockpiling and screening, operates a processing plant (highlighted in green in Figure 1-2 and includes pumps, screens, conveyers, cyclone) plus an excavator to win material and 2 dump trucks to transport to the processing plant.

There is intermittent need to use a dozer to rip the friable sandstone which generally occurs at lower levels within the quarry (RL195 with the exception of the north-western corner where it occurs up to RL205) and also an additional excavator to build mounds, remove topsoil and construct the final landform.

A front end loader is used to feed the processing plant and another front end loader is used to load haul trucks. On a typical busy day there would be 50 trucks loaded (33.5 tonnes per load), i.e. over 12 hours, this is on average 4 per hour or 1 in any 15-minute period. These follow the blue path shown in Figure 1-2.

A copy of Figure 1-2 of the Acoustic Impact Assessment is reproduced below as **Figure 3.3**

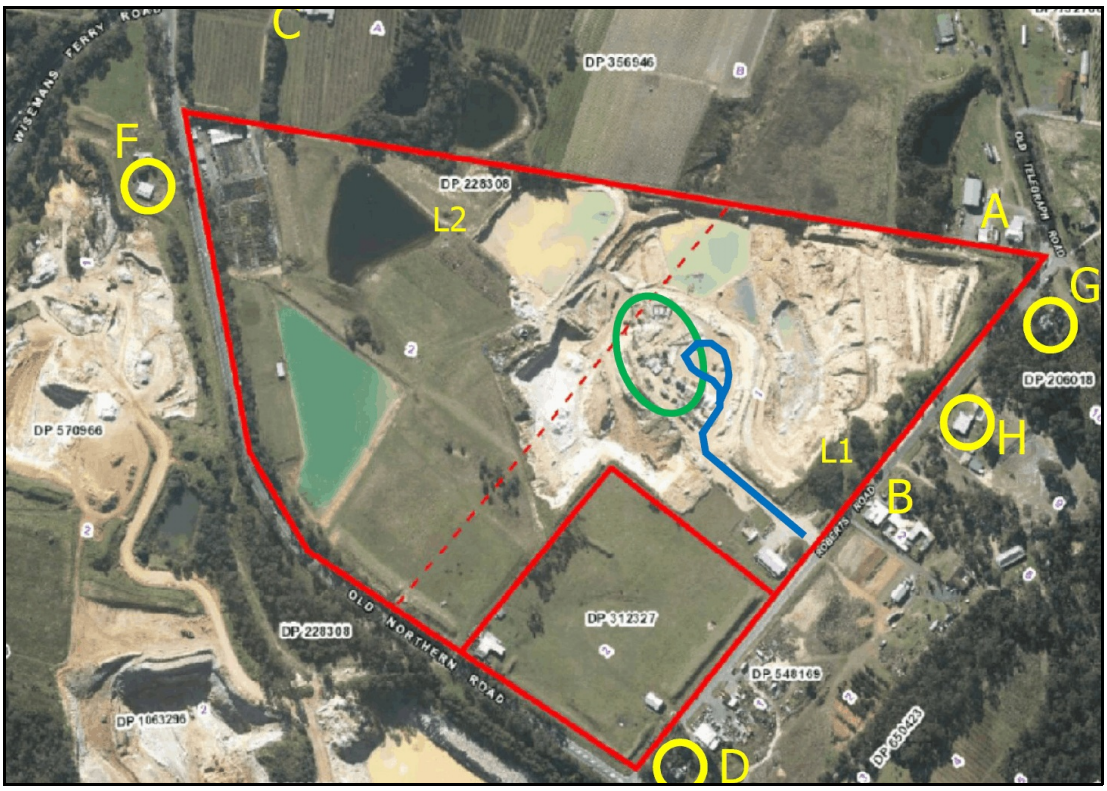

Figure 3.3: Location of receivers for acoustic impact assessment.

The land surrounding the quarry site is rural, although there are a number of other sand quarries in the area. The nearest existing residences, as shown in Figure 1-2 and retains the same nomenclature as the original noise report. Residences are located to the east and south on the corner of Roberts Road and Old Telegraph Road (A) and on the opposite side of Roberts Road (B, G & H). One residence (D) is located near the corner of Old Northern Road and Roberts Road.

Residences are also located to the north on either side of Old Northern Road, one on the eastern side (C) and one on the western side (F).

EXISTING NOISE ENVIRONMENT

The INP recommends collecting one week of background noise data in order to determine the RBL which is then used to set criteria. However, background noise by definition can't include any noise from the industry being assessed. Therefore background data can't be collected in accordance with the INP unless the industry ceases operation for a minimum of a week, or longer if unsuitable weather prevails.

Background data had been collected at residences surrounding this site for the original EA in 1999. Whilst there is a general trend for background noise levels to increase over time as a result of urbanisation and more traffic, it was expected background noise levels wouldn't have changed significantly in this area over time.

Since background noise data each 15minute is used to determine the RBL it is normally the periods in the middle of the day outside the peak hours which affect the

RBL. For this reason we organised for all quarry activities including the arrival and departure of trucks to cease for a period of approximately 90 minutes, whilst short term background noise levels were measured at the three surrounding residences (A-C).

The weather conditions at this time were fine and dry with minimal wind, hence ideal for the collection of suitable background data. It was also noted there were no other short term extraneous noises which may have affected the background from surrounding properties such as construction work.

In the circumstances we believe this was the most appropriate methodology to obtain suitable background data. Even if data was collected over further days it is not considered a lower background noise level would have been measured based on our observations. It is more likely that higher levels may have been obtained at other times.

For this reason, background noise levels for the purpose of setting criteria were established based on previous background noise monitoring in the area (which is unlikely to have changed significantly) and the short-term attended measurements during our site visit when we were able to cease operations between approximately 12.00pm and 1.30pm to measure background levels.

Because the quarry is operational, it was possible to measure noise levels from typical on site activities using attended / unattended noise measurements on Thursday, 11 September 2014 at each of the three receivers A, B and C. In addition, loggers were left at Locations L1 and L2 (as shown in Figure 1-2 within the quarry boundary) for a period of approximately 4-5 hours, where they had line of sight to much of the quarry operations. The purpose of these logger measurements was to determine noise emissions from the existing operation to be used to validate the noise model, rather than background noise.

The noise survey indicated that the background noise levels on the day were lower than previously measured, however, activities on site, although just audible at locations A and B and inaudible at Location C, would comply with the existing consent's noise condition.

Unattended long-term noise monitoring was conducted for the original assessment at locations shown in **Figure 3.3**. The measured median background levels extracted from that report are presented in Table 3-1 of the Wilkinson Murray Report, a copy of which is at **Figure 3.4** below.

Location	6am-7am	7am-6pm
A – 155 Roberts Road	42	50(1)
B – 2a Roberts Road	38	47(1)
C – 156 Old Northern Road	41	43

Note: 1 Daytime background noise influenced by dam construction on site.

Figure 3.4: Measured Median Background Levels (Benbow 1999) - dBA.

Attended noise measurements for the current assessment were conducted at Locations A, B and C while the Site was temporarily shut down on Thursday, 11 September 2014. In addition, noise loggers at Locations L1 and 2 operated during this period.

All attended measurements were conducted using an Nti Type XL2 Sound Level Meter. This sound level meter conforms to Australian Standard 1259 Acoustics - Sound Level Meters as a Type 1 Precision Sound Level Meter which has an accuracy suitable for field and laboratory use. The A-Weighting filter of the meter was selected and the time weighting was set to "Fast". The calibration of the meter was checked before and after the measurements with a Bruel and Kjaer Type 4231 sound level calibrator and no significant drift was noted.

The XL2 and 4231 have been laboratory calibrated within the previous two years in accordance with Quality Assurance Procedures.

The unattended noise monitoring equipment used for this measurement consisted of an ARL NGARA environmental noise logger set to A-weighted, fast response, continuously monitoring in 0.1 second intervals for later detailed analysis of required descriptors. The equipment calibration was checked before and after the survey and no significant drift was noted.

The analysis of the logger typically determines L_{Amax} LA_{10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A10} and L_{A90} are the levels exceeded for 10% and 90% of the sample time respectively. The L_{Amax} is indicative of maximum noise levels due to individual noise events. This is used for the assessment of sleep disturbance. The L_{A90} level is normally taken as the background noise level during the relevant period. The L_{Aeq} is the energy average level which is widely used in many standards and guidelines to assess potential noise impact.

Graphs of noise levels versus time at the two unattended sites are shown below. The two periods when the Site was temporarily shutdown are highlighted.

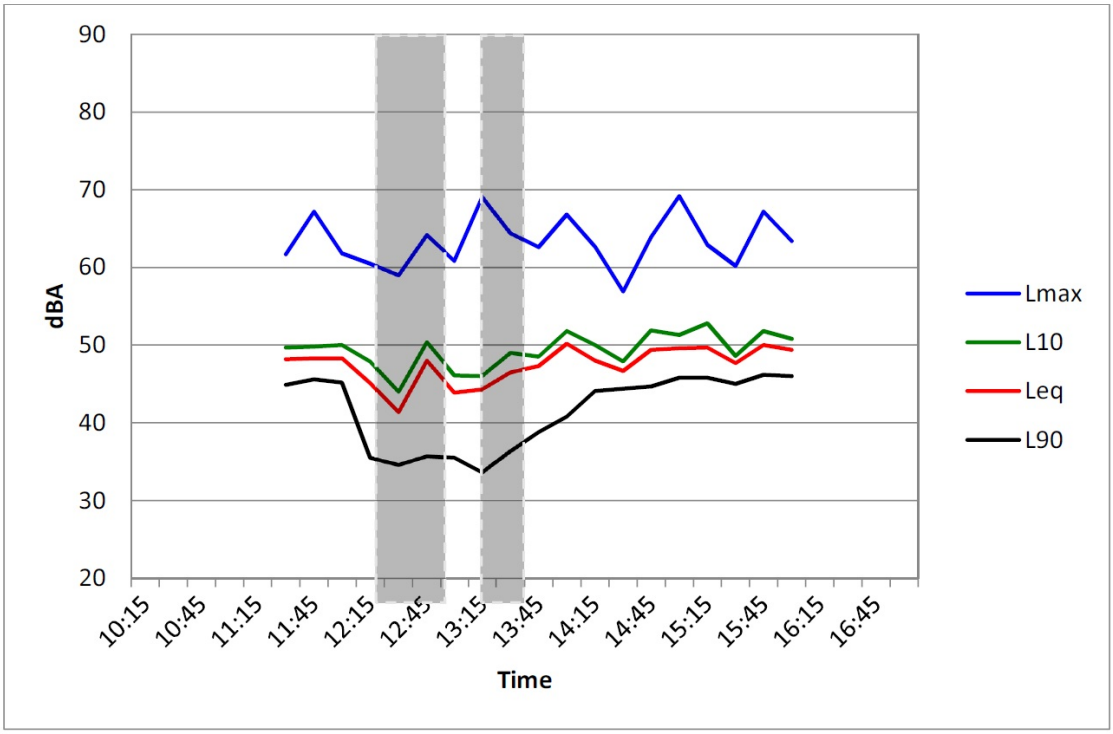

Figure 3.5: Logger Location L1 (Southern Boundary).

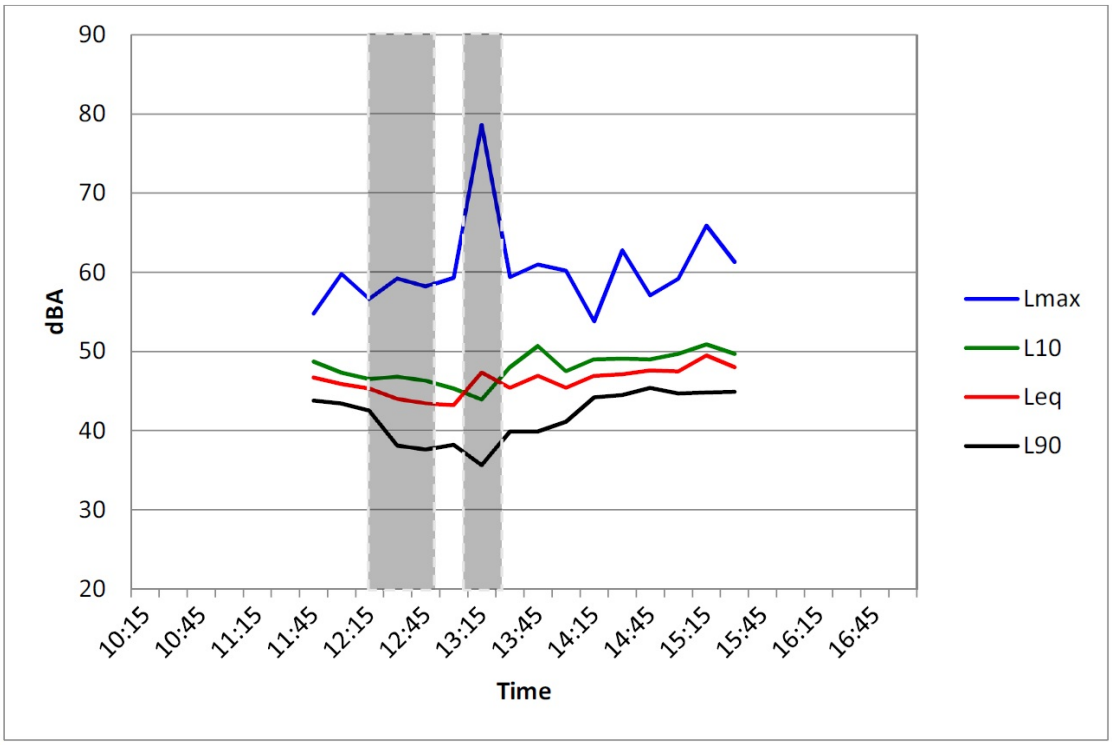

Figure 3.6: Logger Location L2 (Edge of existing pit towards Northern boundary).

Figure 3.7 presents a summary of measured noise levels during the temporary shutdown period.

Location	Comments	Time	Measured Noise Levels (dBA)	
			L_{Aeq}	L_{A90}
A	Distant traffic, birds in trees, tractor	12:05 – 12:20	37	32
B	Distant traffic, birds in trees, wind in trees, traffic on Roberts Road	12:25 – 12:40	46	34
C	Traffic on Old Northern Road, Birds and wind in trees	12:55 – 13:10	45	34
L1	-	12:00 – 12:15	44	36
		12:15 – 12:30	43	35
		12:30 – 12:45	43	36
		13:00 – 13:15	45	34
L2	-	12:00 – 12:15	45	43
		12:15 – 12:30	41	38
		12:30 – 12:45	48	38
		13:00 – 13:15	44	36

Figure 3.7: Background Noise Measurement Results - 11 September 2014 (refer Table 3.2 of the Wilkinson Murray Report).

Before and after this temporary shutdown during normal operations, noise levels were measured as summarised in **Figure 3.8**.

Location	Site Activities	Time	Measured Noise Levels (dBA)	
			L_{Aeq}	L_{A90}
A	Normal. Processing plant audible	11:54 – 11:59	40	35
A	Processing plant only (30 seconds)	11:59 – 12:00	37	35
C	Processing plant off – Truck being loaded	12:43 – 12:55	61	36
L2	Processing plant off – Truck being loaded	12:43 – 12:55		
A	Normal. Processing plant audible	15:10 – 15:15	37	34
B	Normal. Processing plant audible, traffic on Roberts Road	15:22 – 15:27	52	39
C	Normal. Processing plant inaudible	15:35 – 15:45	48	41
L2	Normal. Processing plant audible	15:15 – 15:30	48	45
L1	Normal. Processing plant only audible	15:55 – 16:00	50	46
L1	Normal. Processing plant audible and loader passby at 100m	16:00 – 16:01	50	48

Figure 3.8: Residential / Boundary Noise Measurement Results - 11 September 2014.

3.7.1 Operational Noise Criteria

The following documents provide guidance in relation to noise generated on site:

- The Hills DCP 2012;
- The EPA NSW Industrial Noise Policy, and
- Existing Conditions of Approval.

The Hills DCP (2012) Section B.2.9 Acoustic Management

This document references superseded EPA documents and the requirements for noise are dealt with more comprehensively within the current EPA Industrial Noise Policy.

EPA Industrial Noise Policy

The EPA Industrial Noise Policy (**INP**) is the current method to assess potential noise impacts from extractive industries. The INP recommends two criteria, "intrusiveness" and "amenity", both of which are relevant to the assessment of noise from the Site. In most situations, one of these is more stringent than the other and becomes the project specific noise criteria.

The criteria are based on the L_{Aeq} descriptor.

As discussed in Section 3 of the Wilkinson Murray Report, it was not considered feasible to obtain a full week of background noise data to derive an RBL in accordance with the INP. The RBL for the daytime was, therefore, based on the range of single 15 minute background L_{A90} noise levels measured during the site visit at what was considered to be the quiet part of the day and shown in Table 4-1 of the Wilkinson Murray report, a copy of which is at **Figure 3.9**.

Receiver Area	Time Period	L_{90} (dBA)	Intrusiveness Criterion $L_{Aeq,15min}$ (dBA)	Amenity Criterion $L_{Aeq,period}$ (dBA)
A	Early Morning (7.00am–6.00pm)	42	47	40
	Daytime (7.00am–6.00pm)	32-36	37-41	50
B	Early Morning (7.00am–6.00pm)	38	43	40
	Daytime (7.00am–6.00pm)	34-36	39-41	50
C	Early Morning (7.00am–6.00pm)	41	46	40
	Daytime (7.00am–6.00pm)	34-38	39-43	50

Figure 3.9: Industrial Noise Intrusiveness and Amenity Criteria.

The intrusive criterion adds 5dB to these levels. It is possible a higher daytime RBL would have been obtained since this is based on the 90th percentile value for each day (the 4th lowest value out of 44, 15-minute periods) and then the median of the 7 days.

Where noise levels from industrial sources are close to or above the acceptable levels then the

amenity criterion, which incorporates a sliding scale to set limits, would apply. The sliding scale prevents the overall noise level exceeding the acceptable level due to the addition of a new noise source. Amenity criterion also needs to consider noise level from all industrial sources in the region, which includes the existing extraction site. The intention is that the sum of all local noise sources remains within the acceptable levels for each time period.

The amenity criteria are determined by which particular characterisation surrounding residences become classified as. The potentially affected residences near the Site are in an area which would be classified as "rural" and the relevant recommended "acceptable" amenity criteria for $L_{Aeq,period}$ are 50, 45 and 40dBA for daytime, evening and night time periods respectively.

"Maximum" recommended levels are also part of the criteria and are all 5dBA higher than the "acceptable" levels.

Since the Site is approved to operate between 6:00am and 6:00pm, the early morning shoulder period and daytime period are assessed. **Figure 3.9** shows the relevant industrial noise criteria for this project based on a rural area classification and a review of current and previous noise data.

For the daytime period, the intrusive noise criterion is below the amenity criterion. For the early morning period, the intrusive criterion is above the amenity criterion (which is based on the whole night).

3.7.2 Project Specific Noise Levels

The Wilkinson Murray Report, when discussing project specific noise levels, states:

> *Project Specific Noise Levels (PSNL) have been set based on the range of available background data from the previous assessment, the current work and the previous conditions.*
>
> *A single PSNL has been applied to all receivers to be consistent with the consent which applied the same criteria to all residences surrounding the site.*
>
> *It is considered appropriate that noise criteria for the site should have the assessment parameter changed to $L_{Aeq,15min}$ rather than $L_{A10,15min}$ to bring it in line with the current INP approach to noise assessment.*
>
> *If this project had been assessed in accordance with the INP when the previous background noise data was presented then we assume the noise criteria would have been expressed as $L_{Aeq,15min}$ and given the same numerical values as the current consent.*
>
> *However, the background data at daytime shows background noise levels are lower than previously measured then it was considered appropriate to adjust the criteria*

down to reflect this difference.

A reduction of 2dBA at daytime was selected as this difference is also considered to be a typical difference between L_{A10} and L_{Aeq} levels from quarry operations, such that the new criteria would be no more onerous than the current consent for daytime. It is also possible the current consent conditions were based on what noise levels could be reasonably achieved from the proposed extraction.

It is not clear where the previous consent limit of 40dBA for the early morning period was derived, since the measured background levels were higher than 35dBA. However, 40dBA limit (as an L_{Aeq}) is considered a reasonable limit, allowing for background levels to also be lower at this time and also considering the amenity limits (albeit they are meant to apply to the whole night time period).

Similarly, the $L_{A1,1min}$ noise criteria remains unchanged.

The following limits are recommended:

- *7.00am to 6.00pm $L_{Aeq,15min}$ = 43dBA*
- *6.00am to 7.00am $L_{Aeq,15min}$ = 40dBA*
- *6.00am to 7.00am $L_{A1,1min}$ = 50dBA.*

3.7.3 Operational Noise Assessment

Noise modelling was conducted for both the existing operation and future scenarios including the approved areas for extraction. The existing operation was primarily modelled to validate the noise model to be satisfied it is appropriate to use for the future situation. This is because all the plant and equipment currently on site is not subject to change under proposed future operations.

Site related noise emissions were predominantly modelled using the ISO-9613 algorithm implemented in the "CadnaA" acoustic noise prediction software. Factors which are addressed in the modelling are:

- equipment sound level emissions and location;
- screening effects from buildings, stockpiles, topography;
- receiver locations;
- noise attenuation due to geometric spreading;
- directivity (where appropriate);
- ground effects;
- atmospheric absorption, and
- meteorology (wind and temperature gradients).

Meteorology

At distances from a noise source to receiver of several hundred metres or more, the resultant noise levels will be influenced by wind and temperature gradients.

When assessing potential noise impacts the INP requires that the effects of any weather conditions which are a feature of the area when the development operates need to be taken into consideration. The procedures described in the INP are directed toward finding a single set of meteorological conditions which represent general adverse conditions for noise propagation to be implemented in the noise assessment.

Since activities are predominantly daytime, only the prevalence of temperature inversions are generally considered low and are not required to be considered in this assessment.

Wind can increase noise at a receiver when it blows from the direction of the noise source. An increase in wind strength also results in a corresponding increase in wind noise at the receiver which often masks noise from the source under investigation.

The potential for increased noise levels due to wind should be considered when wind is a feature of the area under consideration. The INP defines this as where wind blows at speeds from 0.5m/s up to 3m/s for more than 30% of the time in any period (day, evening or night time) in any season.

Wind rose data showing wind direction and wind speed ranges (Figure 5-1 of the Wilkinson Murray Report) was analysed in accordance with the INP to determine the frequency of occurrence of seasonal winds for speeds from 0.5m/s up to 3m/s for the daytime period. There is no need to consider adverse conditions as the 30% scenario is not triggered. Results are presented for neutral conditions only.

Operational Noise Sources

Noise levels associated with the extraction operations were measured previously as part of a site audit. A summary of the Sound Power Levels of the plant at the existing quarry site are presented in **Figure 3.10**. These are noted to be typical of this type of plant. Some different plant was monitored on 11 September 2014.

In addition, measurements were made on site on 11 September 2014 at various distances from operating equipment as shown in **Figure 3.11**.

Item	Sound Power Level dBLinear	Sound Power Level dBA
Volvo L150 loader Stationary	111	104
Volvo L150 loader Dynamic	115	105
Volvo L180E loader Stationary	114	103
Top screening plant Operating	105	96
Portostack TC80 engine Operating	112	90
Powerscreen commander screening plant Operating	117	105
Volvo A40D dump truck Dynamic forward	107	100
Volvo A40D dump truck Dynamic reverse	109	101
Hitachi Zaxis 330 excavator Stationary	106	93
Hitachi Zaxis 240 excavator Stationary	111	99
Komatsu 375A dozer Stationary	118	109

Figure 3.10: Sound Power Levels of Existing Extraction Plant (Global Acoustics 2013).

Plant Items	Activity & Distance	Noise Level L_{Aeq} or L_{Amax} (dBA)
Volvo L180c Front End Loader	Tidying stockpile @ 15m	L_{Aeq} = 68, L_{Amax} = 73
Komatsu PC400LC Volvo A40D Dump Truck	Excavator Loading @ 80m	L_{Aeq} = 58
Volvo A40D uphill	passby at 10m	L_{Amax} = 78
Komatsu PC400LC	Winning material at 80m	L_{Aeq} = 55
Komatsu D375A Dozer	Pushing sand at 20m	L_{Aeq} = 76, L_{Amax} = 81
Hitachi 240LC Excavator	Tidying stockpile	L_{Aeq} = 67, L_{Amax} = 75
Volvo L180c Front End Loader Volvo A40D uphill	Loading Processing Plant 20-30m Tipping at stockpile	L_{Aeq} = 73, L_{Amax} = 83
Volvo A40D uphill	passby at 10m	L_{Amax} 80
Processing Plant	Normal operations fine sand 30m	L_{Aeq} = 66
Diesel Power Screen & Conveyer	Normal operations at 35m	L_{Aeq} = 67

Figure 3.11: Noise Levels of Existing Extraction Plant (11 September 2014).

Noise Modelling

As short-term noise levels surrounding the extraction site have been monitored during the site visit, the estimated noise level contribution from extraction activity noise was compared with the predicted noise levels for the existing operations in order to validate the noise model.

During the daytime measurements, there was an intermittent gentle breeze from a westerly direction which increased slightly as the day progressed. The breeze was not considered significant enough to be included in the model, with the exception of the last measurement period.

Figure 3.12 presents the comparison of measured noise levels with predicted noise levels, based on observations during that period.

As presented in **Figure 3.12**, there is good correlation between the measured and predicted noise levels from the Site, hence, the noise model has been validated and is suitable for further modelling purposes.

Time	Operations	Measurement Location	Measured Contribution from Site dBA	Predicted Noise Level
11.55-12.00	Processing plant and associated activities	A	<35	35
		1	47	49
		2	47	46
15:10-15:15	Normal operation	A	36	35
		1	49	49
		2	47	46
15:25–15:30	Normal operation	B	40	40
		1	49	49
		2	47	46
15:35–15:45	Normal operation (westerly wind)	Nr C	Inaudible	34
		1	49	49
		2	47	46

Figure 3.12: Comparison between Measured Results & Noise Model Predictions.

The modified extraction plan and excavation process is split into six future stages as shown in **Figure 2.13**.

The quarry will develop further to the west and north for Stages 1-5 over a period of approximately 8 years, at which time the processing plant would be relocated to allow for the extraction of Stage 6 to include a cell near the northern boundary and the material beneath where the existing processing plant is located. It is noted that the lateral extent of the extraction will not exceed that of the approved development.

Operations also require further excavation and the emplacement of material to create the final landform. This would occur intermittently on a campaign basis, typically 2 weeks at a time, possibly once or twice per year, such that equipment / staff not needed to meet the supply of raw material would be utilised to haul material to the emplacement areas and an excavator to form the final landform. It is possible that some sandstone will need to be ripped in this area at RL195 and below. Noise levels from this activity are not considered to be any higher than that experienced to date.

The proposed extraction process requires an excavator and truck at surface level to remove the top soil and overburden which is initially formed into perimeter bunds and remaining material is stockpiled. From this point onwards, the excavator works occur from below the surface and is able to pull material down from above.

The excavator and truck are, therefore, only at surface level for a small proportion of time (less than 10%) and most of this time it is operating behind a 5 metre bundwall relative to the nearest boundary.

With the exception of cells with suffix A in Figure 5.2 of the Wilkinson Murray Report, there is a need to rip Hawkesbury sandstone in the cells.

The extraction operation includes the use of a dozer to rip. This occurs at RL195, with the exception of cells 4C and 6B where it will occur as high as RL205.

The extracted material is then transported using a dump truck to the processing feed area, where a front end loader manages a few stockpiles to blend the different grades of sand as required before tipping into the power screen. Depending on the haul distance, either 1 or 2 dump trucks return to and from the processing plant area.

In relation to hauling product off site between 6:00am and 6:00pm, it is considered that the typical "worst case" operating scenario would be when 3 truck movements overlap in the same 15-minute period. This assumption incorporates 2 trucks arriving and one truck subsequently leaving the Site. The selection of 3 truck movements is based on operational constraints as this is the maximum which can be loaded.

A summary of operating plant is provided in **Figure 3.13** for the various scenarios considered.

Scenario	Operating Equipment
Core Activities	1 Excavator at base of excavation 2 dump trucks continuously between face and processing area 1 Loader feeding processing plant managing stockpiles 1 Diesel Screen / Conveyers 1 Processing and Washing Plant / Conveyers 1 Loader loading haul trucks / managing stockpiles 3 Haul trucks in 15 minutes taking product off site
Dozer Extraction / Emplacement	Dozer at highest RL within extraction or emplacement area
Surface Extraction	1 Excavator (from base) repositioned at surface behind bund
Bund Construction	1 Excavator (from base) repositioned at surface building bund

Figure 3.13: Typical Scenarios and Plant Numbers.

The noise levels have been predicted using the Cadna modelling software to represent the worst case stages for the surrounding residences. The results are shown in **Figure 3.13**.

The results shown in **Figure 3.14** include typical operations which will occur most of the time (excavator at base of extraction area, haul to processing area, processing plant and associated two loaders and loading out of trucks) and then, in addition, the short periods of time when a dozer is required to operate in the extraction area or in the emplacement area, plus the periods when an excavator would need to operate at the surface in the extraction area or emplacement area behind the perimeter bunds.

Receiver	Worst Stage/s Core activities + either extraction area or emplacement area activities	Typical	With Dozer (Extraction or Emplacement)	With Surface operations behind bund (Extraction or Emplacement
A	1A + emplacement	37	40	48
B	1A + emplacement	42	43	45
B	5A+ extraction	43	-	45
C	6B+ extraction	38	44	43
D	5A + extraction	40	-	53
F	6B+ extraction	35	39	39
G	1A + emplacement	38	40	47
H	1A + emplacement	41	42	44

Figure 3.14: Predicted $L_{Aeq,15min}$ Noise Levels (Neutral Meterology).

During typical operations, the predicted noise levels comply with the $L_{Aeq,15min}$ noise condition of 43dBA at all receivers, however, when dozers are required to operate in some areas, and the excavation of top soil occurs at the beginning of each new cell, noise levels are predicted to exceed the criterion at some receivers.

Exceedances for surface extraction works are up to 1dBA only at Receiver C, typically for a total of 2-3 weeks during sandstone ripping within cells where rock is above approximately RL 200.

Exceedances for dozer ripping works are up to 10dBA at Receiver D, 2dBA at receiver B and 1dBA at receiver H, typically for 3-4 weeks during the initial top soil and overburden extraction of each cell.

Exceedances during these periods for emplacement works are up to 5 dBA at Receiver A, 4dBA at Receiver G, 2dBA at receiver B and 1dBA at receiver H, typically 3 weeks per year on average.

Since the plant on site is considered to be modern and well maintained, there are no feasible or reasonable mitigation measures which can be applied to further reduce noise levels.

In addition to the exceedances above, there are also periods of a few days when perimeter bunding is required to be built and will require an excavator to be located at the surface without any shielding by a bund for a few days at a time. Predicted noise levels from this activity at these times are up to 57dBA at Location D, 48dBA at Location C and 40dBA at Location F. At other locations, the contribution is less than 30dBA.

At three of the receivers (C, D and F), noise levels are expected to increase compared with current levels over the remainder of the project as operations move closer. Two of these receivers (D and F) are located within 30m of Old Northern Road and L_{Aeq} noise levels from traffic are expected to be over 55dBA and, therefore, more than 10dBA higher than typical L_{Aeq} noise levels from the Site and similar or higher than noise levels in the short periods with

an excavator at the surface.

Negligible impact is, therefore, expected at these two receivers. These receivers are also located closer to other sand extraction activities on the other side of Old Northern Road.

Location C is set further back from Old Northern Road so ambient noise levels are lower, but still similar or higher than the predicted noise levels from the quarry of up to 44dBA during normal activities and 48dBA whilst the northern bund is being built.

The existing consent allowing the loading of trucks between 6:00am to 7:00am is not proposed to change, so no change in impact compared to the existing situation is expected. The potentially worst affected residence is Receiver B, closest to the site entrance on Roberts Road.

It is recommended that a short section of 4m bund is constructed from the weighbridge to join with the existing bund adjacent to Roberts Road.

The predicted noise level from this activity is 37dBA which meets the amenity criterion of 40dBA.

3.7.4 Traffic Noise Assessment

The proposal does not include any increase in the approved truck numbers per day or operating hours, just an extension in time of the currently approved operations. Trucks access the Site along Roberts Road from Old Northern Road. The closest residence is on the corner of Roberts Road and Old Northern Road, so there are no residences solely affected by traffic on Roberts Road. At the intersection, the split of traffic on an annual basis is 90% to the south, however, on particular days, all traffic may head south.

Existing volumes on Old Northern Road were measured over a 12-hour period from 6:00am to 6:00pm and were approximately 1,500 vehicles and 17% heavy vehicles.

Road Noise Policy

For existing residences affected by additional traffic on existing freeways / arterial roads (Old Northern Road) generated by land use developments, the appropriate noise assessment criteria are set in the NSW Road Noise Policy (**RNP**). The appropriate daytime assessment criterion is $L_{Aeq,15hr}$ 60dBA at 1m in front of the façade. The night time criterion is $L_{Aeq,15hr}$ 55dBA.

In 1999, at the closest residences to Old Northern Road set back approximately 30m from the centreline, existing traffic noise levels were measured as 55dBA $L_{Aeq,15hr}$, which is 5dB below the daytime criterion of 60dBA. ADT traffic volumes (24 hour) were approximately 2,000 vehicles with 10% heavy vehicle content, so there has not been significant change.

A secondary objective is to protect amenity as the result of a project by applying the relative increase criteria. The RNP deems an increase of up to 2dB represents a minor impact that is

considered barely perceptible to the average person.

Assessment of Traffic Noise

The existing noise contribution of trucks associated with the proposal would result in an increase of less than 1dBA compared with the scenario without the quarry. The difference is not noticeable and negligible impact is therefore expected from the continuation of existing operations.

3.8 Traffic Impacts

Part 6.6.2 of the EIS which accompanied the original application dealt with the impact of the then proposed development on the operation of the intersection of Roberts Road with Old Northern Road and stated:

> *Traffic counts over a number of years show that Annual Average Daily Traffic Volumes in Old Northern Road at Maroota are increasing at 2 per cent per annum. The estimated intersection turning volumes at the intersection of Roberts Road with Old Northern Road on a weekday after 15 years are shown in Figure 8 of the traffic and transport report and reproduced as Figure 25 of this EIS.*
>
> *An INTANAL analysis shows that the current intersection, which has been upgraded recently to include a sheltered right turn bay, will continue to operate at Level of Service A to the end of the project.*
>
> *The sight distance in Old Northern Road and south of Roberts Road are considered satisfactory for a speed of 100 km/hour.*
>
> *No intersection improvements, except for double centreline markings in Roberts Road for 30 metres from Old Northern Road, are required.*

With regard to increased truck traffic in the main road system, the EIS stated:

> *The increase in heavy truck traffic generated by this development is estimated to be 30 truck movements per day (Monday to Friday) in Wisemans Ferry Road west of Old Northern Road and 20 truck movements per day in Old Northern Road south of Roberts Road. These increases amount to 14.25 per cent and 9.37 percent respectively.*
>
> *These increases are relatively small and will not reduce the Level of Service at either the intersection of Roberts Road with Old Northern Road or in Wisemans Ferry Road and Old Northern Road.*

Resulting from the above, condition 49 of the Consent relates to truck movements and states:

> *49. The applicant shall ensure that truck movements associated with the*

development do not exceed 100 movements per day (50 laden truck movements) or 20 (10 laden truck movements) movements per hour, during construction or operation.

No modification to condition 49 is proposed as part of this modification application.

Notwithstanding, Lyle Marshall & Associates Pty Ltd has prepared a report (**the Marshall Report**) relating to the impact the existing approved development would have on the existing road network and, in particular, the intersection of Roberts Road with Old Northern Road, a copy of which is at **Appendix 13**.

3.8.1 Existing Traffic Volumes

Old Northern Road / Roberts Road Intersection

Twelve hour Traffic Volume and Classification Counts were made at the intersection of Old Northern Road with Roberts Road to determine the highest hourly volumes and turning movements at the intersection in order to assess the performance of the intersection.

12 Hour Volume & Heavy Trucks. Count 5/8/14

The 12 hour two-way traffic volume was 261 in Roberts Road, a marginal increase of 10 since the count in 1998. The number of heavy vehicles Austroad Classes 3 to 9 was 85 and amounted to 32.6% of total vehicles. In 1998 the number of heavy vehicles was 78 and amounted to 31% of total vehicles. The number of heavy vehicles Austroads Class 9 (truck and dog trailer) was 37 and amounted to 14.2% of total vehicles.

Peak Hour Volumes

The AM and PM peak hours were from 6:30-7:30am and 4:00-5:00pm. The peak hour two-way through traffic volumes in Old Northern Road were 149 vphr and 154 vphr respectively.

The twelve hour count showing cars and light vehicles and heavy trucks and the two peak hour counts are shown in **Figures 3.15, 3.16 and 3.17** respectively.

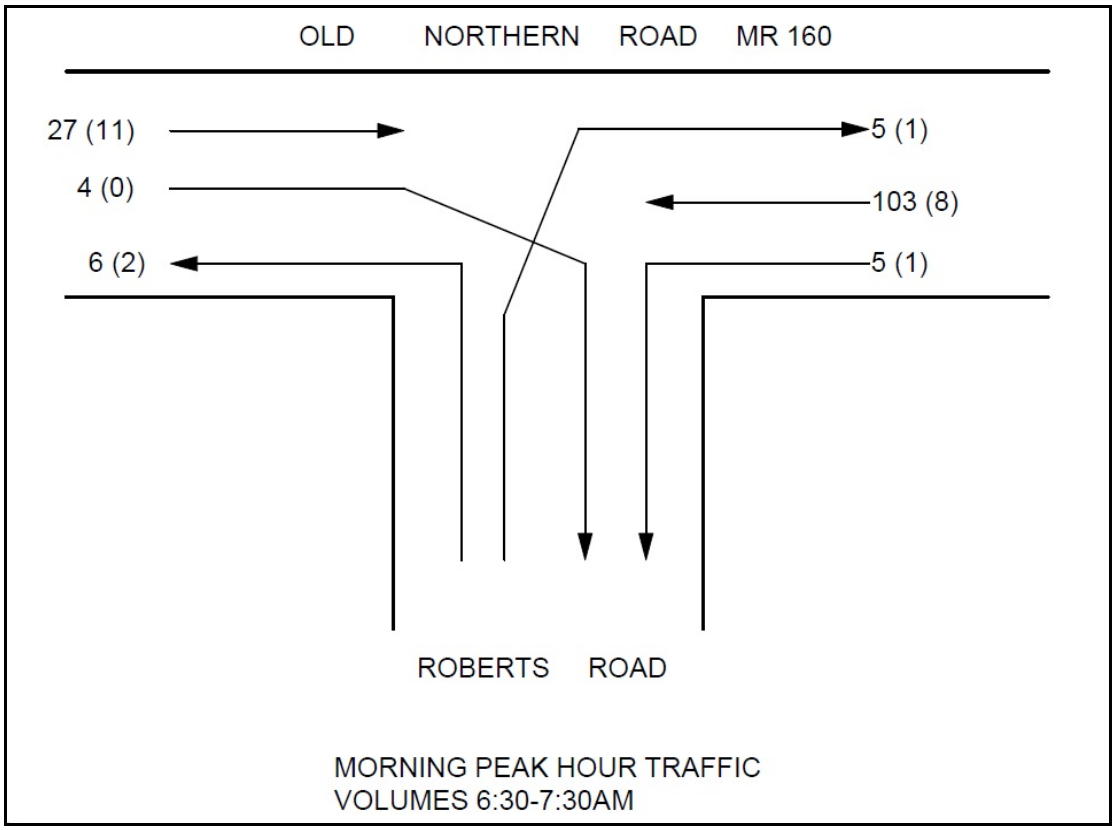

Figure 3.15: 12 Hour traffic volumes.

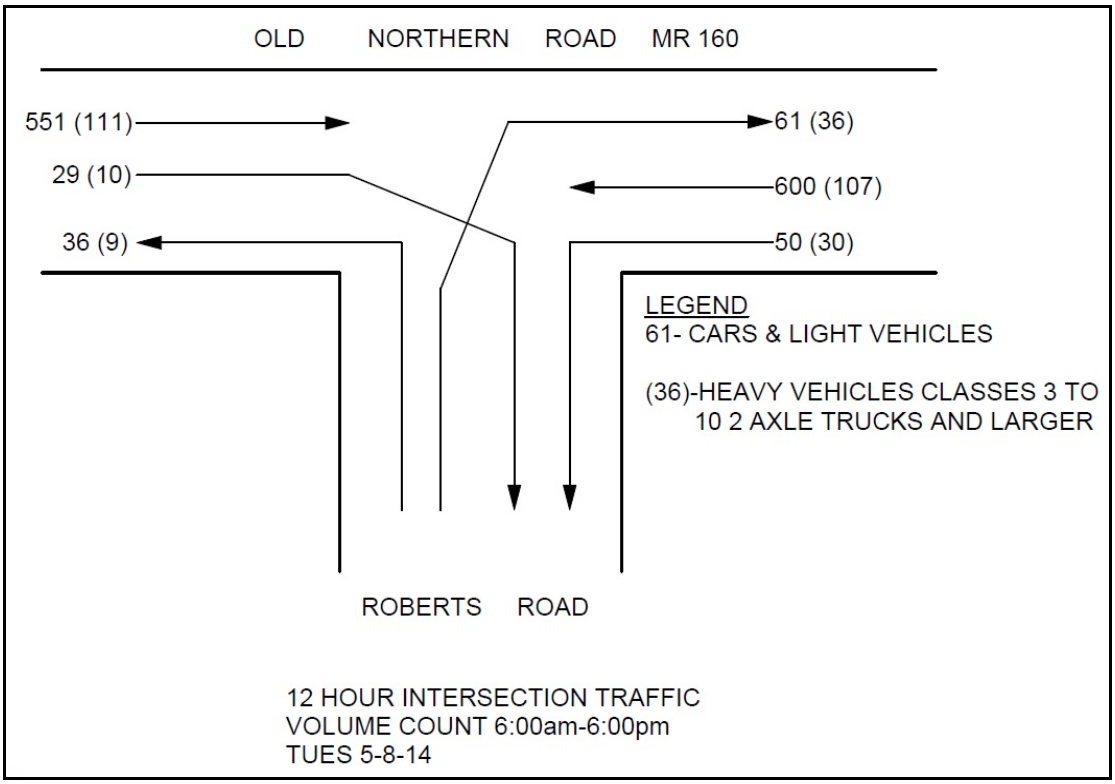

Figure 3.16: Morning peak hour traffic volumes.

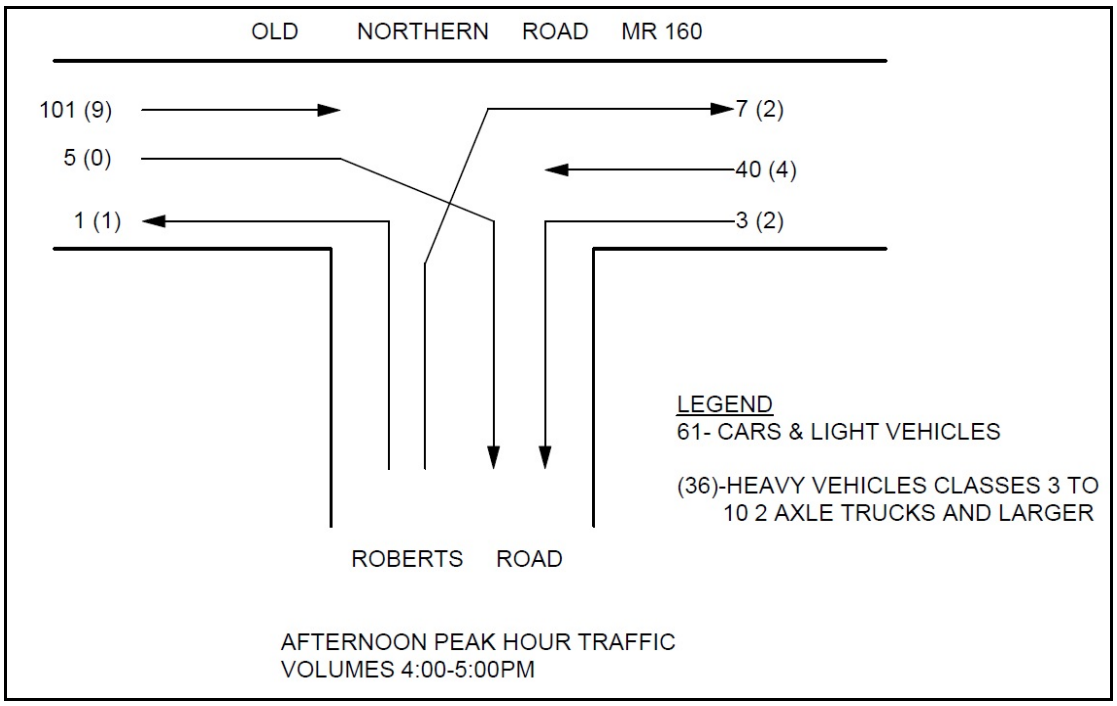

Figure 3.17: Afternoon peak hour traffic volumes.

Week Day and Weekend Volumes on Roberts Road

An automatic counter was placed in Roberts Road to determine the time pattern and volumes of light and heavy vehicles over 7 days including a weekend. Light vehicles are vehicles Classes 1 and 2 and heavy vehicles are Classes 3 to 10.

Heavy vehicles Class 9 (truck and dog trailer) are used for the transport of sand from extractive industries in the area. A Classification Chart is included in Appendix D of the traffic report at **Appendix 13**. The average week day and weekend two-way traffic volumes at Station 5 (in Roberts Road) were as follows:

Average Daily Volumes	Roberts Road
Average Weekday	
Total vehicles	324.4
Light vehicles	242.8
Heavy vehicles	81.6
Heavy vehicles Class 8, 9, 10	34.8
Average Weekend	
Total vehicles	199.5
Light vehicles	190.5
Heavy vehicles	9
Heavy vehicles Classes 8,9,10	0

Weekday and Weekend Volumes on State Main Roads

Automatic counters were placed at two locations on the haul road network from the Site to determine the time pattern and volumes of light vehicle and heavy truck movements over 7

days including a weekend. A Classification Chart is included in Appendix D of the Traffic Report at **Appendix 13**.

The average week day and weekend two-way daily traffic volumes at Station 3 and 4 were as follows:

Average Daily Volumes	Old Northern Road MR160 Station 4	Wisemans Ferry Road MR181 Station 3
Average Week day		
Total vehicles	1761.6 (1923)	2034.2 (1706)
Light vehicles	1528.8 (1710)	1581.2 (1495)
Heavy vehicles	232.8 (213)	453.0 (211)
HV classes 8, 9, 10	74.4	229.4
Average Weekend		
Total vehicles	2010 (2285)	1882.5 (1927)
Light vehicles	1945.5 (2178)	1739.5 (1824)
Heavy vehicles	64.5 (107)	143.0 (103)
HV classes 8, 9, 10	11.5	38.0

The Counts taken in October 1997 are shown in brackets for comparison with the current traffic volumes. In Wisemans Ferry Road, total vehicles have increased by 1% per annum compound and heavy vehicle growth has been 4.5% per annum compound. In Old Northern Road, total vehicles have fallen by 0.5% per annum compound and heavy vehicles have increased by 0.5% per annum compound.

The main findings were:

Station 3 - Wisemans Ferry Road

Total heavy truck movements over 24 hours on weekdays averaged 219.2 eastbound and 233.8 westbound, however, the average truck movements over 12 hours were similar to westbound (208.6) and eastbound (204). The peak hourly movement westbound (average over 5 days) was 24.2 between 6:00 - 7:00am and the peak hourly movement eastbound (average over 5 days) was 19.4 between 10:00 and 11:00am.

Station 4 - Old Northern Road

The average heavy week day truck volumes northbound and southbound were similar over 24 hours (115.4 compared with 117.4) and also over 12 hours between 6:00am and 6:00pm. The peak hourly volume was 13.0 (average over 5 days) southbound from 6:00am to 7:00am. The peak hourly volume northbound (average over 5 days) was 11.6 from 12:00pm to 1:00pm. The counts show that about 91 percent and 86.2 percent of the

24 hour daily truck movements occurred between 6:00am and 6:00pm at survey locations 3 and 4 respectively. The total number of truck movements on Saturday was 36.2 percent of the daily Monday to Friday total at Station 3 and 32.7 percent at Station 4. The number of light vehicles was significantly greater southbound on Sundays at Station 4 than on other days.

Major Changes 1997 - 2014

Heavy vehicle volumes have doubled in both directions in Wisemans Ferry Road whereas the increase is marginal in both directions in Old Northern Road.

Road Inventory

Old Northern Road has a sealed pavement about 6.5 to 6.7 metres wide sealed shoulders about 1 metre wide and unsealed gravel shoulders beyond which vary in width from about 0.5 to 1.5 metres. Wisemans Ferry Road is of a similar standard to Old Northern Road. The edges of the sealed pavement are subject to higher loading by heavy vehicles travelling near the edges of the road pavement and require higher maintenance to repair the broken edges. The road pavement is generally in reasonable condition.

Based upon Table 4.1 in Austroads Rural Road Design the desirable sealed pavement width in Old Northern Road and Wisemans Ferry Road is 7.0 metres because the AADT Traffic Volumes are well in excess of 1000 veh/day.

Roberts Road is a sealed local road and has a pavement width of 5.7 metres.

Operation of Roberts Road/Old Northern Road Intersection

This intersection was up-graded prior to October 1997 to provide a sheltered right turn bay in Old Northern Road. The pavement striping continues on the northern side of Roberts Road. A layout of Roberts Road and Old Northern Road Intersection has been compiled from site measurements and is shown in **Figure 3.18**.

An analysis of the performance of the intersection under existing am and pm peak hour volumes has been made using SIDRA Version 5.0. The intersection is operating at Level of Service A in both peak hours.

The proposed modification would not affect the operation of the existing, approved, access to the Site or the operation of the intersection of Roberts Road with Old Northern Road.

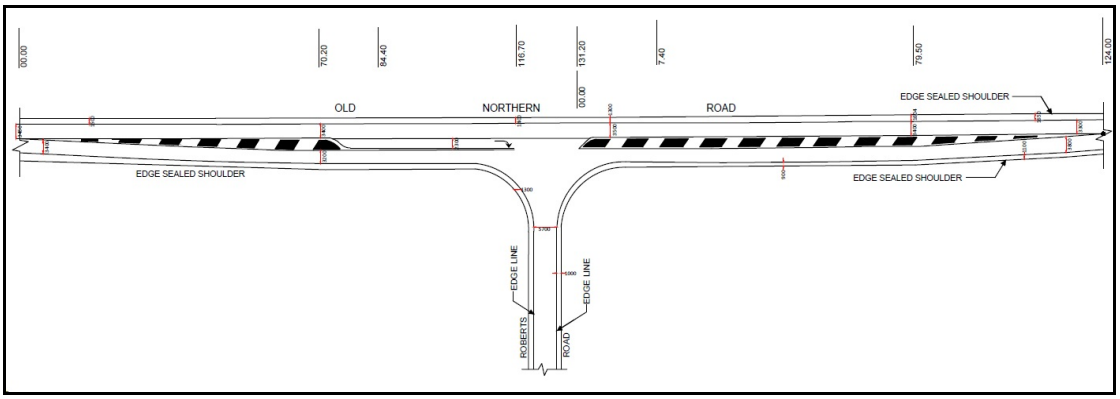

Figure 3.18: Existing layout of the intersection of Roberts Road with Old Northern Road (refer Figure 5 of the Lyle Marshall Report at **Appendix 13**.

3.9 Air Quality

The EIS submitted with the original development application contained a detailed assessment of the then existing air quality together with details of the air quality impacts of the then extraction activity on the Site.

Part 6.2.3 of the EIS detailed the estimated emissions from the then proposed development compared to that of the then existing operation and stated:

> *Dust emissions have been estimated by analysing the proposed extraction operations. It is not anticipated that the level of activity or the mode of operation will change substantially over the life span of the project once maximum production levels have been reached.*
>
> *The operations which apply at the site have been combined with emission factors developed, both locally and by the US EPA, to estimate the amount of total suspended particulate (TSP) produced by each activity. Estimated emission totals are presented in Table 6.4, and details of the calculations are presented in Appendix A of the air quality assessment report at Appendix 10. It has been assumed that the extraction operation will be operating at a production rate of 286,000 tonnes of sand per year, from the 408,890 tonnes per year excavated. This is assuming a maximum excavation rate of 1,430 tonnes per day for 5.5 days per week, 30% of which is "reject" clay material.*

Table 6.4
Estimated Dust Emissions For Extraction Operations

Activity	*TSP Emission Rate (kg/year)*
Scraper excavating material	*11,860*
Scraper transporting material to processing plant	*2,340*
Conveyer stacking screened material	*449*[1]

Loading product to trucks	*7,150*
Hauling product off-site	*8,580*
Wind erosion from exposed extraction area	*4,746*
Wind erosion from stockpiles and processing area	*803*
Total	***34,742***

[1] *This is an approximate value for the year and will vary from hour to hour depending on the wind speed.*

Assessment of Impact of Proposed Operations

The ISCST3 model has been used to predict dust concentrations and deposition levels for each grid receptor and residence near the site to determine whether or not the EPA short-term PM_{10} goals are met by the proposed operations. Dust deposition has been averaged over the year and expressed as monthly deposition levels. Results are presented in Figures 8 to 15 of the air quality assessment report at Appendix 10 and discussed below with reference to the individual goals.

Concentration

Short-term concentration

The predicted maximum 24-hour $PM_{2.5}$ concentrations due to proposed operations at the extraction site, are shown in Figure 8 of the air quality assessment report at Appendix 10. Predicted levels at all residences are expected to be below 10 $\mu g/m^3$. This is well below the short-term US EPA goal of 65 $\mu g/m^3$.

Figure 9 of the air quality assessment report at Appendix 10 shows the predicted maximum 24-hour PM_{10} concentration in the area around the proposed site. The predicted 24-hour PM_{10} concentrations at the nearest residences are slightly less than 50 $\mu g/m^3$. As discussed in Part 6 of this EIS, it is impossible to determine a 24-hour average background PM_{10} concentration without monitoring data. Without contemporaneous meteorological and monitoring data it is also impossible to determine whether or not the maximum predicted 24-hour PM_{10} concentration will occur under conditions which produce the worst-case background levels. The best that can be done is to show that the levels which are predicted to occur for the proposed operations are almost identical to those estimated for existing activities.

It must also be remembered that this is a worst-case assessment for these residences, since the active extraction cell will not always be in the northeast corner of the site. At other times during the year, and throughout the life of the project, the main dust producing activities will be occurring further away from these residences.

The US EPA short-term goal of 150 $\mu g/m^3$ is not predicted to be exceeded at any residence. This is the most appropriate goal for this assessment. Background concentrations would need to be of the order of 100 $\mu g/m^3$ or more for the US EPA

short-term PM_{10} goal to be exceeded, and this is unlikely to be the case.

The NEPM 24-hour goal on which the NSW EPA goal is based, allows five exceedances of 50 $\mu g/m^3$ per year. Figure 10 of the air quality assessment report at Appendix 10 shows the predicted sixth highest 24-hour PM_{10} concentration due to proposed on-site operations. It is shown that all residences lie outside the 50 $\mu g/m^3$ contour.

Figure 11 of the air quality impact assessment at Appendix 10 shows a time series of 24-hour average PM_{10} concentrations at the most affected residence, indicating that the majority of predicted levels are below 30 $\mu g/m^3$. The sixth highest predicted PM_{10} level at this residence is approximately 31 $\mu g/m^3$. A background of 19 $\mu g/m^3$ would therefore be required to cause an exceedance of the NSW EPA goal. It is likely that this could occur under worst-case conditions, but as discussed previously, the more appropriate goal for assessing this proposal is the US EPA 24-hour goal of 150 $\mu g/m^3$. It should also be remembered that when the operations move away from the northeast corner, 24-hour concentrations due to on-site operations will be reduced significantly.

Long-term concentration

Predicted annual average $PM_{2.5}$ levels are shown in Figure 12 of the air quality assessment report at Appendix 10 to be well below the US EPA goal of 15 $\mu g/m^3$. The highest $PM_{2.5}$ prediction at the most affected residence is less than 2 $\mu g/m^3$.

Figure 13 of the air quality assessment report at Appendix 10 shows that predicted PM_{10} levels, due to the proposed operations, are expected to remain well below the US EPA annual goal of 50 $\mu g/m^3$, with the concentration at the most affected residence estimated to be approximately 10 $\mu g/m^3$. When added to an estimated background level of 10 $\mu g/m^3$, the proposal is not anticipated to exceed the annual goal.

Figure 14 of the air quality assessment report at Appendix 10 shows the predicted annual average TSP concentrations due to emissions from the site. The most affected residence is predicted to experience an increase in annual TSP concentration of approximately than 20 $\mu g/m^3$. This is well below the NHMRC annual goal of 90 $\mu g/m^3$ and this goal is not expected to be exceeded even when added to estimated existing levels of 15 $\mu g/m^3$.

Deposition

Annual average dust deposition rates of approximately 4 g/m^2/month are currently experienced at the Maroota Public School and areas to the west. This allows for almost no contribution to deposition levels in those areas from the proposed operations. As shown in Figure 15 of the air quality assessment report at Appendix 10, the levels predicted for areas north of the current study area are negligible.

It is argued that an appropriate background deposition level (excluding existing

operations on the site), would be approximately 1.5 - 2 g/m^2/month, which would allow for an increase in the order of 2 - 2.5 g/m^2/month. Figure 15 of the air quality assessment report at Appendix 10 shows that the levels predicted at the nearest residences are approximately 2 g/m^2/month. The EPA annual average goal of 4 g/m^2/month is therefore not expected to be exceeded due to emissions from the proposed operations. Levels are expected to be similar to those which are currently experienced at the site. It must also be remembered that as the excavation operations move further to the south and west, most of the emission sources will also be relocated. The deposition levels at these residences on Roberts Road are therefore likely to decrease significantly as this occurs.

The assessment has shown that the operations are predicted to comply with both the long-term and short-term concentration goals, as well as the deposition goals. Indeed, in some cases, it may be that the dust levels decrease with the proposed development, as the activities move further away from Roberts Road during the life of the project.

Conditions 28 to 36 of the Consent relate to air quality.

To determine the impact the development as proposed to be modified would have on the air quality of the locality, Wilkinson Murray Pty Limited has prepared an Air Quality Assessment, a copy of which is at **Appendix 14**.

3.9.1 NSW Air Quality Criteria

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality.

Air quality goals relevant to the Site relate to particulate matter and are sourced from the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (NSW DEC, 2005)*.

The air quality goals for the relevant particulate matter pollutants relate to the total pollutant burden in the air and not just the pollutant from the project. As such, consideration of background pollutant levels is required when using these goals to assess potential impacts. **Figure 3.19** shows the criteria for each of the relevant dust metrics considered in this assessment.

Pollutant	Averaging Period	Impact	Criterion
Total suspended particulates (TSP)	Annual	Total	90 µg/m^3
Particulate matter ≤ 10µm (PM_{10})	Annual	Total	30 µg/m^3
	24-hour	Incremental	50 µg/m^3
Deposited dust (DD)	Annual	Incremental	2 g/m^2/month
	Annual	Total	4 g/m^2/month

Figure 3.19: NSW EPA Air Quality Impact Assessment Criteria.

There are currently no air quality goals for particulate matter ≤ 2.5 µm ($PM_{2.5}$) for projects within NSW, however, the National Environmental Protection Council (**NEPC**) has developed an advisory National Environmental Protection Measure (**NEPM**) for $PM_{2.5}$, as follows:

- A maximum 24 hour average concentration of 25 µg/m^3, and,
- An annual average concentration of 8 µg/m^3.

The above goals for $PM_{2.5}$ concentrations are considered advisory only.

The Consent has conditions 28-36 which deal with air quality.

Air quality standards and goals refer to pollutant levels which include the contribution from specific projects and existing sources. The Consent conditions and Air Quality Management Plan for the Site require that PM_{10} and dust deposition be monitored to manage dust from the Site. PM_{10} and dust deposition has been monitored since sand extraction began on the Site. The monitoring locations are shown in **Figure 3.20**.

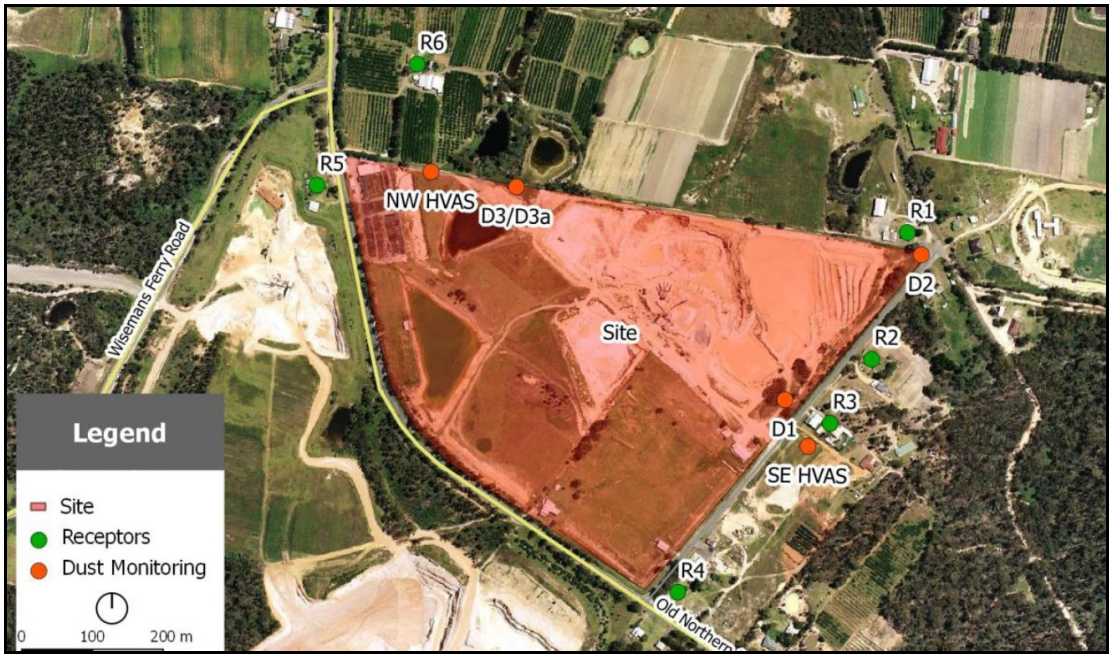

Figure 3.20: Dust Deposition & High Volume Air Sampler Monitoring Locations.

The locality is predominantly agricultural and mining land, although areas to the east of the Site and the National Park are well vegetated. Sources of particulate matter in the area would include traffic on unsealed roads, mining activities, local building and construction activities, animal grazing activities and to a lesser extent traffic on roads.

PM_{10} and dust deposition levels recorded from approximately 2002 have been used to establish the potential zone of impact for the existing sand extraction facility and these results would then be used to qualitatively assess the extension of the facility. The PM_{10} and dust deposition levels measured around the mine are summarised in **Figure 3.21** and **Figure 3.22**, respectively.

Year	Month	PM_{10} monthly averages 24 hour maximum ($\mu g/m^3$)	
		NW HVAS	SE HVAS
2002	January	-	12
	February	-	12
	March	-	15
	April	-	16
	May	-	5
2008	April	18	33
	May	32	32
2011	November	14	14
	December	12	16
2012	January	4-	5
	February	< 2	< 2
	March	4	4
	April	< 2	4
	May	4	11
	June	11	7
	July	9	7
	August	8	11
	September	17	7
	October	15	16
	November	15	11
	December	6	6
2013	January	13	12
	February	22	17

Figure 3.21: PM10 Monitoring Results for the Hodgson Quarry Products Pty Ltd Sand Extraction Facility at Roberts Road (Table 4-1 of the Wilkinson Murray Report).

Annual Averages	D1 Gate	D2 South East Corner	D3 Bund Wall	D3(a) Bund Wall
2005	5.7	1.5	4.8	-
2006	0.9	0.6	1.6	-
2007	<0.6	<0.6	<0.6	-
2008	1.6	1.3	1.8	-
2009	2.1	1.7	2.8	-
2010	1.2	1.4	1.9	-
2011	0.8	1.1	1.6	-
2012	0.8	1.2	1.30	1.96
2013	2.1	1.1	-	1.68
2014	0.96	1.1	-	2.86

Figure 3.22: Dust Deposition Monitoring (g/m^2/month) results for the Hodgson Quarry Products Pty Ltd Sand Extraction Facility at Roberts Road (Table 4-2 of the Wilkinson Murray Report).

The PM_{10} levels and dust deposition levels monitored for the life of the sand extraction facility indicated compliance with the EPA recommended air quality criteria of 50 $\mu g/m^3$ and 4 g/m^2/month.

An exceedance of the dust deposition criterion of 4 g/m^2/month was recorded in 2005, however, the monitoring reports suggest this was atypical due to the extended monitoring time the gauges were subject to, which lead to a build-up of bio-mass in the samples collected.

3.9.2 Local Climate and Dispersion Meteorology

Long term climatic data from the Bureau of Meteorology weather station at the Richmond RAAF base were analysed to characterise the local climate in the proximity of the Site. The Richmond RAAF station is located approximately 20km south-west of the Site.

The data indicates that January is the hottest month with a mean maximum temperature of 30ºC and July is the coldest month with mean minimum temperature of 3.6ºC.

Humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9:00am humidity levels range from 58 per cent in October to 82 per cent in May. Mean 3:00pm

humidity levels vary from 39 per cent in August to 53 per cent in June.

Rainfall peaks during the summer months and declines during winter. The data shows February is the wettest month with an average rainfall of 122.9 mm over 8.4 days and July is the driest month with an average rainfall of 28.5 mm over 3.9 days.

As the closest BoM meteorological station is at Richmond RAAF, approximately 20km from the Site, prognostic meteorological data was generated using The Air Pollution Model (**TAPM**), developed by the CSIRO to investigate site-specific wind conditions.

The Site has a meteorological station, however, this is only used as a reactive dust management tool.

The prognostic modelling domain was centred at 33° 27' S, 151° 0' E and involved four nesting grids of 30 km, 10 km, 3 km and 1km with 35 vertical levels.

Observations of wind speed and direction from the BoM Richmond RAAF station were assimilated into the TAPM model to refine details of local winds.

The prevailing wind directions for Maroota are presented in **Figure 3.23**.

Season	Predominant Wind Direction	
	Day	**Night**
Autumn	North-easterly	North-easterly
Winter	South-westerly	North-westerly
Spring	Easterly	Northerly
Summer	Easterly	North-easterly

Figure 3.23: Predominant Maroota Season Wind Direction in the Day & Night (Table 5-2 of the Wilkinson Murray Report).

3.9.3 Potential Dust Impacts of Continued Operation

The presence of dust is influenced by a variety of factors, including prevailing wind direction, temperature, time of day, topography and operational activities. Due to the physical nature of the sand extraction activities, there is the potential for air pollution due to suspended dust particles. The dust which generally emanates from the Site is usually caused by either wind or traffic generated on roads and hardstand areas.

As part of the extraction, there are various excavation and processing activities proposed to occur on-site for the continued operation. These would include:

- an excavator and truck at surface level to remove the topsoil and overburden;
- an excavator pulling material down from above or a dozer ripping sandstone and

excavator loading dump trucks;

- transportation of product using a dump truck to the processing feed area;
- front end loader managing a few stockpiles to blend the different grades of sand as required before tipping into the power screen, and
- transportation of sand off site.

The total amount of dust generated from the continued sand extraction would not be greater than the levels generated during past operations of the facility.

As the sand extraction is daytime only, the predominate winds of the area are easterly winds in spring and summer, north-easterly in autumn and south-westerly in winter. Residential receiver (F) is west of the Site and residential receiver (D) is south of the Site and would be the major two residential receivers potentially affected by the continuation of sand extraction as extraction is getting closer to them. These residences are, however, no closer than other residential receivers to past extraction areas for example residential receiver (B).

Having reviewed the potentially closest residential receivers to the proposed extraction areas, the predominate winds and the past PM_{10} and dust deposition levels monitored from the Site from past operations, it would appear that dust from the continuation of sand extraction is unlikely to impact on the closest residential receivers as long as the dust mitigation methods in the existing air quality management plan continues. For example:

- Reactive Dust Management

  Assess activities during adverse weather conditions and modify activities as required to minimise dust.

- Damping Down

  Hardstand and manoeuvring areas are kept in a sufficient state of dampness so as to minimise dust raised into the air by the passing of vehicles. Water is applied by water cart. Frequency of water application shall be as often as required so as to prevent dust rising into the air under the prevailing conditions.

- Trucks

  All vehicles are restricted to a speed limit of 30km/h. Trucks are covered when entering and leaving the premises carrying loads of potentially dust generating material.

- Stockpile

  If dust is generated from stockpiles they will be watered using a sprinkler system.

Notwithstanding, the air quality assessment contained as **Appendix 14** contains modelling

of the proposed modification which states:

> *This study has assessed the potential dust impacts associated with the proposed continuation of the Hodgson Quarry Products Pty Ltd sand extraction facility at Roberts Road, Maroota.*
>
> *For existing sand extraction operations, PM_{10} and dust deposition levels recorded from approximately 2002 have been reviewed. It was found that the TSP, PM_{10} and dust deposition levels monitored for the life of the sand extraction facility indicated compliance with the EPA recommended air quality criteria of 50 $\mu g/m^3$ and 4 g/m^2/month.*
>
> *Dispersion modelling results for the three worst case future extraction scenarios indicated that the continued operation of the site is unlikely to impact on sensitive receptors providing that the application of dust mitigation measures identified in the existing air quality management plan continues.*

3.10 Heritage

An archaeological survey of the Site was undertaken as part of the preparation of the EIS for the original development application. Following is an extract from the EIS.

> *The field survey took place on 3 March, 1999. Present were archaeologists Tessa Corkill and John Edgar. Allen Madden and Andrew Roberts represented the interests of the Metropolitan Local Aboriginal Land Council (**LALC**).*
>
> *No Aboriginal archaeological sites or areas of potential archaeological deposit were identified.*
>
> *The ridge on which the Site is located is thought to be part of a major north-south Aboriginal pathway between the Parramatta River valley and the Hawkesbury and thence on to the Hunter Valley. This ridge may also have been a language boundary between the Darug speakers to the west and the Kuringgai to the east, however, no localities particularly suitable for camping or activities likely to result in significant quantities of archaeological material appear to be present on the area surveyed. The absence of local surface water on this section of the ridge top is a particular constraint.*
>
> *Extensive horticultural activity over many years, levelling of surfaces, dam construction and extraction of sand have left virtually no surface within the survey area undisturbed. There is no outcropping rock other than a few small sections in some areas. These rocks are iron-rich and coarse-grained and are unsuitable for engraving or grinding.*
>
> *The lack of old trees, extensive cultivation and lack of outcropping sandstone, eliminate scarred trees, engravings, rock shelters and wells from any site prediction*

model, leaving the rare categories of artefact scatters (Open Camp Sites) and stone arrangements as the most likely archaeological remains.

Generally high levels of grass cover made it difficult to identify artefact scatters which may have been present. As these appear to be rare in this type of landscape, and considering the general level of surface disturbance, it is unlikely that any in situ artefacts are present. There may be occasional stone artefacts on the surface which have been obscured by vegetation or mechanical disturbance, as Aboriginal people are likely to have used this area in the past for foraging and hunting.

No original food plants were identified on the ridge top, those that were likely to have been present in the past having been cleared. Only a few regrowth eucalypts are present near fence lines and three regrowth casuarinas are present below the wall of the dam nearest Old Northern Road.

Ground Surface Visibility

There was a general background surface visibility ranging from zero to 5% in each of the paddocks except in Area K, in which the surface has been removed to a considerable depth or otherwise totally disturbed.

Area K has been excluded from the calculation because of the total destruction of surface area as has the area of the existing two dams. The inclusion of these large areas (relative to the total area) would artificially skew the visibility figures.

Total ground surface visibility was calculated at 6% of the total survey area.

Given the current and past extractive activities, previous clearing and other horticultural practices over the whole of the survey area, and its relatively small size, the Archaeological report concludes that there are unlikely to be any significant undetected, undisturbed Aboriginal sites or areas of Potential Archaeological Deposit in the area surveyed.

Condition 56 of the Consent relates to Heritage and states:

If, during the development, the Applicant becomes aware of any heritage or archaeological materials, all work likely to affect the material shall cease immediately and the relevant authorities consulted about an appropriate course of action prior to recommencement of work. The relevant authorities may include NPWS, the Heritage Office, and the Local Aboriginal Land Councils. Any necessary permits or consents shall be obtained and complied with prior to recommencement of work.

During extraction of the Site to date, no heritage or archaeological materials have been encountered. Adherence to the requirements of Condition 56 would ensure that, should such materials be encountered in the future, suitable actions would be taken to ensure the integrity of those materials.

3.11 Waste

The EIS which accompanied the original development application stated:

> *The proposed facility will not generate significant waste. That waste which will be generated includes the general waste from the office complex and staff amenities, and reject material for the extraction process.*
>
> *All waste from the amenities complex and office will be collected in a commercial waste bin and taken to landfill either through the Council garbage collection or by private contractor.*
>
> *Waste material from the extraction process will be used as fill material during the rehabilitation of the site.*

Condition 26 of the Consent state:

> *26. The Applicant must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal, or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997. This condition only relates to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence under the Protection of the Environment Operations Act 1997.*

The proposed modification would not alter the approved operation on the Site with regard to waste generation and would be subject to condition 26 of the Consent.

3.12 Rehabilitation

The EIS which accompanied the original development application contained an Environmental Management & Rehabilitation Plan (**EMRP**) for the Site which was based on the approved extraction sequence and the approved final landform plan. The EMRP contained a progressive rehabilitation process as follows:

> *The extraction areas will be progressively rehabilitated so that vegetation cover is established at the earliest possible opportunity, thus minimising the extent of disturbed land within each extraction cell, and ensuring that any potential visual impact has a limited life.*
>
> *The EMRP will provide detailed staging plans for the excavation and progressive rehabilitation works.*
>
> *The extraction will entail operating cells approximately 200 x 50 metres (1 hectare).*

It is intended that 3 cells may be open at any one time:-

- *the newest cell will be extracted*
- *the previous cell will now be used for clay drying and topsoil stockpiling*
- *the oldest cell will now be rehabilitated, ...*

An outline of the EMRP was contained in Part 8 of the EIS. With regard to rehabilitation, the following was proposed:

Objectives

- *To ensure that revegetation of the site is undertaken progressively as allowed by the completion of earthworks.*

- *To ensure that eventually the site is left in a stable condition which blends with the general land uses of the Maroota area in accordance with the rehabilitation plan for the site.*

Tasks/Actions

- *Lands which have ceased to be directly involved in the extraction process will be rehabilitated in accordance with the rehabilitation plan.*

- *Implementation of the Rehabilitation Plan.*

Performance Indicator

- *Success of rehabilitation and survival of planted species.*

Responsible Person/Organisation

- *Site Manager.*

Reporting and Review

- *Annual Environment Report.*

Corrective Action Mechanisms

- *Remove and replace dead or diseased plants.*

- *Investigate cause of death and/or disease.*

- *Take remedial action to improve conditions for sustained growth.*

Condition 57 of the Consent deals with rehabilitation of the Site and states:

57. The Applicant shall prepare a Plan for the staged rehabilitation of the site as

part of the EMP. The Rehabilitation Plan shall:

(a) outline procedures for the implementation of rehabilitation measures within an acceptable timeframe;

(b) document the source of material for rehabilitation and methods to ensure that no contaminated of otherwise unsuitable material is brought onto the site;

(c) detail the preferred option for the final landform and implementation of this landform;

(d) detail proposals for the integration of the visual bund walls into the final landform of the site; and

(e) provide evidence of consultation with Council in the design of the final landform for the site.

The proposed modification seeks to modify the approved sequence and method of extraction. A consequence of the proposed modification is a modified final landform for the Site. A reduced copy of the modified final landform plan is at **Appendix 17** with an extract from that plan being **Figure 3.24** below.

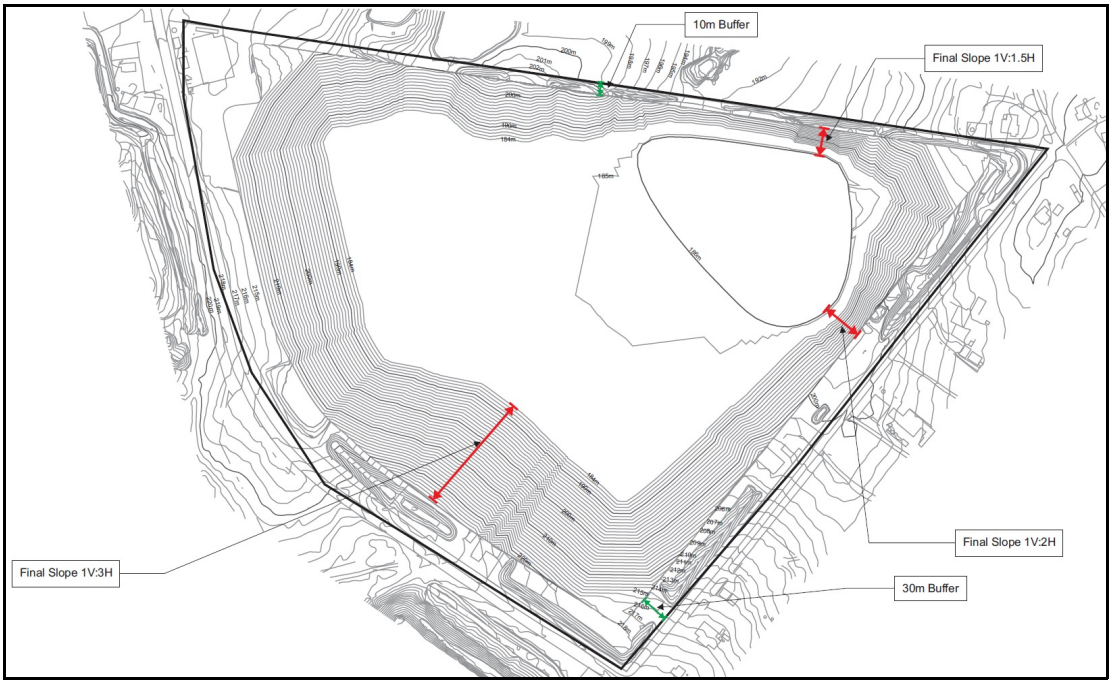

Figure 3.24: Final Landform after rehabilitation.

Due to the proposed modification, there is also a need to modify the approved Rehabilitation Plan for the Site. A revised Rehabilitation Plan has been prepared by Conzept Landscape Architects as part of the proposed modification, a copy of which is at **Appendix 11**.

The modified Rehabilitation Plan is discussed in detail in **Part 2.9** of the EA. The

conclusions are:

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

- *The nominated extraction areas can be successfully rehabilitated, re-establishing an extensive endemic vegetation cover.*
- *That vegetated bunds may be utilized to minimise the visual impact of the extraction works.*
- *The proposed rehabilitation process can be staged in an effective manner so as to progressively rehabilitate areas of the site where extraction has been completed, final levels achieved, and all activity has ceased.*
- *Appropriate standards will be set for the on-going monitoring of the rehabilitation process and maintenance works to ensure the successful establishment of rehabilitated areas on site, resulting in a sustainable, endemic landscape in character with the original Shale-Sandstone Transitional Forest vegetation Community.*

3.13 Social and Economic Impact

The Site is located within the area to which Sydney Regional Environmental Plan No.9 - Extractive Industry (No.2 - 1995) (**SREP 9)** applies.

The Consent was issued having regard to SREP 9 with the conclusion that the approved development was consistent with the aims of SREP 9.

The proposed modification would not result in any additional employment, and the existing market for product would remain. No economic impact, other than continuation of employment of ten (10) staff and the economic use of a valuable sand resource, is expected to result from the proposed modification.

If extraction activity ceased on 31 May 2016, there would be an hiatus in the provision of Maroota Sand to the Sydney construction industry. In addition, less than half of the Site has been extracted, and, as such, it would be impossible to rehabilitate the Site in accordance with the Consent until such time as the Site is fully extracted as per the Consent. In order to cause the least disruption to the operation of the existing extraction, the continued employment of the ten (10) workers at the Site, and to maintain the supply of Maroota Sand to the local market, Modification (2) proposes to extend the existing extraction of the Site to 31 May 2025.

3.14 Visual Impact

The visual impact of the approved extractive industry was canvassed in the EIS which accompanied the original development application and, in particular, with regard to site landscaping and rehabilitation. The aims of the site landscaping and rehabilitation 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 %)*

  - *Dams (7 %).*

- *Ensure that the progressively rehabilitated areas of the site are protected and monitored for the life of the development.*

At the beginning of the project, and within the boundary setback zones, earth bunds shall be established. These bund walls and the remaining boundary setback areas will then be permanently mass planted with appropriate native plants for visual screening and noise attenuation purposes. .....

Proposed bund walls - within the 30 metre setback zone to Old Northern Road and Roberts Road - are typically 23m wide, up to 3m high, and have a profile which portrays a 1 in 4 grade to the road frontage and a 1 in 3 interior grade. Service and maintenance access routes are proposed at the base of both the front and rear of these bund walls.

Nominated bund walls with the 10 metre setback zone along the northern property boundary, shall achieve a 2 metre height, as required for noise attenuation, and will therefore have 1 in 2 finished batter grades.

The bund walls will be constructed using overburden from the existing dam works, and capped with a 250 mm layer of site topsoil.

Within the extraction works areas, additional earth bunding will be provided around nominated works areas to provide additional visual screening and noise attenuation. These internal bunds will be temporary and as such, shall be stabilised with a grass

cover crop.

Other aspects of the rehabilitation of the site, including:

- *Protection of Existing Vegetation;*
- *Native Seed Collection;*
- *Removal of Vegetation;*
- *Topsoil Stripping and Storage;*
- *Treatment of Final Excavated Surfaces, and*
- *Maintenance.*

As detailed in **Part 1.3.1** of this EA, Modification No.1 to the Consent amended the approved method of extraction which did not require bunding for acoustic mitigation purposes, however, for visual impact mitigation purposes, bunding along part of the boundary of the Site was retained.

Appendix 2 contains information relating to the existing bunds on the Site.

As part of the proposed modification to the sequence of extraction, it is also proposed to modify the approved bunding of the Site to enable the visual impact which might otherwise occur to be mitigated. **Appendix 10** contains plans of the proposed modified sequence of extraction and also indicates the position of permanent and temporary bunds to provide for visual impact mitigation.

There will be two types of Bunding associated with the proposed staging of the extraction works. These will be Temporary Bunds and Permanent Bunds. Both type of bunds will essentially be built in the same way, with the same form and profile as detailed in **Figure 2.14**, however, the top profile layer and final planting treatments shall vary as follows:

Temporary Bunds

Temporary bunds shall be constructed with a profile as detailed in **Figure 2.14** from site material, including stockpiled Subsoil material where available.

The finished layer for planting will consist of a 300mm layer of site Topsoil, which shall be laid with turf stripped from Site.

The completed turfed bund will then be the subject of landscape maintenance in accordance with the Landscape Maintenance Schedule detailed in Landscape Maintenance Schedule (refer **Appendix 11**).

Permanent Bunds

Permanent bunds will be constructed with a profile as detailed in the **Figure 2.14** from site material, including stockpiled Subsoil material where available, as per the temporary bunds. Material from temporary Bunding may also be used.

The finished surface for planting will consist of a 300mm layer of site Topsoil, over which will be pegged a layer of approved jute matting material.

Jute matting will be pocket planting with specified planting as detailed in **Figure 2.25** and **Figure 2.26**.

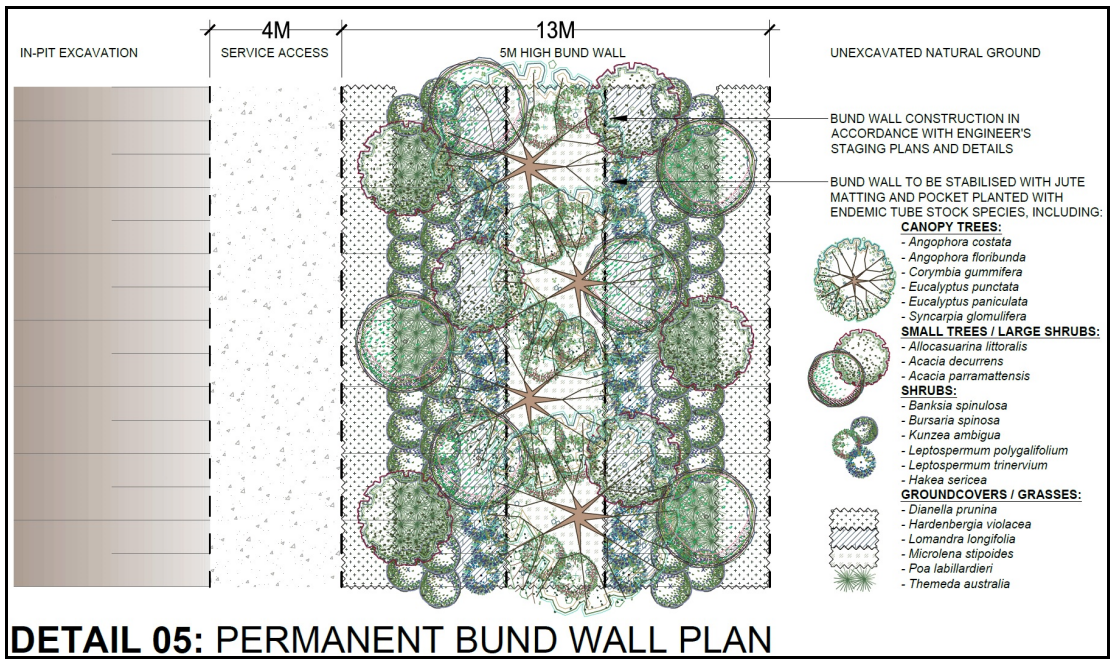

Figure 2.25: Permanent bund wall tube stock planting detail.

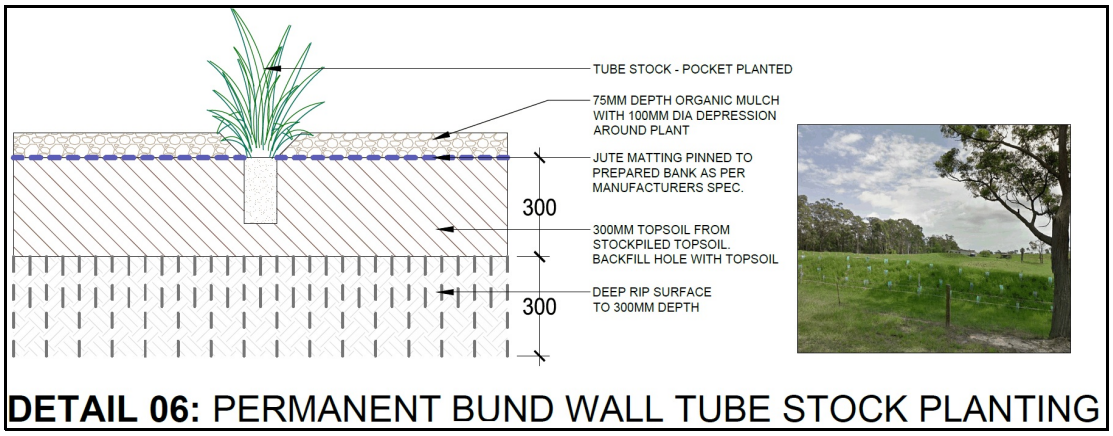

Figure 2.26: Permanent bund wall planting plan.

The completed landscaped bund will then be the subject of landscape maintenance in accordance with the Landscape Maintenance Schedule (refer **Appendix 11**).

With the proposed bunding and landscaping in place, the visual impact of the modified development would be negligible and acceptable.

3.15 Risk Assessment

The proposed modification to the approved extraction involves a number of potential environmental issues. Each of the issues has been addressed and, where appropriate, management and mitigation options have been developed.

Each of the potential environmental issues was ranked as being low, moderate, high or critical risk, the risk rating allocated being dependant upon the probability of the impact occurring and the potential consequences should the impact materialise.

Table 3.1 summaries the findings of the risk assessment which indicate that, in the absence of controls and mitigation measures, aspects of the proposed modification pose a low high moderate risk to the environment. No critical risks were identified.

Aspects of the proposed modification which have been identified as having a low to moderate environmental impact risk ranking have been the primary focus of the EA with appropriate mitigation measures identified.

Ratings in **Table 3.1** were determined based on the following criteria:

Critical Recurring event during the life time of the operation.

High An event which may occur frequently during the life time of the operation.

Moderate An event which may occur during the life time of the operation.

Low An event which is unlikely to occur during the life time of the operation.

Table 3.1: Environmental Risk Rating

Critical	High	Moderate	Low
None	None	Air Quality	Traffic
		Noise	Groundwater

Each of the issues identified are discussed in more detail below.

Air Quality

There is potential for the proposed modified extraction process to impact on the air quality of the locality. To identify any such impacts, Wilkinson Murray Pty Limited has assessed the air quality impact associated with the modified extraction plan. A copy of the Wilkinson Murray Pty Limited report is at **Appendix 14**, which concludes that, having reviewed the

potentially closest residential receivers to the proposed extraction areas, the predominate winds and the past PM_{10} and dust deposition levels monitored from the Site from past operations, it would appear that dust from the continuation of sand extraction is unlikely to impact on the closest residential receivers as long as the dust mitigation methods in the existing air quality management plan continues. For example:

- Reactive Dust Management

  Assess activities during adverse weather conditions and modify activities as required to minimise dust.

- Damping Down

  Hardstand and manoeuvring areas are kept in a sufficient state of dampness so as to minimise dust raised into the air by the passing of vehicles. Water is applied by water cart. Frequency of water application shall be as often as required so as to prevent dust rising into the air under the prevailing conditions.

- Trucks

  All vehicles are restricted to a speed limit of 30km/h. Trucks are covered when entering and leaving the premises carrying loads of potentially dust generating material.

- Stockpile

  If dust is generated from stockpiles they will be watered using a sprinkler system.

Noise

The Environmental Impact Statement which accompanied the original development application contained an assessment of the potential impact of the then proposed extraction on the acoustic environment, and made recommendations with regard to mitigation of identified impacts.

Modification No.1 to the Consent included modification to the approved extraction process which in turn modified the acoustic impact of the modified development.

The currently proposed modification to the approved extraction process has the potential to impact on the acoustic environment. Wilkinson Murray Pty Limited has undertaken an assessment of the potential acoustic impact, a copy of which is at **Appendix 15** which concludes:

> *Operational noise impacts associated with the continuation of material extraction at the Roberts Road Quarry have been assessed in accordance with criteria recommended by the NSW INP and RNP for operational noise and traffic noise. It is recommended the noise condition in the existing approval is amended to reflect the current approach to using LAeq,15min.*

Mitigation in the form of additional perimeter bunding is proposed as part of the development.

In relation to operational noise, compliance with the proposed condition is achieved for typical operations at all surrounding residences. However there are some short periods of time, generally from a few days to a few weeks, through the remaining quarry life (construction of bunds, surface extraction and use of a dozer) which results in exceedances of criteria. No further mitigation is considered feasible and reasonable to reduce these exceedances.

There is no change in traffic noise generated by the development, which results in negligible noise impact at residences located along Old Northern Road.

Traffic

Truck movements generated by approved extraction activity are governed by condition 49 of the Consent, as modified, which states:

> *49. The applicant shall ensure that truck movements associated with the development do not exceed 100 movements per day (50 laden truck movements) or 20 (10 laden truck movements) movements per hour, during construction or operation.*

No modification is proposed to the already approved truck movements to and from the Site.

Since the commencement of the approved extraction there has been an increase in extraction activity in the Maroota area. To determine if the operation of the intersection of Roberts Road with Old Northern Road has altered during that time period, Lyle Marshall & Associates Pty Ltd has updated the traffic assessment report which was undertaken as part of the original EIS. A copy of the update Lyle Marshall & Associates pty Ltd report is at **Appendix 13**, the conclusion of which is that this intersection was up-graded prior to October 1997 to provide a sheltered right turn bay in Old Northern Road. The pavement striping continues on the northern side of Roberts Road.

An analysis of the performance of the intersection under existing am and pm peak hour volumes has been made using SIDRA Version 5.0. The intersection is operating at Level of Service A in both peak hours.

The proposed modification would not affect the operation of the existing, approved, access to the Site or the operation of the intersection of Roberts Road with Old Northern Road.

Groundwater

There is a potential risk that the proposed extraction would impact the regional groundwater resource. The resultant impact would be that groundwater would flow into the extraction pit and that the use of the groundwater resource by other users dependant upon that groundwater would be adversely impacted.

A groundwater assessment was undertaken as part of the EIS for the original development application which concluded that in order to ensure that the proposed development does not have an impact on groundwater, the approved construction of the dam on the Site is to have a base level of 180 m AHD with the approved extraction not to be undertaken within 2 metres of the groundwater level.

The proposed modification does not seek to increase the lateral extent of the approved extraction.

Since extraction commenced, however, policy changes have seen the introduction of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan (**WSP**) (2011) and Aquifer Interference Policy (**AIP**) (2012). As part of the modification, the New South Wales Office of Water (**NOW**) requires evidence that the proposed modifications adhere to the above mentioned plans.

The AGT Report at **Appendix 16** concludes:

> *Based on well data .... local and regional bores correlate with the water levels recorded from the EIS assessment (Woodward-Clyde, 1999). Monitoring from 1999 record water levels in the regional MTSGS between 178.64.5 and 184.23 mAHD.*
>
> *For the purpose of this assessment PT84MW-6 is the most representative well and a maximum wet weather groundwater elevation of 183.10 mAHD is proposed. This would restrict the quarry pit depth to 185.10 mAHD. It should be noted however that the clay band identified at 183.7 mAHD locally confines the regional MTSGR, and quarrying to the preferred depth of 183.7 mAHD will not intersect groundwater.*
>
> *A cross section showing the current landform and the proposed landform is presented as Figure 6. The wet weather elevation adopted by the original EIS assessment (existing consent) together with the revised wet weather elevation 2015 (this modification) are also shown on Figure 6 for comparison.*

In response to the findings of the AGT Report, it is proposed to raise the approved depth of extraction from 182m AHD to 185.1m AHD.

Notwithstanding, as part of the assessment process of Modification (3), the NSW Office of Water made comment as follows:

> *The Office of Water has reviewed the information provided it and it requests that the Department of Planning and Environment notes the following:*
>
> - *That the highest water level measured beneath the site is at least 1 m above that which has been reported in the current documentation (i.e. at 184.08 m AHD, not 183.10 m AHD).*
> - *That any excavation approved for the one year period requested must maintain additional freeboard accordingly (i.e. no excavation deeper than 186.08 m AHD).*

As a consequence of the above comments from the NSW Office of Water, the Consent was modified such that Condition 17 now reads:

> *The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.*

The proposed modification does not seek to amend the approved depth of extraction and would ensure that groundwater is not impacted as part of the modified extraction on the Site.

Part Four

DRAFT STATEMENT OF COMMITMENTS

4.1 Introduction

This part of the Environmental Assessment provides a draft Statement of Commitments which outlines the measures which Hodgson Quarries and Plant would undertake in respect of the environmental management of the Site. Those commitments would be in addition to those which are currently in place as part of the conditions of consent which direct the existing extraction on the Site.

4.2 General

(a) The proposed modification would be undertaken in accordance with the Environmental Assessment prepared by Nexus Environmental Planning Pty Ltd, including Appendices.

(b) The continued extraction of material from Lots 1 & 2, DP 228308 and Lot 2, DP 312327 would be undertaken in accordance with the modified conditions of Development Consent No.267-11-99.

4.3 Groundwater

The modified conditions of Development Consent No.267-11-99 require that the depth of extraction be limited to 186.08m AHD such that extraction does not impact on the regional groundwater table.

Hodgson Quarries and Plant is committed to the continued monitoring to ensure that suitable data are obtained with regard to the behaviour of groundwater as per the current licensing requirements. The following commitments are made with regard to groundwater.

4.3.1 Groundwater Management Strategy

The strategy for groundwater management is to minimise groundwater inflows from the Maroota Tertiary Sands Groundwater Source (**MTSGS**) to the open cut and preservation of groundwater quality. It involves maintaining the depth of mining at or above RL 186.08m AHD. A series of survey stations will be established on the Site to enable monitoring of the depth of extraction.

Aspects assessed to be at risk have been previously assessed by Woodward-Clyde (1999) and summarised in Section 3 of the AGT Report at **Appendix 16**. Mitigation measures have been proposed for each potential impact including predicted and unpredicted impacts. As such, the groundwater monitoring program specifically deals with:

- A mechanism for ensuring the project is compliant with the rules of the Water Sharing Policy (**WSP**) and NSW Aquifer Interference Policy (**AIP**).

- Unforseen impacts on groundwater levels on neighbouring properties and on any users of groundwater.

- Unforseen impacts of the development on groundwater quality such as around storages.

- Periodical monitoring for changes and local and regional impacts of the quarry on groundwater levels and quality during the project and on a reduced basis for at least five (5) years post extraction.

Information gained from the monitoring program will ensure the pit floor remains at or above RL 186.08m AHD, thereby mitigating any drawdown impact to the MTSGS.

Ongoing groundwater monitoring serves to notify changes to the groundwater, quality or unforeseen discharges into the pit. Monitoring is necessary to indicate that abnormal conditions relating to quarrying have developed, as well as compliance with the rules of the WSP and AIP.

A Trigger Action Response Plan (**TARP**) for groundwater will be developed to focus upon appropriate trigger and response actions for the management or mitigation of impacts. The baseline monitoring program which is in place will have established triggers, which will be used to indicate levels of impact and trigger an appropriate response. The fundamental means of determining the magnitude of any impact and the need for further monitoring and/or remedial actions is based upon the impact assessment criteria detailed in Table 6 of the AGT Report, a copy of which is reproduced below.

The responses (actions) documented in the table are proposed to ensure the timely and adequate management of impacts outside of the established trigger levels.

Table 6: Trigger Action and Response Plan

Impact	Observation	Strategy for Mitigation	Monitoring	Monitoring Action	Response
Groundwater level	Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the water sharing plan.	Baseline GWL data has been used to ensure depth of mining remains above the Maroota Tertiary Sands Groundwater Source. Regular review of monitoring data to ensure mining is maintained above the elevation of the regional water table.	PT84MW-6	**Water level**: If water level monitoring indicates increasing trends or confirmed pit inflows, increase monitoring frequency to weekly to establish trend	Investigate potential contributing factors: -Confirm trends or anomalies by repeating water level or quality sampling as required -Compare exceedance with climatic conditions -Engage a hydrogeologist to undertake a preliminary investigation and report on any identified changes. Where investigations determine that impacts are the result of Hodgsons Quarry operations or may potentially impact on adjacent bores or surface water users implement Section 6.2 of this report, which may include: Modify mine plan or obtain groundwater licence to offset impact;
Groundwater quality	Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.	Ensure all spillages are contained, diversion of dirty water into settling ponds, maintenance of machinery to be undertaken in work shop areas. Monitoring of pit will be undertaken as a first line of defence to detect & control the risk of groundwater contamination	PT84MW-6, In-pit surface expressions	**Water Quality**: Repeat sampling of bore and in pit water to confirm contamination event.	
Groundwater users	Reported decrease in yield or GWL outside of climatic variations. Reported decrease in water quality parameter outside of baseline variation	Baseline GWL data has been used to ensure depth of mining remains above the Maroota Tertiary Sands Groundwater Source. Regular review of monitoring data to ensure mining is maintained above the elevation of the regional water table.	PT84MW-6	**Water level**: Increase monitoring frequency to weekly to establish trend	
Pit inflows	Observed seepages from pit wall	Regular review of monitoring data to ensure mining is maintained above the elevation of the Maroota Tertiary Sands Groundwater Source. Monitoring of water quality in pit will be undertaken as a first line of defence to control the risk of groundwater contamination	PT84MW-6	**Water level**: Increase monitoring of bores to weekly to establish trend. **Water quality:** obtain comprehensive analysis from pit seepages. **Volume:** weekly record of pit seepages	

4.3.2 Hodgson Quarries and Plant Responsible Impacts Procedure

Where investigations detailed in the TARP determine that groundwater impacts are the

result of Hodgson Quarries and Plant operations, or may potentially impact on adjacent bores, the following procedure would be actioned:

- Inform landholders adjacent to streams and/or private bore owners, and the NSW Office of Water of preliminary investigation outcomes, as appropriate.
- Undertake a detailed investigation and assess possible mitigation measures in consultation with the landowner and the NSW Office of Water, as appropriate.
- If deemed necessary, prepare and implement a site mitigation/action plan to the satisfaction of DPI, in consultation with the landowner and the NSW Office of Water, as appropriate.
- Conduct a review of results from the follow up investigation.
- Further, the timing of the above includes, but is not limited to:
    - Results of preliminary investigation reported within one week of completion.
    - Commence preparation of detailed investigation including assessment of possible mitigation measures immediately.
    - Commence preparation of mitigation/action within one week of the need being identified.

4.3.3 Notification of Significant Impact

Where a significant, confirmed impact to the environment or private landowner has occurred according to the TARP, relevant agencies will be contacted immediately.

4.4 Rehabilitation

After the completion of the specified rehabilitation works, vegetated areas will be subject to a minimum landscape works period of 12 months. During this time the landscape contractor will make good all defects which may occur for whatever reason.

Consolidation and maintenance will mean the care and maintenance of all areas undergoing rehabilitation in accordance with the rehabilitation report at **Appendix 11** and associated plans, ensuring that a satisfactory result occurs for these areas with regard to germination and establishment.

The maintenance shall include, but not be limited to, the following items where and as required:

- Watering all landscaped areas
- Monitoring germination, replacement planting and re-hydromulching
- Weed Control
- Make good areas of soil subsidence or erosion
- Topping up of mulched areas
- Spray / treatment for insect and disease control
- Monitoring and controlling rabbits.

All areas which have been hydromulched or pocket planted will be watered in thoroughly following initial works, and will be watered a minimum 3 times per week during winter, and 4 times per week during summer. Watering will be done by hand, utilising dam water on site.

Frequency of watering may be adjusted based on whether conditions, with the objective to ensure the maximum percentage of successful established plant stock.

Areas undergoing rehabilitation will be continually monitored until well established, with failures being replaced in line with the report at **Appendix 11** and landscape specification, and failed hydromulching re-sprayed.

All replacements will be to specification, and of a size equivalent to similar healthy species surrounding the rejected plant, or, in the case of mature trees, to the original size and quality, as a minimum.

Weed removal will be conducted regularly, with hand removal of all top growth roots, rhizomes and stolons of unwanted vegetation. The regular control of all weeds is essential. The applications of pre-emergent sprays are acceptable with approved chemicals applied in strict accordance with manufacturer directions. Any spraying will be done during calm days, to avoid winds blowing herbicides onto native planting.

The landscape contractor will become familiar with the healthy appearance of the plant material and constantly monitor it for damage or pest infestations. When either of these become evident the contractor will immediately apply the necessary control measures.

If newly planted areas are becoming subject to rabbit attack, it may be necessary to install approved rabbit-proof fencing to the area of rehabilitation, to ensure minimal damage is done.

4.5 Flora and Fauna

The proposed modification would not result in the removal of vegetation outside that which has been approved.

4.6 Soil and Water Management

The proposed modification would be undertaken in accordance with the revised Soil and Water Management Plan contained in **Appendix 19**.

Part Five

CONCLUSION

5.1 Introduction

Hodgson Quarries and Plant seeks the approval of the Minister for Planning to modify Development Consent No.267-11-99 to permit a continuation of the approved extraction on Lots 1 and 2, DP 228308 and Lot 2, DP 312327, Roberts Road, Maroota.

Development Consent No.267-11-99, as modified, permits:

(a) development for the purposes of an extractive industry on the Site, in accordance with details contained in the Environmental Impact Statement (**EIS**) prepared by Nexus Environmental Planning Pty Ltd, dated 1999 as submitted with the development application;

(b) extraction in accordance with an extraction plan prepared by Woodward Clyde which details both the sequence and depth of extraction;

(c) extraction in accordance with the modified method of extraction as detailed in the documents prepared by Dick Benbow & Associates which were submitted with the s.96(2) modification application, and

(d) extraction of the Site until 31 May 2016 to a depth no greater than RL 186.08m AHD.

The proposed modification would amend the Consent as follows, full details of which are provided in **Part 2** of this Environmental Assessment.

Dam Construction

Part of the Consent was for the continued construction of a water supply dam on the Site, that dam being required to provide sufficient water to maintain the life of the approved extraction.

The approved dam was to be constructed in two (2) stages, details of which were described in the EIS which accompanied the application for extraction.

During the construction of the approved dam, the applicant has determined that the construction process would be better served if the dam were to be constructed in three (3) stages rather than the approved two (2) stages. It is proposed to amend the consent to modify the dam construction process accordingly.

Sequence of Extraction

There is an approved sequence of extraction of the Site as shown in **Figure 1.6**.

During the extraction process, it has been determined that the approved method of extraction using the cells shown in **Figure 1.6** is neither an economic nor practical way to achieve that extraction.

The existing extraction process on the Site involves a similar cell by cell extraction process to that which is approved but one which is not as rigidly defined as that portray in **Figure 1.6**.

It is proposed to modify the approved sequence of extraction to reflect that which is now being undertaken on the Site such that the most efficient means of extracting the material on the Site is achieved.

Extraction Process

The approved extraction was to be undertaken in accordance with the method of extraction described Modification No.1 to the Consent where a *"Pumping Unit"* method of extraction was to be employed.

Since commencement of the extraction, it has been determined that the approved *"Pumping Unit"* method of extraction is not a practical means by which the resource can be extracted.

While the general concept of the *"Pumping Unit"* method of extraction remains, there have been modifications made to that method as follows:

1. The approved method of extraction is as follows:

   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.

While the above is generally the case, there are instances where sandstone is encountered which is not able to be extracted using an excavator alone. In such circumstances, the sandstone material is ripped using a dozer and then removed using the excavator.

2. The approved method of extraction states:

   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.

The introduction of extracted sand into the mixing tank is being undertaken, however, the approved process assumes that the mixing tank is mobile and can easily move around the

active extraction cell with the excavator. This is physically not easily achieved. What actually occurs is that the mixing tank is located close to the processing plant and is located there on a semi-permanent basis. The material won from the individual extraction cell is then loaded by the excavator to a dump truck which transports that material to a stockpile adjacent to the mixing tank. From there, a front end loader transfers the sand to the mixing tank.

It is proposed to modify the Consent to regularise the existing method of extraction.

Approved Volume of Material to be Extracted and Life of the Consent

Table 4.3 of the EIS relating to the Consent provided details of the sequence of extraction, the volume of material to be extracted from each cell, and the time for that extraction to be completed, those data having been provided by Woodward Clyde as part of the mine plan prepared for the approved extraction.

It has become apparent that the volume calculations undertaken by Woodward Clyde, as detailed in Table 4.3 of the EIS, are flawed in that they do not provide accurate volumes of the material present on the Site.

Having regard to the errors in the original calculations undertaken by Woodward Clyde, it is now proposed to modify the Consent based on the volume figures calculated by VGT.

In light of the above, the applicant seeks a modification to the life of the extraction from 31 May 2016 to 31 May 2025.

The above modifications have potential to cause impacts relating to:

- Groundwater
- Acoustics
- Air Quality
- Traffic
- Rehabilitation.

5.2 Groundwater

By Notice of Determination dated 18 August 2015, consent was granted to Modification (3) of the Consent to, among other things, modify condition 9 to read:

> *9. The duration of extraction under this Consent is until 31 May 2016. The Applicant shall ensure that rehabilitation of all disturbed areas is*

completed within six months of completion of extraction.

Condition 17 of the original consent stated:

> *17. Baulkham Hills Shire Council Development Control Plan for Extractive Industries (DCP 500) requires that the depth of extraction incorporate a 2m freeboard above the wet weather high groundwater level. To meet the objectives of this policy, the Applicant shall ensure that the depth of extraction is consistent with the depth as shown in the extraction plan in the EIS and follow the procedures in Condition 40 if groundwater is encountered during extraction.*

As part of the Environmental Assessment process for Modification (2), is has been determined that the wet weather groundwater level of the Site is higher than that predicted in the original EIS. As such, it was proposed that the continued extraction of the Site as proposed in Modification (3) would not involve extraction within 2 metres of the newly assessed groundwater level of 183.1m AHD.

Notwithstanding, as part of the assessment process of Modification (3), the NSW Office of Water made comment as follows:

> *The Office of Water has reviewed the information provided it and it requests that the Department of Planning and Environment notes the following:*
>
> - *That the highest water level measured beneath the site is at least 1 m above that which has been reported in the current documentation (i.e. at 184.08 m AHD, not 183.10 m AHD).*
> - *That any excavation approved for the one year period requested must maintain additional freeboard accordingly (i.e. no excavation deeper than 186.08 m AHD).*

As a consequence of the above comments from the NSW Office of Water, the Consent was modified such that Condition 17 now reads:

> *The Applicant shall ensure that the depth of extraction is no deeper than 186.08 metres AHD, unless otherwise agreed by the Secretary.*

A copy of the Notice of Determination for Modification (3) and a copy of the consolidated consent following Modification No.(3), are at **Appendix 20**.

The proposed modification does not seek to either alter the dimensions of the approved dam or increase the lateral extent of the approved extraction.

With regard to the comments of the NSW Office of Water, AGT states:

> *In a recent submission to the Department of Planning and Environment (reference DA2671199 Mod 3), the NSW Office of Water stated that the highest*

water level measured beneath the site was 184.08 mAHD. We understand that this elevation was based on groundwater levels obtained from a historic bore known as PT84MW3, which no longer exists. Groundwater levels obtained from this bore were included in the original EIS (Woodward-Clyde, 1999) yet at this time, the approval to extract to 182 mAHD was based on a lower wet weather elevation of 180 mAHD recorded in other nearby bores.

The reason for neglecting the slightly higher groundwater elevation in PT84MW3 in the original EIS (and the original consent) was not clear, but as discussed under Section 3.4 above, a subsequent investigation indicated that the groundwater levels in PT84MW3 may be perched due to underlying clay layer and therefore water levels measured in PT84MW3 may not be representative of the MTSGR. It can be seen on Figure 6 that the bottom of PT84MW3 is completed above the bore screen of PT84MW6.

Given the uncertainty around PT84MW3, the groundwater level of 183.1 mAHD measured in monitoring bore PT84MW6 is considered to be the most reliable indication of groundwater elevation beneath the site and ongoing monitoring should be undertaken to confirm this. However, the groundwater level elevation of 184.08 mAHD and the extraction depth of 186.08 mAHD recommended by the NSW Office of Water should be adopted by Hodgson Quarry, and ongoing monitoring of the site bores (in particular PT84MW6) should be undertaken to confirm the groundwater elevations over time. The groundwater level monitoring data may be used to support changes to the extraction depth in the future.

Since quarrying commenced, policy changes have seen the introduction of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan (**WSP**) and the Aquifer Interference Policy (**AIP**). As part of the modification, the New South Wales Office of Water (**NOW**) requires evidence that the proposed modifications adhere to the above mentioned plans.

In this regard, Australian Groundwater Technologies (**AGT**) has prepared a report titled *"Hodgson Quarry Groundwater Assessment, Roberts Road, Maroota"* (**the AGT Report**), a copy of which is at **Appendix 16**.

The AGT Report concludes:

Based on well data .... local and regional bores correlate with the water levels recorded from the EIS assessment (Woodward-Clyde, 1999). Monitoring from 1999 record water levels in the regional MTSGS between 178.64.5 and 184.23 mAHD.

For the purpose of this assessment PT84MW-6 is the most representative well and a maximum wet weather groundwater elevation of 183.10 mAHD is proposed. This would restrict the quarry pit depth to 185.10 mAHD. It should be noted however that the clay band identified at 183.7 mAHD locally confines the regional MTSGR, and quarrying to the preferred depth of 183.7 mAHD will not intersect groundwater.

A cross section showing the current landform and the proposed landform is presented as Figure 6. The wet weather elevation adopted by the original EIS assessment (existing consent) together with the revised wet weather elevation 2015 (this modification) are also shown on Figure 6 for comparison.

Notwithstanding the findings of the AGT Report, it is not proposed to modify the approved depth of extraction which is RL 186.08m AHD such that no impact would result to the groundwater resource from the continuation of extraction.

5.3 Acoustic Impact

The quarry will develop further to the west and north for modified Stages 1-5 over a period of approximately 8 years, at which time the processing plant would be relocated to allow for the extraction of modified Stage 6 to include a cell near the northern boundary and the material beneath where the existing processing plant is located. The lateral extent of the extraction will not exceed that of the approved development.

Operations also require further excavation and the emplacement of material to create the final landform. This would occur intermittently on a campaign basis, typically 2 weeks at a time, possibly once or twice per year, such that equipment / staff not needed to meet the supply of raw material would be utilised to haul material to the emplacement areas and an excavator to form the final landform. It is possible that some sandstone will need to be ripped in this area at RL195 and below. Noise levels from this activity are not considered to be any higher than that experienced to date.

The modified extraction process requires an excavator and truck at surface level to remove the top soil and overburden which is initially formed into perimeter bunds and remaining material is stockpiled. From this point onwards, the excavator works occur from below the surface and is able to pull material down from above.

The excavator and truck are, therefore, only at surface level for a small proportion of time (less than 10%) and most of this time it is operating behind a 5 metre bundwall relative to the nearest boundary.

In relation to hauling product off site between 6:00am and 6:00pm, it is considered that the typical "worst case" operating scenario would be when 3 truck movements overlap in the same 15-minute period. This assumption incorporates 2 trucks arriving and one truck subsequently leaving the Site. The selection of 3 truck movements is based on operational constraints as this is the maximum which can be loaded.

During typical operations, the predicted noise levels comply with the $L_{Aeq,15min}$ noise condition of 43dBA at all receivers, however, when dozers are required to operate in some areas, and the excavation of top soil occurs at the beginning of each new cell, noise levels are predicted to exceed the criterion at some receivers.

Exceedance for surface extraction works are up to 1dBA, typically for a total of 2-3

weeks during sandstone ripping within cells where rock is above approximately RL 200.

Exceedance for dozer ripping works are up to 10dBA at Receiver D, 2dBA at receiver B and 1dBA at receiver H, typically for 3-4 weeks during the initial top soil and overburden extraction of each cell.

Exceedance during these periods for emplacement works are up to 5 dBA at Receiver A, 4dBA at Receiver G, 2dBA at receiver B and 1dBA at receiver H, typically 3 weeks per year on average.

Since the plant on site is considered to be modern and well maintained, there are no feasible or reasonable mitigation measures which can be applied to further reduce noise levels.

In addition to the exceedance above, there are also periods of a few days when perimeter bunding is required to be built and will require an excavator to be located at the surface without any shielding by a bund for a few days at a time. Predicted noise levels from this activity at these times are up to 57dBA at Location D, 48dBA at Location C and 40dBA at Location F. At other locations, the contribution is less than 30dBA.

At three of the receivers (C, D and F), noise levels are expected to increase compared with current levels over the remainder of the project as operations move closer. Two of these receivers (D and F) are located within 30m of Old Northern Road and L_{Aeq} noise levels from traffic are expected to be over 55dBA and, therefore, more than 10dBA higher than typical L_{Aeq} noise levels from the Site and similar or higher than noise levels in the short periods with an excavator at the surface.

Negligible impact is, therefore, expected at these two receivers. These receivers are also located closer to other sand extraction activities on the other side of Old Northern Road.

Location C is set further back from Old Northern Road so ambient noise levels are lower, but still similar or higher than the predicted noise levels from the quarry of up to 44dBA during normal activities and 48dBA whilst the northern bund is being built.

The existing consent allowing the loading of trucks between 6:00am to 7:00am is not proposed to change, so no change in impact compared to the existing situation is expected. The potentially worst affected residence is Receiver B, closest to the site entrance on Roberts Road.

It is recommended that a short section of 4m bund is constructed from the weighbridge to join with the existing bund adjacent to Roberts Road.

The predicted noise level from this activity is 37dBA which meets the amenity criterion of 40dBA.

5.4 Air Quality

The EIS submitted with the original development application contained a detailed assessment of the then existing air quality together with details of the air quality impacts of the then extraction activity on the Site.

To determine the impact the development as proposed to be modified would have on the air quality of the locality, Wilkinson Murray Pty Limited has prepared an Air Quality Assessment, a copy of which is at **Appendix 14**.

The air quality goals for the relevant particulate matter pollutants relate to the total pollutant burden in the air and not just the pollutant from the project. As such, consideration of background pollutant levels is required when using these goals to assess potential impacts.

The locality is predominantly agricultural and mining land, although areas to the east of the Site and the National Park are well vegetated. Sources of particulate matter in the area would include traffic on unsealed roads, mining activities, local building and construction activities, animal grazing activities and to a lesser extent traffic on roads.

As part of the extraction, there are various excavation and processing activities proposed to occur on-site for the continued operation. These would include:

- an excavator and truck at surface level to remove the topsoil and overburden;
- an excavator pulling material down from above or a dozer to ripping sandstone and excavator loading dump trucks;
- transportation of product using a dump truck to the processing feed area;
- front end loader managing a few stockpiles to blend the different grades of sand as required before tipping into the power screen, and
- transportation of sand off site.

The total amount of dust generated from the continued sand extraction would not be greater than the levels generated during past operations of the facility.

Having reviewed the potentially closest residential receivers to the proposed extraction areas, the predominate winds and the past PM_{10} and dust deposition levels monitored from the Site from past operations, it would appear that dust from the continuation of sand extraction is unlikely to impact on the closest residential receivers as long as the dust mitigation methods in the existing air quality management plan continues.

5.5 Traffic Impact

Part 6.6.2 of the EIS which accompanied the original application dealt with the impact of the then proposed development on the operation of the intersection of Roberts Road with Old Northern Road.

With regard to increased truck traffic in the main road system, the EIS stated:

> *The increase in heavy truck traffic generated by this development is estimated to be 30 truck movements per day (Monday to Friday) in Wisemans Ferry Road west of Old Northern Road and 20 truck movements per day in Old Northern Road south of Roberts Road. These increases amount to 14.25 per cent and 9.37 percent respectively.*
>
> *These increases are relatively small and will not reduce the Level of Service at either the intersection of Roberts Road with Old Northern Road or in Wisemans Ferry Road and Old Northern Road.*

Resulting from the above, condition 49 of the Consent relates to truck movements and states:

> *49. The applicant shall ensure that truck movements associated with the development do not exceed 100 movements per day (50 laden truck movements) or 20 (10 laden truck movements) movements per hour, during construction or operation.*

No modification to condition 49 is proposed as part of this modification application.

Notwithstanding, Lyle Marshall & Associates Pty Ltd has prepared a report (**the Marshall Report**) relating to the impact the existing approved development would have on the existing road network and, in particular, the intersection of Roberts Road with Old Northern Road, a copy of which is at **Appendix 13**. The Marshall Report concludes that the proposed modification to the extraction would have no additional impact on the local road network or the operation of the intersection of Roberts Road with Old Northern Road.

5.6 Rehabilitation

The EIS which accompanied the original development application contained an Environmental Management & Rehabilitation Plan (**EMRP**) for the Site which was based on the approved extraction sequence and the approved final landform plan.

Condition 57 of the Consent deals with rehabilitation of the Site and states:

> *57. The Applicant shall prepare a Plan for the staged rehabilitation of the*

site as part of the EMP. The Rehabilitation Plan shall:

(a) outline procedures for the implementation of rehabilitation measures within an acceptable timeframe;

(b) document the source of material for rehabilitation and methods to ensure that no contaminated of otherwise unsuitable material is brought onto the site; and

(c) detail the preferred option for the final landform and implementation of this landform.

The proposed modification seeks to modify the approved sequence and method of extraction. A consequence of the proposed modification is a modified final landform for the Site. A reduced copy of the modified final landform plan is at **Appendix 17**.

Due to the proposed modification, there is also a need to modify the approved Rehabilitation Plan for the Site. A revised Rehabilitation Plan has been prepared by Conzept Landscape Architects as part of the proposed modification, a copy of which is at **Appendix 11**.

The modified Rehabilitation Plan is discussed in detail in **Part 2.9** of the EA. The conclusions are:

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

- *The nominated extraction areas can be successfully rehabilitated, re-establishing an extensive endemic vegetation cover.*
- *That vegetated bunds may be utilized to minimise the visual impact of the extraction works.*
- *The proposed rehabilitation process can be staged in an effective manner so as to progressively rehabilitate areas of the site where extraction has been completed, final levels achieved, and all activity has ceased.*
- *Appropriate standards will be set for the on-going monitoring of the rehabilitation process and maintenance works to ensure the successful establishment of rehabilitated areas on site, resulting in a sustainable, endemic landscape in character with the original Shale-Sandstone Transitional Forest vegetation Community.*

5.7 Conclusion

This Environmental Assessment has concluded that, with the proposed modification to

Development Consent No.267-11-99, there would be no impact to the environment of the Site and its environs over and above that which was identified in the assessment of Development Application No.267-11-99.

The proposed modification, with commitments in place as described in **Part 4**, would ensure that a valuable resource is utilised to its economic capacity and ensure that the Site would be rehabilitated to be consistent with the agricultural landscape of the area.