

VOLUME 2
APPENDICES
SECTION 75W MODIFICATION
DA 250-09-01
DIXON SAND (PENRITH) PTY LTD
OLD NORTHERN ROAD
MARROOTA

8 December 2011

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Attachment 1

DIXON SAND (PENRITH) PTY LTD

Land and Environment Court of NSW
CONSENT ORDERS No 10273 of 2000
Ordered: 7 July 2000

**(These orders comprise the Conditions of
Consent for Lot 196/29 Old Northern Rd
Maroota DP 752025)**

Scope of Development:

**The development is to be carried out
substantially in accordance with the
following:**

- 1. DA No 796/00/HE enclosure**
- 2. EIS prepared by Southern
Environmental Pty Ltd dated 1 June
1999. – 3 volumes**
- 3. Supplementary information received by
Council on:**
 - a) 2 November 1999 – enclosure**
 - b) 4 January 2000 – enclosure**
 - c) 21 January 2000 – enclosure****except where amended by the
Conditions of Consent .**

**In the Land and
Environment Court
of New South Wales**

No. 10273 of 2000

**Simon James Leonard
McCartney**

Applicant

**Baulkham Hills Shire
Council**

First Respondent

**Dixon Sand (Penrith) Pty
Limited**

Second Respondent

Order

The Court orders by consent that:

1. The appeal be upheld.
2. Development Consent is granted to Development Application No.796/00/HE, for sand extraction, processing and rehabilitation on lots 29 and 196 DP 752025 Old Northern Road, Maroota subject to the conditions in Annexure "A" hereto

The Court orders:

3. All exhibits are to remain on the Court file.
4. No order as to costs.

The Court notes:

5. The undertaking of the Second Respondent to file copies of Development Application No.796/00/HE, the Environmental Impact Statement prepared by Southern Environmental Pty Limited, dated 1 June 1999 and supplementary information received by the First Respondent on 22 November 1999, 4 January 2000 and 21 January 2000.
6. Draft conditions of consent are amended by substituting the first paragraph of 3.12 for the paragraph, Exhibit J, and the addition of the plan showing precinct 9 which is also part of Exhibit J.
7. The agreement to be entered into by the Applicant and the Second Respondent generally in accordance with the draft deed, Exhibit H.

Ordered: 7 July 2000
By the Court


L. Jankovski
Registrar

"A"

APPLICANT: Dixon Sand (Penrith) Pty Limited

OWNER: D Gouskos

PROPERTY: Lots 29 & 196 DP 752025 Old Northern Road,
Maroota

DEVELOPMENT: Proposed Sand Extraction, Processing and
rehabilitation

Conditions of Consent

GENERAL MATTERS AND ADVICE

PART 1 - GENERAL

1.1 Scope of Development

The development being carried out substantially in accordance with Development Application No. 796/00/HE and accompanying Environmental Impact Statement (EIS) prepared by Southern Environmental Pty Limited, dated 1 June 1999, lodged with Council on 30 August 1999, and supplementary information received by Council on 22 November 1999, 4 January 2000 and 21 January 2000, except where amended by the following conditions of consent.

1.2 Changes to Development Require Consent

The proponent is to lodge a separate application for any alterations and/or expansion to the approved extraction activities including vehicle ingress/egress arrangements and the erection of any signs.

1.3 General Terms of Approval

The development is to be undertaken in accordance with the General Terms of Approval issued by the Department of Land and Water Conservation (DLWC), the Environment Protection Authority (EPA) and the Roads and Traffic Authority (RTA), as attached to this consent.

PART 2 - PRIOR TO COMMENCEMENT OF EXTRACTION

Roadworks and Drainage Works External to the Site

2.1 Upgrade of Intersection of Old Northern Road and Crown Road

The intersection of Old Northern Road and the Crown Road access to the subject site is to be upgraded to a type B intersection, to Roads and Traffic Authority and Council standards. This is to include a slip lane and the widening of Old Northern Road on the eastern side to allow vehicles to pass right turning traffic into the Crown Road safely.

- (a) Stage 1 works, which involve a paved deceleration lane to the requirements of the RTA, is to be constructed within two weeks of obtaining the relevant approval of the RTA and any relevant service authorities.

These works are required to ensure the safe movement of vehicles on Old Northern Road and are to be completed no later than six months from the commencement of extraction.

- (b) Stage 2 works, which involve completion of the full type B intersection are to be completed within 12 months of commencement of extraction.

2.2 Upgrade of Crown Road Access

- (a) The Crown Road access to the subject site is to be sealed for its entire length, to a point where it meets the subject site. Details of Stage 1 and Stage 2 works as outlined below, are required to be submitted to Council for approval prior to commencement of works. The Crown Road access to the subject site is to be maintained for the life of the extractive industry operations on the subject site.

- (i) Stage 1 works, which involve the sealing of a minimum of 50 metres of the Crown Road from the intersection of Old Northern Road, are required within 6 months of commencement of extraction. These works are required to minimise dust and sediment impact on Old Northern Road.

- (ii) Stage 2 works, which involve the sealing of the entire length of the Crown Road access are to be completed within 12 months of commencement of extraction.

- (b) The intersection of the private road and the Crown Road, which is frequently used by off-road vehicles, is to be sign-posted with Give Way signs together with an advance warning sign Intersection W2-1A and heavy Machinery Crossing T1-206.

2.3 Road and Drainage Works Required

Road and drainage construction works are to be provided by the applicant in accordance with:

- (a) Council's "Design Guidelines - Subdivisions/Developments" (June 1997).

- (b) Council's "Works Specifications - Subdivisions/Developments" (August 1997).

and are to include:-

- (i) The Old Northern Road intersection be upgraded and designed with deceleration lane, passing lane, widening, line marking, chevrons, signs all in accordance with the Roads and Traffic Authority "Road Design Guide" or current practice for the design traffic and life of the proposed development operations.

This will include all subsoil surface table drain construction for the full extent of the intersection upgrading and relocation of services. Where necessary easements for stormwater drainage from the public road will be required over the adjoining properties where a natural watercourse is not accessible for stormwater discharge from pipes, pits or surface drains. Traffic control during construction will be to the Roads and Traffic Authority requirements or the appropriate Australian Standard and AS1742.3 "Traffic Control Devices for Work on Roads".

- (ii) Construction of the road pavement, table drains, subsoil drains and piped drainage as necessary to meet the traffic design load and life within the Crown Road reserve. Where necessary easements for stormwater drainage from the reserve road will be required over the adjoining properties where a natural watercourse is not accessible for stormwater discharge from pipes, pits or surface drains.

2.4 Erosion and Sedimentation Control Devices

Erosion and sedimentation control devices are to be provided in accordance with Council's "Works Specification - Subdivisions Developments" (August 1997). All devices are to be established prior to the commencement of engineering works and maintained for a minimum period of six (6) months after the completion of all works. Periodic maintenance of the erosion and sedimentation control devices is to be undertaken to ensure their effectiveness.

2.5 Road Drainage Requirements

Road drainage is to be provided based upon a minimum recurrence interval of ten (10) years (1 in 10 year storm event). All sag discharge points will be provided based upon a minimum recurrence interval of twenty (20) years (1 in 20 year storm event) with overland flow channel section designed to carry all events above the 1 in 20 year event and up to the 1 in 100 year event.

2.6 Engineering Works to be Undertaken under Supervision

All engineering works associated with the development are to be carried out under the supervision of a practising Professional Engineer or Registered Surveyor.

2.7 Drainage into a Natural Watercourse

- (a) The natural watercourse from the crown road to the adjoining lots is to be piped to suit a 1 in 20 year storm event. An overland flow path is also to be provided above the constructed pipeline to accommodate all storm events, up to and including the 1 in 100 year storm. (1% AEP).
- (b) Where necessary easements to drain water a minimum 3.0 metres wide, are to be acquired over the downstream properties.
- (c) Should the engineering plans provide for any works to be carried out, or necessitate easements, over adjoining land, the issue of a Construction Certificate will be withheld until such time as a copy of the plan has been suitably endorsed by the adjoining owner(s) and submitted to Council.
- (d) The creation of suitable easements to drain water, minimum 5 metres wide and 30 metres long, from the outlet of any culverts located within the property, prior to commencement of extraction.
- (e) Alternatively, the proponent is to demonstrate the collection of drainage water from the Crown Road and the intersection of Old Northern Road is able to be discharged into a natural drainage line/watercourse.

2.8 Submission of Engineering Plans Prior to Issue of Construction Certificate

The submission to Council of detailed engineering plans prepared in accordance with Council's "Design Guidelines - Subdivisions/Developments" (June 1997), that include the proposed construction works referred to above, together with payment of a Construction Certificate fee of \$500 as prescribed in Council's Schedule of Fees and Charges. Alternatively, should the nominated Principal Certifying Authority be other than Council, the fee shall be by agreement.

2.9 Submission of Suitable Undertaking Prior to Issue of Construction Certificate

The lodgement of a suitable undertaking, under the common seal of the company, to complete all required engineering works. Such works are to be completed prior to commencement of extraction operations.

2.10 Submission of Cash Bond or Bank Guarantee Prior to Issue of Construction Certificate

The submission of a cash bond or acceptable bank guarantee in respect of construction works external to the site. The amount of such bond will be assessed on the submission of satisfactory engineering construction plans.

Please note: If submitting a Bank Guarantee:

- 1. The Bank Guarantee will only be accepted direct from the issuing bank.

2. The Bank Guarantee must have no expiry date.
3. The Bank must quote Council's reference (796/00).
4. Should it be necessary for Council to uplift the guarantee, a notice in writing will be forwarded to the applicant fourteen (14) days prior to such action being taken.

If the applicant disagrees with the amount of the bank guarantee, the amount shall be assessed by an independent Professional Engineer.

The bank guarantee shall be released upon completion of all works.

No Bank Guarantees will be accepted direct from the applicant.

2.11 Plans Approved by the Roads and Traffic Authority and Council Prior to Issue of Construction Certificate

Engineering plans approved by the Roads and Traffic Authority are to be submitted to Council for all works in Old Northern Road. All roadworks to be undertaken at no cost to the Roads and Traffic Authority or Council.

2.12 Letters from Authorities Prior to Issue of Construction Certificate

Letters from the Authorities including Sydney Water, Telstra, Integral Energy and the Australian Gas in respect of any proposed relocation of services required by the engineering plans. (A suitable clearance will be required at the completion of any works, from the respective authority).

2.13 Construction Certificate Fees

Payment of construction certificate fees in accordance with Council's Schedule of Fees and Charges. The fees will be assessed following the submission of satisfactory engineering plans and are to be paid prior to the issue of a Construction Certificate.

2.14 Erosion and Sedimentation Control for Roadworks and Drainage Works

The provision of erosion and sedimentation control. Details to be approved by the Environment Protection Authority and the Department of Land and Water Conservation, and shown on plans submitted to Council. The devices are to be established prior to the commencement of works.

2.15 Care to be Exercised During Construction

Care is to be exercised during the construction of the proposed works to ensure natural vegetation and topography on the subject site is not unnecessarily disturbed.

2.16 State Survey Marks and Permanent Marks

The Developer shall preserve and maintain in their true position all State Survey Marks (SSM) and Permanent Marks (PM) whether or not the marks are to be used for the purpose of setting out, checking or measuring the work.

Should any SSM or PM be disturbed or obliterated, the Developer shall arrange for a Registered Surveyor to rectify such disturbance or obliteration. The cost of rectification shall be borne by the Developer.

2.17 Protection of Trees During Construction

- (a) Permission is granted for the removal of vegetation/trees to enable the construction of the intersection of Old Northern Road and the Crown Road.
- (b) All trees are to be retained (except all trees referred to in 2.17(a)), and protected by paraweb fencing, firmly staked four (4) metres from the trunk of the tree and maintained in position for the duration of the construction works. The area within the dripline of the tree should not be used for the stockpiling of any material, nor for vehicular or pedestrian convenience or uses that would compact the soil in this area.

2.18 Inspections

The following inspections shall be arranged by the applicant with Council to obtain satisfactory certificates for the following:-

- a) Sub-grade - Inspection
- b) Drainage - Pipeline - Inspection
- c) Drainage - Backfill - Inspection
- d) Sub-base - Inspection
- e) Base Course - Inspection
- f) Final Inspection.

2.19 Completion of All Engineering Works

The completion of all engineering works in accordance with the conditions of this consent.

2.20 Work As Executed Plans

The submission to Council of works as executed plans in accordance with the requirements of Council's "Design Guidelines-Subdivisions/Developments" (June 1997) in accordance with the conditions of this consent.

2.21 Maintenance Bond Prior to Commencement of Extraction

The submission to Council of a maintenance bond by way of a bank guarantee equivalent to 5% of the total cost of the roadworks external to the site (minimum \$5,000) to be held for a minimum period of twelve (12) months.

Internal Haul Road – Lot 29 DP 752025

2.22 Temporary Access Route

- (i) The proponent is to provide and construct a temporary access route as indicated on Drawing No.: DIXON-2.DWG.
- (ii) The temporary access route must be constructed in accordance with engineering plans to be submitted to and approved by Council.
- (iii) Evidence of a registered right of carriageway ("ROC"), by way of creation of a Section 88B instrument, must be presented to Council prior to any extraction taking place on Lot 29 DP 752025.
- (iv) The ROC must at a minimum address the following:-
 - (a) Provision of a ROC 20 metres wide;
 - (b) Which entity will construct the ROC;
 - (c) Which entity will have the benefit of the use of the ROC and any restrictions upon that use;
 - (d) Which entity will have the burden of maintenance of the ROC;
 - (e) Any modification, amendment or release of the ROC is to be approved by Council;
 - (f) The ROC continues to operate upon successors in title;
 - (g) Issues of insurance, liability and indemnity as a result of use of the ROC; and
 - (h) The right of carriageway shall be extinguished upon construction of the final access route.
- (v) The temporary access route must be constructed and operational within 12 months of the date of this consent.
- (vi) A noise attenuation wall is to be erected inside the eastern boundary of Lot 29, adjacent to the temporary internal haul road, in order to mitigate the impacts of noise on the adjoining properties and the Maroota Public School to the east. Details of the wall are to be submitted to Council for approval, and the wall erected prior to implementation of the temporary internal haul road. The wall should remain in place until extraction on Lot 29 and the use of the temporary internal haul road are ceased.

2.23 Sedimentation & Erosion Control for Internal Haul Road

- (i) The proponent is to undertake the following measures:-
 - (a) Construct all internal all-weather surfaced access tracks (including the temporary access route as indicated on Drawing No.: DIXON-2.DWG and final access route as indicated on Drawing No.: DIXON-3.DWG) with crossfall and associated table drains and lead outs, designed to carry the extraction vehicle loading

- (b) Provision of headwalls, scour protection and sedimentation traps for all drainage systems and leadouts mentioned in (a) above.
- (c) The provision of erosion and sedimentation control. Details to be shown on engineering plans and the devices to be established prior to the commencement of engineering works.
- (d) Include all recommendations from the Authorities in preparation of the engineering plans in respect of access and transport of materials, extraction activities and rehabilitation works. The particular authorities must include:-
 - (i) Department of Urban Affairs & Planning;
 - (ii) Hawkesbury - Nepean Catchment Management Trust;
 - (iii) NSW Department of Agriculture & Fisheries;
 - (iv) Environment Protection Authority; and
 - (v) Department of Land & Water Conservation.

Provision of safety protection fencing where appropriate (where safety is an issue) where faces and batters are proposed in the quarry area and adjacent to tailings dams and the access track.

- (ii) The proponent is to submit for approval by Council detailed engineering plans in respect of (i) above. In this regard, satisfactory engineering plans are required drawn to scale, showing a north point, contours, benchmark, catchment area, batter slopes for cut and fill and drainage calculation. The plans are to include details of the internal haul road design, drainage and erosion and sedimentation control measures.

Receipt of such plans does not imply automatic approval of the plans.

Further, Council requires payment of the engineering plan assessment fee of \$150 as prescribed in Council's Schedule of Fees and Charges. These plans are to be accompanied by advice from the relevant Authorities, that their requirements are met.

Rehabilitation

2.24 Submission to Council of a Detailed Rehabilitation Plan

Submission to and approval by Council of a detailed Rehabilitation Plan, including the following details:-

- (a) Plans and cross-sections to scale, showing the proposed final landform demonstrating that it integrates with the surrounding terrain;
- (b) Site analysis used to determine compatible contours, shape, form, landscape features and quality of the final landform, including the identification of conservation areas;

- (c) The retention, protection and replenishment scheme, including the means of maintaining and replenishing buffer zones/setback areas and completed rehabilitated areas;
- (d) The restoration and rehabilitation of the 50 metre buffer zone to the *Kunzea rupestris* plant species;
- (e) The progressive rehabilitation of both extraction areas and setback/buffer zones;
- (f) Details regarding the rehabilitation of that part of Lot 29, which has encroached the depth limitation and extracted into Crown Land. Details are to be to the satisfaction of the Department of Land and Water Conservation, with written evidence submitted to Council demonstrating DLWC's approval to the works.
- (g) A Works Program defining a schedule of works and associated time period for the rehabilitation of each disturbed and/or exposed extraction area or stage with the aim to restore vegetative covers at the earliest possible opportunity;
- (h) Details of all backfilling works, including source of materials and the grades and stability of all batters. Batter design should be in accordance with the provisions of DCP No. 500 – Extractive Industries, and certification is to be provided by appropriately qualified engineers regarding the stability of all designed batters;
- (i) Schedule of works that are to be carried out under the supervision of a nominated qualified person;
- (j) Details including a soil drainage plan sufficient for growing crops that require free drainage. In this regard, the rehabilitation plan should have regard to comments provided by the Department of Agriculture, that the aim of rehabilitation for the site should be to achieve a standard that can support the types of agriculture that could have been supported prior to extraction taking place;
- (k) Compliance with the notified requirements (including established rehabilitation methods) of relevant public authorities, Hawkesbury Nepean Catchment Management Trust and Council's DCP No. 500 – Extractive Industries.

2.25 Rehabilitation Bond

The proponent shall submit a Rehabilitation Bond in the form of an unconditional bank guarantee to be held by Council as a legal document over the life of the development, sufficient in amount to cover the cost of rehabilitating the extraction area and other likely disturbed areas in the event of non-compliance with this consent.

In this regard, the Rehabilitation Bond shall be based upon \$2.00 per square metre of all exposed extraction areas at any one time in accordance with the approved extraction and rehabilitation as outlined in the EIS and accompanying appendices prepared by Southern Environmental Pty Limited dated 1 June 1999.

The Rehabilitation Bond will be released upon submission by the proponent of a certificate by a qualified landscape consultant that final rehabilitation has been completed in accordance with the conditions of this consent concerning rehabilitation and the Council's satisfaction of that fact.

The bond currently held by Council in favour of Dixon Sands shall be construed as a credit.

General

2.26 Need to Obtain Construction Certificate

Submission to and approval by Council of a construction certificate for all proposed temporary and permanent structures.

Plans submitted with the construction certificate are to be in accordance with plans and details submitted with Development Application No. 796/00/HE, and are to demonstrate compliance with the Building Code of Australia and conditions of this consent.

2.27 Need to Obtain Building Certificate

Submission to and issue by Council of a Building Certificate for all existing structures on-site which have been built without the prior approval of Council. Details submitted are to demonstrate compliance with the Building Code of Australia and conditions of this consent.

2.28 Installation of Groundwater Monitoring Bores

A minimum of two Groundwater Monitoring Bores are to be installed, monitored and maintained to the requirements of the Department of Land and Water Conservation. Bores are to be installed prior to the commencement of extraction.

Specifically, one monitoring bore is to be installed within or near the extraction area whilst the other monitoring bore is to be installed at some other location, within the subject site, beyond the radius of any mining influence.

The actual location and depth of each bore is to meet the notified requirements of both Council and the Department of Land & Water Conservation.

2.29 Obtaining Other Relevant Approvals

The proponent is to obtain all necessary operating licenses and permits from all relevant public authorities including the Environment Protection Authority and the Department of Land & Water Conservation and details of which are to be submitted to Council prior to the commencement of on-site works.

PART 3: OPERATIONAL

3.1 Life of Consent

Consent for the purpose of extraction of material and rehabilitation is limited to a period of ten (10) years effective from the endorsed date of this consent (operational consent is twenty-eight (28) days after consent is issued, i.e. consent lapses on 22 March 2010).

The continuation of extraction on the site is subject to review on an annual basis, in accordance with Part 6 of this consent.

3.2 Notices in the Event of Non-Compliance with Consent

- (a) Council reserves the right to issue a notice on the proponent in accordance with the prevailing legislation if there is any breach of conditions of consent.
- (b) The Council may serve notice under paragraph (a) if:-
 - (i) no Environmental Management Plan is submitted to the Council pursuant to Part 6 of this consent; or
 - (ii) an Environmental Management Plan submitted to the Council pursuant to Part 6 of this consent reveals that the development is not being carried out in accordance with the conditions of this consent; or
 - (iii) the Council is otherwise reasonably of the opinion that development is not being carried out in accordance with the conditions of this consent.
- (c) The Council may amend or revoke any notice served under paragraph (a) or serve further notices under paragraph (a) from time to time.

3.3 Buffer Zones

- (a) The area of land disturbed for the purpose of extraction shall not exceed the area as detailed in the Environmental Impact Statement and supplementary information.
- (b) The 50m setback/buffer zone to the *Kunzea rupestris* plant species is to be rehabilitated and maintained within 3 months of commencement of extraction on Lot 29 DP 752025.
- (c) A 10m setback/buffer zone is to be provided to the northern boundary of Lot 29 DP 752025.
- (d) A 10m setback/buffer zone is to be rehabilitated and maintained to the eastern boundary of Lot 29 DP 752025 within 3 months of the implementation of the permanent internal haul road.

- (e) The 10m setback to the western boundary of Lot 196 is to be rehabilitated and stabilised with native vegetation, in order to minimise any impact on adjoining bushland. Appropriate erosion and sedimentation control measures are to be installed along this boundary, and maintained at all times, to prevent any impact on the adjoining bushland.

3.4 Sequence of Extraction

- (a) Extraction shall be carried out in the sequence specified in the Environmental Impact Statement and support documentation or such other amended extraction program as may be approved in writing by Council upon justification by the proponent.
- (b) Rehabilitation of the previously extracted precinct is to be completed within 3 months of completion of extraction in that cell. Rehabilitation of the tailings precincts shall be in accordance with the Environmental Impact Statement.

3.5 Extraction Depth

- (a) The extraction depth is to be in accordance with details provided in the Environmental Impact Statement and supporting details, except as amended by these conditions of consent.
- (b) Extraction is not to occur within 2m of the wet weather high groundwater level, or otherwise to the requirements of the Department of Land & Water Conservation.
- (c) Extraction should not exceed 15.24m from original ground level, as this would encroach onto Crown land title.

3.6 Protection of Groundwater

The proponent is to ensure that groundwaters are not breached or contaminated. In the event of groundwaters being breached or contaminated, operations are to cease within the vicinity of the affected area and Council together with the Department of Land & Water Conservation are to be immediately consulted to determine the basis upon which extraction may recommence.

3.7 Final Access Route

- (i) The proponent is to provide and construct a final access route as indicated on Drawing No.: DIXON-3.DWG.
- (ii) The final access route must be constructed in accordance with engineering plans to be submitted to and approved by Council.
- (iii) Evidence of a further registered right of carriageway ("ROC#2"), by way of creation of a section 88B instrument, must be presented to Council prior to use of the final access road.

- (iv) The ROC#2 must at a minimum address the following:-
 - (a) Provision of a ROC#2 20 metres wide;
 - (b) Which entity will construct the ROC#2;
 - (c) Which entity will have the benefit of the use of the ROC#2 and any restrictions upon that use;
 - (d) Which entity will have the burden of maintenance of the ROC#2;
 - (e) Any modification, amendment or release of the ROC#2 is to be approved by Council;
 - (f) The ROC#2 continues to operate upon successors in title; and
 - (g) Issues of insurance, liability and indemnity as a result of use of the ROC#2.
- (v) The proponent must ensure that a registered right of carriageway is provided at all times for extractive industry traffic either in the form of the temporary access route as indicated on Drawing No.: DIXON-2.DWG or final access route as indicated on Drawing No.: DIXON-3.DWG.
- (vi) Prior to the closure of the temporary access route, the final access route must be constructed for use by extractive industry traffic.
- (vii) Prior to the use of the final access route, approval is to be obtained from the Department of Land and Water Conservation for the closure of part of the Crown Road Reserve as set out in Drawing No.: DIXON-2.DWG which runs adjacent to the southern boundary of Lot 196 DP752025 and runs adjacent to the eastern boundary with Lot 213 DP 752025.
- (viii) Sedimentation and erosion control devices are to be implemented for the final haul road route in accordance with the requirements outlined in Condition 2.23 of this consent.

3.8 Vehicle Movements

- (a) The number of laden vehicle movements are not to exceed a combined total of 60 laden movements per day, including the importation of concrete sand product material.
- (b) The number of vehicles permitted to enter and leave the subject site between the hours of 6.00am and 7.00am is 15 laden vehicles, subject to compliance with EPA noise limitations.
- (c) The proponent shall implement a traffic management program to mitigate impacts of truck movements on Maroota Public School during opening and closing hours (i.e. 8.30am - 9.00am and 3.00pm - 3.30pm). Such measures shall be provided to Council prior to commencement of extraction from the subject sites.

The compliance with and effectiveness of such measures shall be reviewed in the Environmental Management Plan submitted to Council on an annual basis.

- (d) All vehicles are to enter and leave the site in a forward direction and prominent and permanent signposting to this effect is to be provided and maintained at all times.
- (e) The proponent is to ensure that the Old Northern Road pavement in the vicinity of the intersection with the Crown Access Road is regularly maintained and kept free of sand, clay and soil at all times. All costs of these works are to be borne by the proponent.
- (f) Details confirming the above matters are to be submitted to Council prior to the commencement of production and processing.

3.9 Restriction on Importation of Concrete Sand Product

- (i) The importation of concrete sand product to blend with local sand on-site, is restricted to a maximum of 7% in accordance with details submitted in the Environmental Impact Statement;
- (ii) The truck movements associated with importation of concrete sand product are to be included in the permitted 60 laden truck movements per day; and
- (iii) Records of the date, time and number of truck movements and amount of concrete sand product imported are to be submitted to Council on a monthly basis, at the same time as records of vehicle arrival and departures times are submitted.

3.10 Maximum Total Annual Volume of Extractive Material

The maximum total annual volume of material to be extracted from the development site shall be in accordance with details provided in the Environmental Impact Statement and accompanying Appendices, prepared by Southern Environmental Pty Limited, dated 1 June 1999.

3.11 Discovery of Archaeological Material

In the event that any archaeological material is found during extraction, operations within the immediate vicinity are to cease immediately and the National Parks & Wildlife Service and Council are to be consulted.

3.12 Hours of Operation

Operations involving extraction, transportation and processing or running of machinery for maintenance purposes shall not take place on the development site except between 7.00am and 6.00pm Monday to Saturday and at no time on Sundays and public holidays and there shall be no extraction in that part of the site described as the north western corner of the site shown as Precinct 9 on the Plan marked "A" on Saturdays.

The proponent will however be permitted to a maximum of fifteen (15) laden vehicles to enter and leave the subject site between the hours of 6.00am and 7.00am Mondays to Saturday, excluding Sundays and Public Holidays. The number of vehicles permitted

between the hours of 6.00am and 7.00am is subject to compliance with the Environment Protection Authority's noise limitations.

In relation to the transportation of material between 6.00am and 7.00am, the proponent will advise its drivers and its clients not to arrive at the site prior to 5.45am on any day. Certified (under company seal) weighbridge dockets and a log book or equivalent computer records are to be kept to verify the arrival and departure times of vehicles and copies of which are to be submitted to Council on the twenty-eight (28) day of each month.

3.13 Conservation of Adjoining Bushland

- (a) Care is to be taken at all times to ensure that all natural bushland directly adjoining the development site and bushland to be conserved within the development site, is not damaged or disturbed.
- (b) Existing barriers located within the 10m setback to property boundaries are to be stabilised, revegetated to ensure protection of the adjoining bushland. Details are to be submitted to Council within 3 months of commencement of operations.
- (c) Erosion and sedimentation control measures are to be installed and maintained in appropriate locations in order to protect adjoining bushland.

PART 4: WATER, AIR & NOISE QUALITY

4.1 Compliance with Water Legislation

The proponent shall ensure that the provisions of the *Clean Waters Act 1970* and *Rivers & Foreshore Improvements Act 1948* are complied with at all times.

4.2 Compliance with Protection of the Environment Operations Act, 1997

The proponent shall comply with the provisions of the *Protection of the Environmental Operations Act, 1997*.

4.3 Compliance with Occupational Health & Safety Legislation

The proponent shall ensure employees are not subjected to noise or dust levels greater than those specified and prescribed by the Workcover Authority and the Department of Mineral Resources and Factories (*Health & Safety Hearing Conservation*) Regulation 1979.

4.4 Noise Performance Standard

The proponent shall ensure that construction and operational noise on the development site complies with the General Terms of Approval issued by the Environment Protection Authority, as attached to this consent.

4.5 Dust Suppression Equipment

Dust suppression equipment is to be fitted to all processing equipment and is to be maintained at all times. Details of these devices are to be submitted to Council in accordance with Condition 6.2 of this consent and to the satisfaction of the Environmental Protection Authority.

4.6 Sprinkler System for Dust Suppression

The proponent shall install wind activated sprinkler system capable of suppressing dust from all exposed/disturbed areas, internal access tracks and other sources in order to minimise the impacts of dust.

4.7 Monitoring of Dust Generation

The proponent is to monitor dust generation from the extractive operations and associated activities and the results of which are to be detailed in the Air and Noise Quality report referred to in Condition 6.2 of this consent.

In the event of dust nuisance being identified, the proponent shall immediately inform Council and implement any mitigation practice as required.

4.8 Prevention of Dust Nuisance from Stockpiles

Stockpiles of materials and other sediment laden areas are to be maintained so as to prevent any dust nuisance.

In this regard, arrangements satisfactory to Council are to be made for dust suppression from topsoil stockpiles until such time as vegetative consolidation takes effect and details of which are to be confirmed prior to the commencement of on-site works.

4.9 Covering of Payloads

Prior to leaving the development site, all loaded trucks must have their payloads fully covered by a suitable material to prevent spillage from the trucks onto the roads.

4.10 Soil Erosion Mitigation Measures

Mitigation measures to control soil erosion, sediment and surface water runoff are to be in accordance with the requirements of the Environmental Protection Authority and Department of Land and Water Conservation. This is to include regular monitoring in conjunction with relevant Officer(s) from the Environment Protection Authority, Department of Land and Water Conservation and Council.

4.11 Discharge of Stormwater

Discharge of stormwater from the subject site is to be clear of sediment and pollution in accordance with the provisions of the Protection of the Environment Operations Act, 1997 and to the satisfaction of the Environment Protection Authority and Council.

4.12 Noise Attenuation Wall

A noise attenuation wall is to be erected inside the eastern boundary of Lot 29, adjacent to the temporary internal haul road, in order to mitigate the impacts of noise on the adjoining properties and the Maroota Public School to the east. Details of the wall are to be submitted to Council for approval, and the wall erected prior to implementation of the temporary haul road. The wall should remain in place until extraction on Lot 29 and the use of the temporary haul road are ceased.

PART 5: REHABILITATION

5.1 Native Bush Regeneration

Native bush regeneration techniques shall be used to stabilise the semi-permanent topsoil and overburden banks surrounding the extraction area. The specialised techniques shall be carried out under the direction of a qualified Plant Ecologist.

The techniques used shall include the re-use of stored topsoil that has not been contaminated with exotic grasses or weed species and the collection and propagation of species from the site.

5.2 Materials to be used for Backfill

The extraction area is to be backfilled only with earth and rock materials sourced as a result of extraction operations on the subject site. No building waste or putrescible materials are to be disposed on the development site.

5.3 Progressive Rehabilitation of the Development Site

The development site is to be progressively rehabilitated in accordance with the EIS dated 1 June 1999 and the Rehabilitation Management Plan required by Condition No. 2.24 and regularly endorsed as required by Condition No. 6.4 of this consent or such amended plan as might be approved by Council.

Rehabilitation is to be undertaken progressively. Rehabilitation should be completed within 3 months of completion of extraction of a precinct. Tailings precincts shall be rehabilitated in accordance with the Environmental Impact Statement.

Final rehabilitation of the development site shall be completed in accordance with the conditions of this consent within the life of this consent (ie ten (10) years). The proponent is to submit thereafter a certificate of a qualified landscape consultant that final rehabilitation has been carried out in accordance with the conditions of this consent.

PART 6: MONITORING AND MANAGEMENT

6.1 Environmental Management Plan

The proponent shall submit to Council every twelve (12) months after the endorsed date of this consent an Environmental Management Plan in which Council is to be satisfied of the overall performance and management of the operation.

The Environmental Management Plan should refer to the objectives and principles of Ecologically Sustainable Development (ESD) and shall include as chapters the reports specified in conditions 6.2 to 6.6 of this consent.

The proponent shall provide to the Council an additional copy of the Environmental Management Plan to be made available for inspection by the public during Council's office hours.

6.2 Air and Noise Quality Report

The proponent is to prepare an Air and Noise Quality Report in which Council is to be satisfied of the following:-

- a) Dust and noise sources are identified, classified and contained;
- b) Details on the containment of noise sources shall include the status of the construction of acoustic/visual mounds surrounding all plant equipment and machinery;
- c) All necessary licenses or permits are obtained;
- d) Dust and noise levels comply with the relevant standards and statutory requirements;
- e) Cumulative dust and noise levels do not adversely affect the amenity of surrounding residents and other rural land uses;
- f) The comments and recommendations of the Environment Protection Authority, Department of Land and Water Conservation and any other relevant authority;
- g) Measures are implemented to effectively control and reduce noise and dust emissions and thereby improve the performance of the operation.

The Noise Quality Report should also include the following matters, as recommended by the Environment Protection Authority:-

Operational Noise:

- (i) complaints monitoring;
- (ii) community liaison (eg. news letter presenting monitoring results);
- (iii) identifying and implementing engineering and operational methods of noise control;
- (iv) program to review any new technology/practises to reduce noise emissions over time;

- (v) longer-term strategies directed towards mitigating noise levels that exceed the target noise criteria; and
- (vi) monitoring the effectiveness of those measures with the affected community.

Traffic Noise:

- (i) scheduling truck movements to reduce noise impacts;
- (ii) more stringent limits for noise emissions from vehicles (ie. using specially designed "quiet" trucks and/or trucks to use air bag suspensions;
- (iii) type of road surface;
- (iv) phasing in the increased road use;
- (v) ongoing community liaison to monitor complaints;
- (vi) regular maintenance of road surfaces;
- (vii) a reduction of truck speed limits through residential areas;
- (viii) limiting the use of engine exhaust brakes around residential areas; and
- (ix) implementation of noise minimisation procedures through training programs for truck drivers.

6.3 Water Management Plan

The proponent is to prepare a Water Management Plan in which Council is to be satisfied that adequate means of transferring and/or discharging the build up of ground and surface waters is continually maintained and monitored particularly in relation to the following:

- (a) Certified and suitable arrangements for dewatering water pits including contingency arrangements;
- (b) Means of treating polluted (including sediment laden) waters;
- (c) Means of maintaining/monitoring current surface and sub surface water quality;
- (d) Identification and adequacy of existing destination points for waters collected within the extraction area;
- (e) On-site reuse of collected water and other potential uses;
- (f) Maximum and average water levels experienced and the capacity of the existing water sump to sustain major storm events; and
- (g) State of significant site features, groundwater recharge areas and natural springs;
- (h) Achievement of qualitative and quantitative criteria of the approved Water Management Strategy including any improvements and/or adjustments now needed; and
- (i) The attainment of all necessary license and permits are obtained and complied with.

6.4 Rehabilitation Plan Review

The proponent is to prepare a Rehabilitation Plan Review in which Council is to be satisfied of the following:-

- (a) the rate of rehabilitation should relate to the Works Program referred to in Condition 2.24 of this consent;
- (b) vegetated conservation zones and rehabilitated areas are maintained;
- (c) vegetation within buffer zones are successfully retained and protected;
- (d) progressive rehabilitation integrates with the surrounding terrain as illustrated in the Rehabilitation Plan, subject to the requirements of Condition 2.24;
- (e) vegetative covers are established at the earliest possible opportunity;
- (f) assessment/comment on the progress of rehabilitation carried out under the direction of the nominated supervisor;
- (g) on-going monitoring program for all flora and fauna species and communities within the development site, particularly those scheduled under the *Threatened Species Conservation Act, 1995*;
- (h) Conservation of threatened species, populations and ecological communities including buffer zones and conservation zones containing the *Kunzea rupestris*;
- (i) The construction of acoustic and visual bunding (buffers) is progressing in accordance with the details provided in the Environmental Impact Statement and Rehabilitation Plan, subject of Condition No. 2.24 of this consent;
- (j) Work As Executed plans are submitted for each completed extraction precinct, in accordance with the requirements of Council's "Design Guidelines - Subdivision/developments" (June 1997). These plans are to demonstrate that work and levels has been carried out in accordance with the Rehabilitation Plan;
- (k) Certification is submitted from an appropriately qualified Geotechnical Engineer, confirming the rehabilitated land has been compacted to a level suitable for its end use;
- (l) The creation of a restriction as to the use of the land, restricting future development after rehabilitation works, in accordance with details submitted by the Geotechnical Engineer appointed by the proponent and to the satisfaction of Council;
- (m) Method and progress of the rehabilitation of extracted areas and tailings dams are in accordance with current environmental laws standards and practices including guidelines published by the Australian Federal Environment Department and the Department of Land and Water Conservation.

6.5 Social Impact Management Plan

The proponent is to prepare a Social Impact Management Plan in which Council is to be satisfied that extraction operations effectively manage and monitor social impacts upon the local community including:-

- a) Impact Management Planning which clearly identifying adjusted operating objectives and procedures undertaken to minimise social impact;
- b) Monitoring and Mitigating procedures involving the collection of information about actual impacts which is then applied to specific operating procedures to mitigate and manage social effects; and
- c) Evaluating involving the retrospective review of the overall performance of extraction and assesses the effectiveness of the management process itself with the view to rectify any deficiencies.

6.6 ESD Report

The proponent is to prepare an ESD report in which Council is to be satisfied that extraction operations implement the principles of Ecologically Sustainable Development by demonstrating:-

- (a) Acquisition of all necessary licences and permits under all prevailing environmental statutes;
- (b) On-site materials management;
- (c) Water management;
- (d) Acoustic management;
- (e) Air quality management;
- (f) Transport routes, access and movements;
- (g) Rehabilitation management including results of flora and fauna monitoring programs;
- (h) Soil Conservation including geo-technical appraisal of tailing system, stability of all batters and certification of all erosion and sediment controls for all phases of development;
- (i) On-going consultation with community groups and nearby residents, together with the consideration of the recommendations of the Community Consultative Committee referred to in Condition 6.7 of this consent;
- (j) Identification, assessment and evaluation of risks, safeguards and the confidence level of contingency/emergency plans;

- (k) Statement of Compliance with the approved EIS documentation, conditions of this consent and the objectives of Council's DCP No. 500 – Extractive Industries. To confirm and illustrate the status of extraction and rehabilitation, the Statement of Compliance shall include a survey plan prepared by a registered Surveyor;
- (l) Consideration of advice and recommendations of all relevant state government agencies;
- (m) Reference to International Standards (ISO) 14001-14004 relating to Environmental Management Systems, which should address issues such as:-
 - the capacity and support mechanisms necessary to implement and achieve the proponent company's environmental policy, objectives and targets; and
 - the means by which the proponent company measure, monitor and evaluate its environmental performance.
- (n) Consideration of recommendations to adjust operation procedures to improve the overall performance of the operation.

6.7 Liaison and Review Committee

The proponent shall convene two review meetings a year to facilitate consultation and communication between the proponent, the Council, relevant state government agencies and the community in relation to the development and any impacts the development might have on the environment.

The committee for the review meetings shall consist of such of the following invited representatives who wish to attend:-

- (a) two permanent residents of Maroota not associated with the proponent company approved by the Council;
- (b) two representatives of the Council;
- (c) one representative of each of the Environmental Protection Authority, Department of Land and Water Conservation and Hawkesbury Nepean Catchment Management Trust;
- (d) one representative of the proponent; and
- (e) any other relevant person/s as may be considered appropriate by the Committee.

These meetings are to be arranged by the proponent, and all expenses involved in the organisation, carrying out and recording of these meetings are to be met by the proponent.

PART 7: SECTION 94

7.1 Section 94 Contributions

The applicant shall pay or procure payment to the Council of a contribution under Section 94 of the Environmental Planning and Assessment Act (1979) at the rate of \$0.65 per tonne of all extracted/processed material transported from the subject site, and in respect of the said contribution, the following provisions shall apply:-

- (a) The said contribution will be calculated and paid monthly from the date on which development consent became effective.
- (b) The said contribution will be indexed and adjusted annually as from the date the consent became effective, in accordance with the Consumer Price Index applicable to each year ending 30 June, commencing 1 July 1999, for the duration of the development consent and the said adjustment to the contribution shall take effect from and including July each year, commencing 30 June 1999 for the duration of the consent.
- (c) On or before the fourteenth day of each month of the duration of the consent, the applicant shall deliver or procure delivery to the Council of true certified copy weighbridge or other returns or records showing the true quantities of extracted/processed material transported from the property during the immediately preceding month and the Council will then, as soon as it can conveniently do so, issue an invoice to the applicant or its consenting assignee, who will pay to the Council within fourteen (14) days of the date thereof.
- (d) The Council has the right to inspect and have the original records relating to any of the extracted/processed material, including numbers and types of laden trucks, trailers and load quantities transported from the property audited by any person nominated by its internal accountant any time when he may by written request so require.
- (e) The Council will pay all of the said contribution payments into a specially identified account for payments towards the rehabilitation, restoration, repair and/or maintenance of Old Northern and Wisemans Ferry Roads from the intersection of the Crown Road access and the Baulkham Hills Shire boundary at Cattai Creek and other projects identified in the Plan of Management for Extractive Industries adopted by Council.

This condition has been imposed in accordance with Contributions Plan No. 6 - Extractive Industries. A copy of this plan may be inspected at the Customer Service Centre, Council's Administration Complex, corner of Carrington and Showground Roads, Castle Hill, between the hours of 8.30am and 4.30pm weekdays.

Pursuant to Section 80A of the Environmental Planning and Assessment Act, the reasons for the conditions imposed on this application are as follows:-

1. To facilitate the orderly implementation of the objects of the Environmental Planning and Assessment Act, 1979 and the aims and objectives of Council's Planning instrument.
2. To ensure that the local amenity is maintained and is not adversely affected, and that adequate safeguards are incorporated into the development.
3. To ensure the development does not hinder the proper and orderly development of the subject land and its surrounds.
4. To ensure the relevant heads of consideration under Section 79C of the Environmental Planning and Assessment Act 1979 are maintained.

Attachment 2

**Hawkesbury River Environment Centre and Neville Diamond v Planning NSW and
Dixon Sand (Penrith) Pty Ltd**

Land and Environment Court Proceedings No 10206 of 2003

CONDITIONS OF CONSENT

This instrument includes changes made by DA 250-09-01 Mod1 in February 2006 (marked in blue)

This instrument includes changes made by DA 250-09-01 Mod2 in August 2008 (marked in red)

SCHEDULE 1

Development Application:	DA No. 250-09-01, lodged with the then Department of Urban Affairs and Planning on 21 September 2001;
Applicant:	Dixon Sand (Penrith) Pty Ltd ("the Applicant");
Consent Authority:	The Minister for Infrastructure and Planning;
Land:	Lots 1 and 2, DP 547255, and Lots 29 and 196, DP 752025, Old Northern Road, Maroota, Baulkham Hills Shire local government area;
Proposed Development:	The operation of an extractive industry on Lots 1 and 2 DP 547255; the continued use of the existing central processing plant on Lot 196, DP 752025; and water management and rehabilitation operations over Lots 1 and 2, DP 547255, and Lots 29 and 196, DP 752025, as described more particularly in Annexures "B" and "C".
State Significant Development	The proposed development is within a class of development classified as State Significant development by virtue of a declaration made by the then Minister for Urban Affairs and Planning on 3 August 1999 under section 76A of the <i>Environmental Planning and Assessment Act</i> ;
Integrated Development	The proposed development requires an additional approval from the EPA under the <i>Protection of the Environment Operations Act 1997</i> . Consequently it is classified as integrated development under section 91 of the <i>Environmental Planning and Assessment Act 1979</i> .
Designated Development	The proposed development would involve sand extraction and processing above the threshold in Schedule 3 of the <i>Environmental Planning and Assessment Regulation 2000</i> . Consequently it is classified as designated development under clause 4 of the <i>Environmental Planning and Assessment Regulation 2000</i> .
BCA Classification:	This consent does not provide for construction of any buildings or structures.

SCHEDULE 2

INDEX

1.	GENERAL	3
2.	COMPLIANCE	5
3.	ENVIRONMENTAL PERFORMANCE	6
4.	ENVIRONMENTAL MONITORING AND AUDITING	14
5.	COMMUNITY INFORMATION, CONSULTATION AND INVOLVEMENT	17
6.	ENVIRONMENTAL MANAGEMENT	19
7.	ENVIRONMENTAL REPORTING	24

In this consent, except in so far as the context or subject-matter otherwise indicates or requires the following terms have the meanings indicated:

AEMR	Annual Environmental Management Report
Act	<i>Environmental Planning and Assessment Act, 1979</i>
Applicant	Dixon Sand (Penrith) Pty Ltd
BCA	Building Code of Australia
Council	Baulkham Hills Shire Council
DA	Development Application
DECC	NSW Department of Environment and Climate Change
Department	NSW Department of Planning
Director-General	Director-General of the NSW Department of Planning, or delegate
DPI	Department of Primary Industries
Dust	Any solid material that may become suspended in air or deposited
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPL	Environment Protection Licence issued under the <i>Protection of the Environment Operations Act, 1997</i>
Existing Quarry	The existing extraction area, processing plant, raw material and product stockpile areas, offices and amenities, and environmental controls on Lots 29 and 196 DP 752025, Old Northern Road, Maroota, currently operating under development consent 796/00/HE
Existing Consent	Consent 796/00/HE awarded by the Land and Environment Court on 7 July 2000
GTA	General Term of Approval
Minister	Minister for Planning or delegate
Operation	Any activity that results in the production, or intended production, of quantities of quarry products to be transported off site including clearing, stripping, sand extraction and processing, and overburden emplacement.
POEO Act	<i>Protection of the Environment Operations Act, 1997</i>
Quarry Extension	Clearing, stripping, and sand extraction on Lots 1 and 2, DP 547255, and processing, overburden emplacement, haul roads, water management, weighbridge, offices, and associated infrastructure on Lots 29 and 196, DP 752025, Old Northern Road, Maroota.
Regulation	<i>Environmental Planning and Assessment Regulation, 2000</i>
RTA	NSW Roads and Traffic Authority
SEE	Statement of Environmental Effects
Site, project site	the land to which this consent applies

1. GENERAL

Obligation to Minimise Harm to the Environment

- 1.1 The Applicant shall implement all practicable measures to prevent or minimise any harm to the environment that may result from the construction and operation of the quarry extension, and rehabilitation of the project site.

Scope of Development

- 1.2 Incorporates EPA General Term of Approval. The Applicant shall carry out the development generally in accordance with:

- a) development application No.250-09-01, lodged with the then Department of Urban Affairs and Planning on 21 September 2001;
- b) The extract from Chapter 2 and Chapter 5 of the *Maroota Quarry Extension – Environmental Impact Statement for Dixon Sand (Penrith) Pty Ltd* (one volume), dated August 2001 and prepared by Environmental Resources Management Australia Pty Ltd (ERM) forming Annexure “B” to this consent.
- c) Statement of Environmental Effects (SEE) titled *Sand Quarry on Lots 29, 196, 1 & 2 Old Northern Road, Maroota, Section 96 Consent Modification*, dated July 2005 and prepared by Environmental Resource Management (Australia) Pty Limited;
- d) the material contained in Annexure “C” being:
 - (i) ERM Figures 1-4 in relation to the staging of rehabilitation works;
 - (ii) ERM Figures 5 and 6 in relation to the final landform; and
 - (iii) SEE Figure 1.3 in relation to the final landform; and
- e) Modification Application 250-09-01 Mod 2 and the accompanying Statement of Environmental Effects titled *“Section 96 Modification for Dixon Sand Pty Ltd”* and dated August 2007;
- f) letters regarding the modification application 250-09-01 Mod 2 from Environmental Resources Management Australia to the Department dated 1 April 2008 and 29 May 2008; and
- g) conditions of this consent.

- 1.3 If there is any inconsistency between the above documents, the latter document shall prevail over the former to the extent of the inconsistency. However, the conditions of this consent shall prevail over all other documents to the extent of any inconsistency.

Relationship with Existing Consent

- 1.4 The Applicant shall minimise duplication of documentation and avoid unnecessary complexity by ensuring EMPs, AEMRs and other documentation required by this consent, and the community consultative committee for the site comply with both this consent and consent 796/00/HE. The Applicant may apply to synchronise the timing of these activities, subject to written approval of the Director-General.

Period of Approval

- 1.5 This consent provides approval for sand extraction on Lots 1 and 2, DP 547255, until 24 May 2022 and for the:

- a) continued use of processing facilities, haul roads, water management, weighbridge, offices, and associated infrastructure on site;
- b) transport of extracted sand and concrete product to the site, and sand product from the site; and
- c) decommissioning of equipment, rehabilitation and revegetation of the site,

for a period of twenty-five (25) years from the commencement of the development consent for the Haerses Road quarry (DA 165-7-2005).

Extraction on Lots 29 and 196 DP 752025 shall not occur beyond the period of approval under development consent 796/00/HE.

Limits on Production

- 1.6 The combined production of quarry products from the site (Lots 196 and 29 DP 752025, and Lots 1 and 2 DP 547255, Old Northern Road, Maroota) and from the Haerses Road sand quarry shall not exceed 495,000 tonnes per annum.
- 1.7 Processing of extracted sandstone on the site shall not exceed 1750 tonnes per day.
- 1.8 The Applicant shall provide annual production data to the Department of **Primary Industries** using the standard form for the purpose.

Provision of Documents

- 1.9 Where practicable, the Applicant shall provide all draft documents and reports required to be submitted to the Director-General under this consent in an appropriate electronic format. Final approved documents shall be provided in hard copy format. Provision of documents and reports to other parties, as required under this consent, shall be in a format acceptable to those parties and shall aim to minimise resource consumption.
- 1.10 Nothing in this consent prevents the Applicant from combining reporting requirements under this consent with identical or similar reporting requirements for submission to another relevant party. Reporting requirements shall only be combined with the prior agreement of the Director-General of Infrastructure and Planning and the Director-General (or equivalent) of the other relevant party.
- 1.11 Subject to commercial confidentiality the Applicant shall make the following documents available to the public upon request at the quarry site and Council, and shall post all documents on the internet, within 14 days of approval of the documents by the Director-General or relevant agency:
 - a) this consent and the existing consent;
 - b) any licences or approvals for the quarry obtained from the Government agencies; and
 - c) all documents required under this consent, including environmental management plans, AEMR's and Independent Audits.

The Applicant shall ensure the address of the quarry internet site is publicised and freely available.

Dispute Resolution

- 1.12 In the event that a dispute arises between the Applicant and a public authority other than the Department, in relation to a specification or requirement applicable under

this consent, the Applicant shall refer the matter to the Director-General, and if not resolved, to the Minister, whose determination of the dispute shall be final and binding on all parties. For the purpose of this condition, "public authority" has the same meaning as provided under section 4 of the Act.

Participation in Cumulative and Regional Studies

- 1.13 The Applicant shall provide all existing relevant information to assist the Director-General in any cumulative/regional studies related to extractive industry activities.

Fit and Proper Person

- 1.14 The Applicant must, in the opinion of the EPA, be a fit and proper person to hold a licence under the Protection of the Environment Operations Act 1997, having regard to the matters in s.83 of that Act.

Rehabilitation Bond

- 1.15 Prior to commencement of operations on Lots 1 and 2 DP 547255, the Applicant shall provide a Rehabilitation Bond in the sum of \$255,000 in the form of an insurance bond or bank guarantee acceptable to the Director-General from any bank licensed pursuant to the *Banking Act 1959 (Cth)*. The Rehabilitation Bond shall be made in favour of the Minister administering the *Environmental Planning and Assessment Act 1979* to ensure completion of the rehabilitation and landscaping works at the site. The sum of the Rehabilitation Bond is calculated based on \$3.00 per square metre for a maximum exposed area of 8.5 ha. Should progressive AEMR's or Independent Environmental Audits determine that the exposed, non-rehabilitated, area on the site is greater than 8.5 ha, the Director-General may direct the Applicant to increase the value of the Rehabilitation Bond at the rate of \$3.00 per square metre in excess of 8.5 ha.

The Director-General may at any time, and without notice to the Applicant, demand all or part of the monies available under the Rehabilitation Bond if, in the Director-General's opinion, the Applicant has failed to make satisfactory progress on the Rehabilitation and landscaping of the site. The Director-General shall apply the monies to ensure that the actions specified in the documents listed in condition 1.2 and/or any approved Site Environmental Management Plan are achieved.

The Rehabilitation Bond will be released when the Applicant submits documentation prepared by a qualified landscape and rehabilitation consultant certifying that the final rehabilitation has been completed in accordance with the conditions of this consent and/or any approved Site Environmental Management Plan to satisfaction of the Director-General.

2. COMPLIANCE

- 2.1 The Applicant shall ensure that employees, contractors and sub-contractors are aware of, and comply with, the conditions of this consent relevant to their respective activities.
- 2.2 Prior to commencement of operations on Lots 1 and 2, DP 547255, the Applicant shall commission an independent person(s) or organization(s), approved by the Director-General, to certify in writing to the satisfaction of the Director-General, that the Applicant has complied with all conditions of this consent applicable prior to that event.
- 2.3 Notwithstanding condition 2.2 of this consent, the Director-General may require an update report on compliance with all, or any part, of the conditions of this consent.

Any such update shall meet the requirements of the Director-General and be submitted within such reasonable period as the Director-General may agree.

- 2.4 Any compliance report or compliance update required under condition 2.2 or 2.3 of this consent shall be made available for public inspection on request.
- 2.5 If at any time, the Director-General is made aware of the occurrence of any adverse environmental impacts from the proposal, the Director-General may order the Applicant to modify or cease the activities causing those impacts until those concerns have been addressed to the satisfaction of the Director-General.

3. ENVIRONMENTAL PERFORMANCE

Setbacks and Buffer Zones

- 3.1 Prior to commencement of operations on Lots 1 and 2, DP 547255, the Applicant shall engage a registered surveyor to mark out buffer zones and setbacks generally in accordance with the provisions of Baulkham Hills Development Control Plan 500 relating to extractive activities at the date of this consent. In this regard, a buffer zone shall be established which excludes areas from extraction between the quarry and nearby landuses or sensitive environmental areas. The boundary of the buffer zone(s) shall be located:
- a) Not less than 250m from the boundary of Maroota Public School (Lot 18 DP 752025);
 - b) Not less than 10m from the boundary of Lot 117 DP 752025;
 - c) Not less than 50m from the existing house on Lot 1 DP 547255;
 - d) In accordance with condition 3.50 around the threatened species conservation area; and,
 - e) At the edge of the area of shallow groundwater indicated on Fig 2.1 of the EIS.

A survey plan of the buffer zone and setback boundary shall be submitted to the Director-General for approval at least one month prior to the commencement of operations on Lots 1 and 2, DP 547255. Once approved, the surveyed boundary and buffer zone shall be fenced to prevent vehicles and unauthorized persons entering the area(s). No works or operations on Lots 1 and 2, DP 547255 shall occur on the site until the approved boundary has been fenced.

Air Quality Impacts

Location of monitoring/discharge points

- 3.2 Incorporates an **DECC** General Term of Approval. The following points referred to in the table below are identified for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

ID Number	Type of Monitoring Point	Type of Discharge Point	Description of Location
1	Ambient air monitoring	-	To be determined between DECC and the Applicant

Air Quality Standards/Goals and Performance Criteria

- 3.3 The Applicant shall ensure that dust emissions from the development do not cause exceedences of the following ambient air quality standards/goals at affected residences and Maroota Public School:

Table 1 Particulate Matter Criteria

Pollutant	Standard/Goal	Agency
Total Suspended Particulate Matter (TSP)	90ug/m3 (annual mean)	NH & MRC
Particulate Matter < 10um (PM10)	30 ug/m3 (annual mean)	NSW EPA
Particulate Matter < 10um (PM10)	50ug/m3 (24 hr average)	NSW EPA

Table 2 NSW EPA Amenity Based Criteria for Dust Fallout

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Deposited dust	Annual	2 g/m2/month	4 g/m2/month Note: dust is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19)

Dust Emissions

- 3.4 Incorporates an **DECC** General Term of Approval. The site must be maintained in a condition which minimizes or prevents the emission of dust from the site, including the prompt and effective rehabilitation of all disturbed areas.
- 3.5 To prevent dust emissions from vehicles the Applicant shall ensure that all vehicles entering or leaving the site, carrying a load that may generate dust, are covered to prevent dust emissions at all times, except during loading and unloading. Vehicles leaving the site carrying a load that may generate dust are to be covered prior to final weighing.
- 3.6 The Applicant shall install, operate, and maintain dust control measures and/or equipment on the following areas at the site:
- a) All processing equipment;
 - b) Internal haul roads and disturbed areas;
 - c) Truck loading areas; and,
 - d) All stockpiles including raw material, product, topsoil, and overburden.
- 3.7 A mobile water tanker equipped with a pump and sprays must be provided to suppress dust from unsealed roads when in use.
- 3.8 Haul roads must be surfaced in selected hard, non-friable material. Soft mudstone, claystone and shale must not be used.

Soil and Land Management

- 3.9 The Applicant shall ensure that extraction is undertaken in accordance with the extraction plan and sequence in the EIS.

- 3.10 The Applicant shall minimise the removal of trees and other vegetation from the project site, and restrict any clearance to the areas occupied by quarrying activities, processing plant, and those areas necessary for fire control.
- 3.11 Any topsoil removed during operations must be stockpiled for use in the rehabilitation of the site. Topsoil should not be mixed with other overburden products. The topsoil stockpile location should have easy access and be protected from erosion. The topsoil stockpiles shall be sown with appropriate vegetation to stabilise the soil if they are to be stored for longer than six months. Topsoil stockpiles must have a maximum depth of 1.5 metres.
- 3.12 The Applicant shall complete rehabilitation and revegetation works of extracted strips to a point requiring only ongoing monitoring and management before commencement of works on the extraction strip following the next strip in the extraction sequence. Strips 5 and 6 shall be rehabilitated before the end of the period of approval for extraction under condition 1.5. In this regard, strips shall be rehabilitated in the following sequence:

Strip to be rehabilitated	Before event
1	Commencement of operations on strip 3
2	Commencement of operations on strip 4
3	Commencement of operations on strip 5
4	Commencement of operations on strip 6
5	End of period of approval (condition 1.5)
6	End of period of approval (condition 1.5)

- 3.13 The Applicant shall undertake all rehabilitation works and construction of the final landform of the eastern highwall of the quarry within 250m of Maroota Public School in school holiday periods only.
- 3.14 The Applicant shall implement appropriate measures, in consultation with **DPI** and Maroota Public School, to ensure public safety and restrict unsupervised access of school children to the quarry site. Those measures may include the erection of safety fencing around the highwall of the quarry or at the school boundary as well as the fencing referred to in condition 3.1.
- 3.15 The Applicant shall regularly consult with adjoining property owners to ensure property management issues including maintenance of common fences, weed control measures, and bushfire management are coordinated. Details of consultation are to be reported in the AEMR.
- 3.16 The Applicant shall establish a riparian zone, revegetated with local native species, along the entire length of the reconstructed ephemeral waterway on the quarry extension site. The reconstructed waterway shall be located generally in accordance with the Final Landform Plan (Fig 2.5 of the EIS). The riparian zone shall be no less than 20m wide measured horizontally and at right angles to the flow from the top of both banks. No exotic plant species, other than sterile cover crops, are to be planted in the riparian zone.

Water Quality Impacts

Pollution of waters

- 3.17 Except as may be expressly provided by a licence under the *Protection of the Environment Operations Act 1997* in relation of the development, section 120 of the *Protection of the Environment Operations Act 1997* must be complied with in and in connection with the carrying out of the development.

Surface Water

- 3.18 The stormwater system must be designed and installed in accordance with Managing Urban Stormwater: Soil and Conservation, Department of Housing 1998, to contain and treat all rainfall and runoff at the site resulting from a 90 percentile, 5 day rainfall event ("the design event").
- 3.19 The Applicant must maintain stormwater basins with the capacity to contain all rainfall and runoff generated from the "design event" specified in condition 3.18.
- 3.20 The Applicant must take all practical measures to avoid or minimise total suspended solids contained in wet weather discharges from the site.
- 3.21 The Applicant shall undertake appropriate measures to ensure that any vehicles which leave the site do not track materials onto public roads.
- 3.22 The Applicant shall consult with **DPI** prior to commencement of operations in strip 4 (as described in the EIS) on Lots 1 and 2, DP 547255 and, if required, obtain a permit under the *Fisheries Management Act 1994* for works to be carried out on the site.
- 3.23 Discharge of stormwater from the site is to be clear of sediment and pollution in accordance with the provisions of the Protection of the Environment Operations Act, 1997, and the EPL for the quarry, and to the satisfaction of the **DECC**.

Groundwater

- 3.24 The Applicant shall maintain the four groundwater monitoring bores established on Lots 1 and 2, DP 547255, throughout the life of the development.
- 3.25 The Applicant shall ensure that no extraction or excavation works occur within two (2) metres of the highest recorded wet weather groundwater level.
- 3.26 The Applicant is to ensure that groundwaters are not breached or contaminated by its operations. In the event of groundwaters being breached or contaminated, operations are to cease within the vicinity of the affected area and the Applicant shall consult with the Director-General and Council to determine the basis upon which extraction may recommence.
- 3.27 The Applicant shall carry out remedial works to protect the groundwater system, to the satisfaction of the Director-General, if it is determined that any of the existing dams on the site breach the groundwater table.
- 3.28 Maintenance and equipment refuelling operations shall only be carried out in the designated workshop and refuelling areas on the existing quarry site.

Bunding and Spill Management

- 3.29 The Applicant shall store and handle all hazardous chemicals, dangerous goods, fuels and oils, strictly in accordance with:
 - a) All relevant Australian Standards;
 - b) A minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and
 - c) The **DECC**'s Environment Protection Manual Technical Bulletin *Bunding and Spill Management*.

In the event of an inconsistency between the requirements listed from a) to c) above, the most stringent requirement shall prevail to the extent of the inconsistency.

Traffic and Transport Impacts

3.30 Truck movements at the site, including those provided for in consents 796/00/HE, 250-9-01 and 165-7-2005, shall not exceed:

- a) a total of 180 per day (ie inbound combined with outbound);
- b) 40 between the hours of 6.00am and 7.00am (inbound combined with outbound); and
- c) 118 laden per day, of which no more than 28 may be inbound.

3.30A The Applicant shall:

- a) keep daily records of the amount of sand transported from the site;
- b) keep daily records of all traffic movements in and out of the site (including records of movements approved under condition 3.30; and
- c) include detailed reports on these records in the AEMR.

3.31 All vehicles are to enter and leave the site in a forward direction and prominent and permanent signposting to this effect is to be provided and maintained at all times.

3.32 The Applicant is to ensure that the Old Northern Road pavement in the vicinity of the intersection with the Crown Access Road is regularly maintained and kept free of sand, clay and soil at all times. All costs of these works are to be borne by the Applicant.

3.33 The Applicant shall advise its drivers and its clients not to arrive at the site prior to 5.45am on any day. Certified (under company seal) weighbridge dockets and a log book or equivalent computer records are to be kept to verify the arrival and departure times of vehicles. Copies of these records shall be summarized in the AEMR.

3.35A The Applicant shall ensure all new truck drivers are provided with Site Induction for Drivers outlining site requirements, including the requirements of the Transport Code of Conduct referred to in condition 6.3 of this consent, and expected driver behaviour such as observing the 40 kph speed limit at Maroota School on school days between 8:30 am – 9:00 am and 3:00 pm – 3:30 pm (or such other speed limits as may be imposed from time to time), and not using exhaust brakes, especially during morning periods.

3.35B The Applicant shall liaise with representatives of Maroota Public School as required, but no less than annually, to discuss the effectiveness of traffic management procedures.

3.35C The Applicant shall impose a 20 km/hr speed limit on internal haul roads and shall ensure that all vehicles using internal haul roads do not exceed this speed limit.

Noise Impacts

Noise limit Interpretation and Measurement

3.34 All noise limits specified as part of this consent apply under:

- a) Wind speeds up to 3 ms⁻¹ at 10 metres above ground level; and
- b) Temperature inversion conditions up to 3oC per 100 metres.

3.35 For the purpose of assessment of noise levels specified in this consent, noise from the development shall be:

- a) Measured at the most affected point on or within the receptor site boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary to determine compliance with LAeq(15 minute) noise limits in condition 3.39;
 - b) Measured at 1 metre from the dwelling façade of the most affected classroom to determine compliance with LAeq(1 hour) noise limits in condition 3.40; and
 - c) Subject to the modification factors provided in Section 4 of the *New South Wales Industrial Noise Policy* (DECC, 2000).
- 3.36 Notwithstanding condition 3.36 of this consent, should direct measurement of noise from the site be impractical, the Applicant may employ an alternative noise assessment method deemed acceptable by the DECC (refer to Section 11 of the *New South Wales Industrial Noise Policy* (DECC, 2000)). Details of such an alternative noise assessment method accepted by the DECC shall be submitted to the Director-General prior to the implementation of the assessment method.
- 3.37 Noise limits identified in condition 3.39 do not apply for residential premises where there is a negotiated agreement between the Applicant and the Landowner of the premises.

Noise Limits

3.38 Noise from the premises must not exceed:

- An LAeq(15 minute) noise emission criterion of 44 dB(A) between 7am and 6pm Monday to Saturday; and
- An LAeq(15 minute) noise emission criterion of 37 dB(A) between 6am and 7am Monday to Saturday

at any residence not owned by the Applicant.

3.39 Noise from the premises must not exceed an LAeq(1 hour) noise emission criterion of 45 dB(A) at the most affected classroom of Maroota Public School.

Hours of Operation

- 3.40 Construction of earth bunds around the Maroota Public School setback perimeter, required for the mitigation of noise and dust, must only be carried out between 7am and 6pm Monday to Friday during school holiday periods unless otherwise approved in writing by the DECC.
- 3.41 Loading of trucks and truck movements at the site must only be carried out between 6am and 6pm Monday to Saturday, and at no time on Sundays and Public Holidays. All other activities at the premises must only be carried out between 7am and 6pm Monday to Saturday, and at no times on Sundays and Public Holidays.

Operational Noise – Management of Operations

- 3.42 The Applicant shall design and implement a management system that ensures operations at the quarry site meet the criteria in conditions 3.39 and 3.40. In this regard, the Applicant shall:
- a) Construct all bunds on the eastern, southeastern and northern sides of the quarry extension site to at least 5 m above the existing ground level;

- b) Not use the bulldozer concurrently with any other plant on strips 4,5 and 6 of the quarry extension site for any operations at quarry depths between existing ground level and six metres below the existing ground level; and
- c) Only use the bulldozer for clearing, stripping and bund construction on the quarry extension site in calm wind conditions.

The Applicant shall report on monitoring results from the on-site weather monitoring station, and corresponding operations and noise impacts in adverse weather conditions, in the AEMR and compliance reports required under condition 3.45. The Director-General, in consultation with DECC, may approve variations to the operating restrictions in this condition based on actual noise monitoring conducted by the Applicant on the site and/or the results of compliance reports required in condition 3.45.

- 3.43 The Applicant shall design quarry operations to minimise the need for reversing of trucks and machinery where reversing beepers may contribute to noise impacts exceeding the criteria in conditions 3.39 and 3.40.

Operation Noise – Compliance Report

- 3.44 The Applicant must undertake noise monitoring after noise mitigation earth bunds at strips 4, 5 and 6 are completed. The results of the noise monitoring must be submitted to the DECC and the Director-General in a report within 3 months of completion of the earth bund construction. The report must include a statement of whether compliance has been achieved with noise limits specified in the Environment Protection Licence and this consent.

Operational Noise – Negotiated Agreement with G&M Accurso

- 3.45 The Applicant is to implement the noise mitigation measures contained in the agreement with Mr and Mrs G&M Accurso dated 5 April 2004 titled *Letter of Agreement between Mr and Mrs G&M Accurso and Dixon Sand (Penrith) Pty Ltd* forming Annexure “D” to this Consent. Noise limits contained in condition 3.39 do not apply to the Accurso residence (Lot 117, DP 752025) while the agreement is in force.
- 3.46 Should the agreement referred to in condition 3.46 be terminated for any reason the Applicant shall comply with noise criteria in condition 3.39.

Operation Noise – Residential Noise Management

- 3.47 In the event that noise from the site exceeds noise criterion in condition 3.39 or condition 3.40, or the negotiated agreement in condition 3.46 is terminated for any reason, then the Applicant shall actively manage residual noise (ie noise in excess of the criteria) at the affected receptor. Residual noise shall be managed in accordance with the residual noise management measures detailed in the approved Site Environmental Management Plan. As a minimum to ensure compliance, the Applicant shall undertake the following measures:
- a) Implement a reactive management system where site operations are modified in adverse weather conditions identified through meteorological monitoring;
 - b) Implement additional controls of treatments on individual sources on the site or on site operations, or otherwise modify operations to ensure compliance; or
 - c) Provide other forms of benefit or amelioration of impacts of noise agreed between the Applicant and the affected party, as providing acceptable compensation for noise levels experienced; and

- d) Identify long term strategies to eliminate noise levels that exceed the noise criteria in condition 3.39 or 3.40.

Impacts on Flora and Fauna

3.48 Prior to commencement of operations on Lots 1 and 2, DP 547255, the Applicant shall engage a suitably qualified and experienced ecologist to identify all threatened plant species on the site and clearly mark vegetation to be conserved, generally in accordance with the proposed conservation areas in documents listed in condition 1.2. The Applicant shall then define a buffer zone(s) around threatened species conservation areas as follows:

- a) A 50 metre buffer around the populations of *Tetratheca glandulosa* and shale-sandstone transitional forest; and,
- b) A reduced buffer of 20 m on the northern point of the conservation area.

The boundary of the conservation area shall be surveyed and fenced in accordance with condition 3.1. Fencing around the threatened species conservation area shall be sufficient to ensure excavation operations, truck movements, overburden dumping, dust generation, and weed infestation due to quarry operations do not adversely affect flora and fauna. No works or operations on Lots 1 and 2, DP 547255 shall occur on the site until the approved conservation area boundary has been fenced.

3.49 The Applicant shall ensure that all natural bushland directly adjoining the site and bushland to be conserved within the development site, is not damaged or disturbed by its operations.

3.50 Native bush regeneration and habitat reconstruction techniques shall be used to rehabilitate the threatened species conservation area, extraction areas, tailings ponds, and disturbed areas, and stabilize environmental bunds on the site in accordance with the SEMP. Bush regeneration shall include a specific program to translocate, propagate, and revegetate threatened plant species on the site including *Tetratheca glandulosa*. Shale/sandstone transition forest, *Darwinia Fascicularis* susp. *oligantha*, and *Kunzea rupestris*. The specialised techniques shall be carried out under the direction of a qualified Plant Ecologist and shall include the re-use of stored topsoil that has not been contaminated with exotic grasses or weed species and the collection and propagation of species from the site.

Indigenous Heritage

3.51 If, during the course of any activities conducted under this consent, the Applicant becomes aware of any heritage or archaeological sites not previously identified, all work likely to affect the site shall cease immediately. The Applicant shall then consult with relevant authorities and decide on an appropriate course of action prior to recommencement of work. The relevant authorities may include DECC, the NSW Heritage Office, and the relevant local Aboriginal community. Any necessary permits or consents shall be obtained and complied with prior to recommencement of work.

Waste Management Impacts

3.52 The Applicant shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal, or any waste generated at the site to be disposed of at the site, except as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*. This condition only applies to the storage, treatment,

processing, reprocessing or disposal of waste at the site if it requires an Environment Protection Licence under the *Protection of the Environment Operations Act 1997*.

- 3.53 All liquid and non-liquid wastes generated at the development shall be assessed, classified and managed in accordance with the DECC's Environmental Guidelines *Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (EPA, 1999).
- 3.54 Any waste generated at the development shall only be transported to an DECC - approved waste management facility for treatment, recycling and/or disposal, where relevant.

Section 94 Contributions

- 3.55 The Applicant shall pay or procure payment to the Council of a contribution under Section 94 of the *Environmental Planning and Assessment Act 1979* at a rate in accordance with Baulkham Hills Shire Council's *Contributions Plan No: 6 – Extractive Industries*. The said contribution will be calculated and paid monthly from the date on which development consent became effective. The said contribution will be indexed and adjusted annually in accordance with *Contributions Plan No: 6 – Extractive Industries*. On or before the fourteenth day of each month for the duration of the consent, the applicant shall deliver or procure delivery to the Council of true certified copy weighbridge or other returns or records showing the true quantities of extracted/processed material transported from the property during the immediately preceding month and the Council will then, as soon as it can conveniently do so, issue an invoice to the applicant or its consenting assignee, who will pay to the Council within fourteen (14) days of the date thereof. The Council and the consent authority has the right to inspect and have the original records relation to any of the extracted/processed material, including numbers and types of laden trucks, trailers and load quantities transported from the property audited by any person nominated by its internal accountant any time when he may be written request so require. The Council will pay all of the said contribution payments into a specially identified account for payments towards the rehabilitation, restoration, repair and/or maintenance of Old Northern and Wisemans Ferry Roads from the intersection of the Crown Road access and the Baulkham Hills Shire boundary at Cattai Creek and other projects identified in the Plan of Management for Extractive Industries adopted by Council.

4. ENVIRONMENTAL MONITORING AND AUDITING

General Monitoring Requirements

- 4.1 The results of all monitoring required under this consent shall be:
- a) In a legible form, or in a form that can be readily reduced to a legible form;
 - b) Kept for at least four years after the monitoring or event to which the results relate took place; and
 - c) Produced in a legible form to any authorized officer of the DECC or the Director-General, upon request; and
 - d) Kept with the following details for each sample required to be collected:
 - i) the date(s) on which the sample was collected;
 - ii) the time(s) at which the sample was collected;
 - iii) the point at which the sample was collected; and

iv) the name of the person who collected the sample.

- 4.2 Incorporates an **DECC** General Term of Approval. The Applicant shall monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The Applicant must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns:

Parameter	Units of Measure	Averaging Period	Frequency	Method
Rainfall	mm/hr	1-hour	Continuous	AM-4
Sigma Theta @ 10 m		1-hour	Continuous	AM-2
Siting	-	-	-	AM-1
Temperature @ 2 m	K	1-hour	Continuous	AM-4
Wind Direction @ 10 m		1-hour	Continuous	AM-2
Wind Speed @ 10 m	m/s	1-hour	Continuous	AM-2

Note: the purpose of condition 4.2 of this consent is to provide a mechanism for collection and recording meteorological data relevant to the site for use in on-going air quality and noise assessment and management.

Air Quality Monitoring

- 4.3 For each monitoring point or utilisation area specified in condition 3.2, the Applicant must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1 of the table below. The Applicant must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

Air

Pollutant	Units of measure	Frequency	Sampling Method
Particulate matter – PM10	ug/m3	1 day in 6 or continuous, or as otherwise approved by EPA	AM-18 or AS3580.9.8 – 2001
Particulate Matter (deposited matter)	g/m2/month	Continuous	AM-19
Siting	-	-	AM-1

- 4.3A The Applicant shall install a continuous monitoring device approved by the EPA and connected to an alarm system by electronic link at a central point in the operations area at sensitive sites such as Maroota school with a trigger level set at the maximum predicted level which respectively contributed to setting of the overall levels of 24 hour PM10 at 37.0Ug/m3 annual PM10 at 16.4ug/m3 annual TSP at 37.0ug/m3 and TSP at 2.5/m2/month tabulated by ERM Australia in its Air Quality Assessment for Proposed Maroota Quarry Extension September 2003 or such other level prescribed by the **DECC** from time to time. If the measured concentration of PM10 reaches the trigger level then the operations shall cease or be modified immediately such that the trigger level is not reached. The trigger level and period for averaging that level shall be certified by the **DECC**.

- 4.4 Monitoring for the concentration of a pollutant emitted to the air required to be conducted under this consent, or a licence under the *Protection of the Environment Operations Act 1997*, must be carried out in accordance with *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (**DECC** 2001) or latest document.

Noise Monitoring

- 4.5 The Applicant shall engage an independent person(s) to conduct noise monitoring at sensitive residential locations and Maroota Public School every six months, or as otherwise approved by the Director-General, during the operation of the development to determine compliance with the noise criteria in conditions 3.39 and 3.40. Noise monitoring shall seek to coincide with worst case operating scenarios for noise generation and adverse weather conditions.
- 4.6 Within six months of the date of this consent, the Applicant shall engage an independent person(s) to conduct road traffic noise monitoring at Maroota Public School to determine the actual impact of truck movements on existing traffic noise levels compared to predictions made in the EIS for the existing development consent (796/00/HE). In the event that monitoring indicates that the relevant criteria in EPA's *Environmental Criteria for Road Traffic Noise* is exceeded, the Applicant shall implement noise mitigation measures at the School in consultation with Maroota Public School, Council, RTA, and EPA and as directed by the consent authority and in accordance with a specification approved by the consent authority.
- 4.6A The Applicant shall engage an independent person(s) to conduct road traffic noise monitoring at Maroota Public School for 1 day per week (being the peak product dispatch day) for a period of 3 months within the 6 months following the commencement of truck movements in accordance with the approval of DA 250-09-01 Mod 2, or as directed by the Director-General. The monitoring shall be undertaken to determine compliance with the predicted noise levels in the SEE for DA 250-09-01 Mod 2 and comply with levels prescribed in condition 3.39. A copy of the monitoring results shall be provided to the Department and Maroota Public School.

In the event that monitoring indicates noise level exceedances, the Applicant shall implement reasonable and feasible noise mitigation measures at the Maroota Public School in consultation with the Maroota Public School, Council, RTA and DECC, and to the satisfaction of the Director-General.

Water Quality Monitoring

Surface Water

- 4.7 The Applicant shall undertake surface water monitoring and discharge monitoring in accordance with the EPL for the quarry.

Groundwater

- 4.8 The Applicant shall monitor groundwater levels in the four monitoring bores on Lots 1 and 2, DP 547255 monthly and following any periods of extreme wet weather. Water quality monitoring of groundwater shall be undertaken every six months. Results of groundwater monitoring shall be reported in the AEMR.

Flora and Fauna Monitoring

- 4.9 The Applicant shall prepare and implement a Flora and Fauna Monitoring Program to monitor the effects of the development on flora and fauna including known populations of *Tetratheca Glandulosa*, Shale-Sandstone Transitional Forest, *Darwinia fascicularis subsp. oligantha*, and *Kunzea Rupestris* on the site. The Program shall also monitor the success of revegetation works on the site. The Program shall be developed in consultation with DECC and Council. The Program shall include annual surveys for threatened species during quarry operations, and include monitoring of the threatened species conservation area. The Applicant shall include the Flora and Fauna Monitoring Program in the SEMP (condition 0).

- 4.10 The Flora and Fauna Monitoring Program shall begin before commencement of operations on the quarry site and continue until at least two years beyond the period of approval in condition 1.5.

Independent Auditing

- 4.11 The Applicant shall commission an independent person(s) to undertake an Environmental Audit of the entire quarry at the following stages of the development:

- a) Before commencement of operations on strips 2, 3, 4, 5, and 6;
- b) At the end of the period of approval set out in condition 1.5; and,
- c) At the completion of the Flora and Fauna Monitoring Program in condition 4.10, or as otherwise required by the Director-General.

The independent person(s) shall be approved by the Director-General prior to the commencement of the Audit. An **Environmental Audit Report** shall be submitted to the Director-General, the DECC, the RTA and Council within one month of the completion of the Audit. The Audit shall:

- a) Be carried out in accordance with *ISO 14010 – Guidelines and General Principles for Environmental Auditing* and *ISO 14011 – Procedures for Environmental Auditing*;
- b) Assess compliance with the requirements of this consent, and other licences and approvals that apply to the development;
- c) Assess the development against the predictions made and conclusions drawn in the documents referred to under condition 1.2 of this consent;
- d) Review the effectiveness of the environmental management of the development, including any environmental impact mitigation works; and
- e) Independently review and validate monitoring systems and outcomes.

The Director-General may, having considered any submission made by the DECC, the RTA or Council in response to the Environmental Audit Report, require the Applicant to undertake works to address the findings or recommendations presented in the Report. Any such works shall be completed within such time as the Director-General may require. The Applicant shall make the Environmental Audit Report available for public inspection on request. The Director-General may make the Environmental Audit Report available on the Department's internet site.

- 4.12 The Applicant shall provide a compliance report(s) to the Director-General detailing the implementation of the recommendations of the Environmental Audit Report (refer to condition 4.11). The compliance report(s) shall be submitted to the Director-General within such time, and at such frequency, as the Director-General may require. The Applicant shall make the compliance report(s) available for public inspection.

5. COMMUNITY INFORMATION, CONSULTATION AND INVOLVEMENT

Complaints Procedure

- 5.1 Throughout the life of the development, the Applicant shall ensure that the following are available for community complaints:

- a) A telephone number on which complaints about the development may be registered;
- b) a postal address to which written complaints may be sent; and

- c) an email address to which electronic complaints may be transmitted.

The telephone number, the postal address and the email address shall be advertised in at least one appropriate local newspaper prior to the commencement of operations on Lots 1 and 2, DP 547255. These details shall also be provided on the Applicant's internet site.

5.2 The Applicant shall record details of all complaints received through the means listed under condition 5.1 of this consent in a Complaints Register. The Register shall record, but not necessarily be limited to:

- a) The date and time, where relevant, of the complaint;
- b) The means by which the complaint was made (telephone, mail or email);
- c) Any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
- d) The nature of the complaint;
- e) Any action(s) taken by the Applicant in relation to the complaint, including any follow-up contact with the complainant; and
- f) If no action was taken by the Applicant in relation to the complaint, the reason(s) why no action was taken.

The Complaints Register shall be made available for inspection by the **DECC** or the Director-General upon request. The Applicant shall also make summaries of the Register, without details of the complainants, available for public inspection.

Community Consultative Committee

5.3 The Applicant shall establish a Community Consultative Committee (CCC) to oversee the environmental performance of the development. The Applicant shall ensure that one committee is established for the entire site which meets the requirements of both this consent and the existing consent for the site while that consent operates. This committee shall:

- a) Be comprised of:
 - 1 independent chairperson nominated by the Director-General in consultation with the Council, and agreed to by the Applicant;
 - 2 representatives from the Applicant, including the Environmental Officer;
 - 1 representative from the Council;
 - 1 representative from the Maroota Public School; and
 - 2 representatives from the local community;

whose appointment has been approved by the Director-General in consultation with the Council;

- b) Meet at least once every six months; and
- c) Review and provide advice on the environmental performance of the development, including the Site Environmental Management Plan, monitoring results, audit reports, compliance reports, AEMR's or complaints.

- 5.4 Representatives from the Department may attend committee meetings. Representatives from relevant government agencies, the local community, the local Aboriginal community, or other individuals may be invited to attend meetings as required by the Chairperson.
- 5.5 The Applicant shall, at its own expense:
- a) Ensure that 2 of its representatives attend all the Committee's meetings;
 - b) Provide the Committee with regular information on the environmental performance and management of the development;
 - c) Provide meeting facilities for the Committee;
 - d) Meet all reasonable costs associated with operating the Committee;
 - e) Allow the Committee to inspect the site, if necessary;
 - f) Take minutes of the Committee's meetings;
 - g) Make these minutes available for public inspection at the Council within 14 days of the Committee meeting, or as agreed by the Committee;
 - h) Respond to any recommendations the Committee may have in relation to the environmental performance of the development;
 - i) Forward a copy of the minutes of each Committee meeting verified by the independent chairperson, and any responses to the Committee's recommendations to the Director-General within 14 days of the Committee meeting.
- 5.6 The Applicant shall ensure that the Committee has its first meeting prior to the submission of the Site Environmental Management Plan.
- 5.7 The Applicant shall prepare and implement a Community Relations Plan (CRP) to improve communications with the local community and Maroota Public School. The Plan shall be developed in consultation with Council, the CCC, and MPS. The Plan shall include, but not be limited to:
- a) Identification of stakeholders potentially affected by the development;
 - b) Details of strategies to ensure open communication between the Applicant and the community and Maroota Public School;
 - c) Details of strategies to monitor and evaluate social impacts of the development on the local community and Maroota Public School;
 - d) Measures to improve community relations including:
 - i. Quarry open days and education sessions to promote better understanding of quarry operations in the wider community;
 - ii. Participation in community activities;
 - iii. Strategies involving in-kind exchanges of expertise and resources for activities such as bush regeneration, Landcare, Streamwatch, and other community-based environmental programs.

The CRP shall be included in the SEMP.

6. ENVIRONMENTAL MANAGEMENT

Environmental Officer

- 6.1 Within 3 months of the operation of this consent, the Applicant shall nominate a suitably qualified and experienced Environmental Officer(s), approved by the Director-General. The Applicant shall employ an Environmental Officer(s) on a full-time basis throughout the life of the development. The Environmental Officer(s) shall be:

- a) The primary contact point for the Department, the **DECC**, the RTA, Council and the community, as applicable, in relation to the environmental performance of the development;
- b) Responsible for all Management Plans and Monitoring Programs required under this consent;
- c) Responsible for considering and advising on matters specified in the conditions of this consent, and all other licences and approvals related to the environmental performance and impacts of the development;
- d) Responsible for receiving and responding to complaints in accordance with condition 5.2 of this consent; and
- e) Given the authority and independence to require reasonable steps be taken to avoid or minimize unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.

The Applicant shall notify the Director-General, the **DECC**, the RTA, and Council of the name and contact details of the Environmental Officer upon appointment, and any changes to that appointment that may occur from time to time.

6.2 The Applicant shall prepare and implement a **Site Environmental Management Plan** (SEMP) to detail an environmental management framework, practices and procedures to be followed during the operation of the development. The SEMP shall cover operations on both the existing quarry site and the quarry extension. The Plan shall include, but not necessarily be limited to:

- a) Demonstration of consistency with commitments made in documents listed in condition 1.2 and compliance with the conditions of this consent;
- b) Identification of all statutory and other obligations that the Applicant is required to fulfil in relation to operation of the development, including all consents, licenses, approvals and consultations;
- c) A description of the roles and responsibilities for all relevant employees involved in the operation of the development;
- d) Overall environmental policies and principles to be applied to the operation of the development;
- e) Standards and performance measures to be applied to the development, and a means by which environmental performance can be periodically reviewed and improved;
- f) Management policies to ensure that environmental performance goals are met and to comply with the conditions of this consent;
- g) Procedures to be followed to ensure the protection and conservation of Aboriginal cultural heritage;
- h) The CRP required in condition 5.7
- i) The Management Plans listed under condition 6.3 of this consent; and,
- j) The environmental monitoring requirements outlined under conditions 4.1 to 4.12 of this consent, inclusive.

The SEMP shall be submitted for the approval of the Director-General no later than one month prior to the commencement of operation of the development, or within such period otherwise agreed by the Director-General. Operation shall not commence until written approval has been received from the Director-General. Upon receipt of the Director-General's approval, the Applicant shall supply a copy of the SEMP to Council, the **DECC**, the RTA as soon as practicable. The Applicant shall make the SEMP available for public inspection on request.

6.3 As part of the SEMP for the development, required under condition 6.2 of this consent, the Applicant shall prepare and implement the following Management Plans:

- a) An **Air Quality Management Plan** to outline measures to minimise impacts from the development on local and regional air quality. The Plan shall address the requirements of the DECC and Council. The Plan shall include, but not necessarily be limited to:
 - i. identification of all sources of dust emissions from the development and potentially affected properties;
 - ii. detailed procedures for management and minimisation of dust emissions during operations on site;
 - iii. procedures and schedules for rehabilitation of disturbed areas to minimise dust emissions;
 - iv. a protocol for handling dust complaints;
 - v. air quality monitoring, consistent with the requirements of this consent and any relevant Environment Protection Licence for the site; and
 - vi. a contingency plan should an incident or weather event lead to air quality impacts above environmental performance goals/limits.
- b) An **Erosion and Sedimentation Control Plan** to detail measures to minimise erosion during site preparation and operation. The Plan shall address the requirements of the Director-General, the DECC, and Council. The Plan shall include, but not necessarily be limited to:
 - i. results of investigations into soils associated with the site, in particular the stability of the soil and its susceptibility to erosion;
 - ii. details of erosion, sediment and pollution control measures and practices to be implemented;
 - iii. procedures for removal of farm dams on site to ensure that large volumes of water and sediment are not released to natural waterways;
 - iv. demonstration that erosion and sediment control measures will conform with, or exceed, the relevant requirements and guidelines provided in the former Department of Land and Water Conservation's publication *Urban Erosion and Sedimentation Handbook*, the DECC's publication *Managing Urban Stormwater: Soils and Construction*;
 - v. design specifications for diversionary works, banks and sediment basins;
 - vi. an erosion monitoring program during site preparation works and construction of the development; and
 - vii. measures to address erosion, should it occur, and to rehabilitate/stabilise disturbed areas of the site.
- c) A **Noise Management Plan** to detail measures to minimise noise impacts during the operation of the development and to manage residual noise (refer to condition 3.48 of this consent). The Plan shall be developed in consultation with Council and the DECC. The Plan shall include, but not necessarily be limited to:
 - i. identification of a noise sources associated with the proposed development;
 - ii. program to investigate and monitor noise levels from the development on periodic basis;
 - iii. a protocol for handling noise complaints;
 - iv. a program to investigate additional noise mitigation measures for the development if it is determined that noise criteria in this consent are being exceeded;

- v. a specific program to identify and implement, where appropriate, noise mitigation measures on the site, or at the receptor, to reduce residual noise impacts at the receptors including requirements of condition 3.48 of this consent; and
 - vi. a program to identify other forms of benefit or amelioration that may be applied, upon agreement of the Applicant and the affected party, at receptors the subject of condition 3.48 of this consent.
- d) A **Water Management Plan** to outline measure to control and manage surface water, stormwater and groundwater on the site. The Plan shall address the requirements of the Director-General, the **DECC** and Council. The Plan shall include, but not necessarily be limited to:
- i. identification of all potential sources of surface water and groundwater pollution;
 - ii. management measures to ensure separation of clean and dirty water on site;
 - iii. measures to rehabilitate erosion-affected areas and areas the subject of excavation, including tree, shrub and/or cover crop species and implementation;
 - iv. management procedures for all surface water collection and storage structures on the site, including a maintenance program for associated infrastructure (eg pumps, pipes, dam walls etc) and a program for desilting of those structures, where relevant;
 - v. a demonstration of consistency with the surface water management plan for the catchment, should one exist, or with the **DECC's** publication *Managing Urban Stormwater: Council Handbook* should a stormwater management plan for the catchment not exist;
 - vi. management measures to ensure the groundwater table is not breached by the quarrying operation;
 - vii. details of a program for monitoring surface water and groundwater quality and quantity at the site;
 - viii. details of measures to ensure a sustainable water management system is created in the final landform on the site; and,
 - ix. a strategy for the decommissioning of water management structures, including storage, and sedimentation dams once extraction is complete.
- e) A **Rehabilitation and Landscape Plan** to detail the proposed final landuse and landform for the site and measures to be undertaken to create that landform and vegetation cover. The Plan shall address the requirements of the Director-General, Council, **DECC and DPI**. The Plan shall include, but not necessarily be limited to:
- i. details of all landscaping to be undertaken on the site;
 - ii. maximisation of flora species endemic to the locality in landscaping the site;
 - iii. a specific program to translocate, propagate, and revegetate and monitor threatened plant species on the site including *Tetradlea glandulosa*, Shale/sandstone transition forest, *Darwinia Fascicularis susp. oligantha*, and *Kunzea rupestris*;
 - iv. Plans and cross-sections to scale, showing the proposed final landform demonstrating that it integrates with the surrounding terrain. The final landform shall be integrated across the entire site and adjoining land;
 - v. Site analysis used to determine compatible contours, shape, form, landscape features and quality of the final landform, including the identification of conservation areas;
 - vi. Details of rehabilitation and habitat construction works to be undertaken in the conservation area and buffer zones;

- vii. Details of the progressive rehabilitation of both extraction areas, environmental bunds, and setback/buffer zones;
 - viii. Details of stream restoration works including:
 - Methods to stabilise the bed and banks of the waterway;
 - Establishment of riparian zones using local native vegetation;
 - Vegetation monitoring, maintenance, and performance criteria; and,
 - Use of an environmentally sympathetic, soft-engineering approach;
 - ix. a schedule of works and associated time period for the rehabilitation of each disturbed and/or exposed extraction area or strip with the aim to restore vegetative covers and habitat at the earliest possible opportunity;
 - x. procedures for weed control and feral animal control;
 - xi. details of all backfilling works, including source of materials and the grades and stability of all batters. Batter design should be in accordance with the provisions of DCP No 500 – Extractive Industries, and certification is to be provided by appropriately qualified engineers regarding the stability of all designed batters;
 - xii. details including a soil drainage plan sufficient for growing crops that require free drainage.
- f) A **Bushfire Management Plan** for the site, developed in consultation with Council and relevant emergency services. The Plan shall be consistent with any bushfire management measures for State Forests and National Parks in the region;
- g) A **Traffic Management Plan** to outline measures to minimise traffic impacts associated with the development. The Plan shall address the requirements of Council and the RTA. The Plan shall include specific measures to minimise the impact of heavy vehicles, including restrictions on routes and times (particularly in relation to peak hours, holiday periods and times immediately before and after school hours, i.e. 8.30 am – 9.00am and 3.00pm – 3.30pm);
- h) A **Transport Code of Conduct** to outline minimum requirements for the movement of heavy vehicles to and from the site. The Code shall meet the requirements of Council and the RTA. The Code shall include, but not necessarily be limited to:
- i. restrictions to routes (consistent with the Transport Management Plan required under g) above, where relevant);
 - ii. speed limits to be observed within certain periods along routes to and from the site;
 - iii. restrictions to the hours of transport operations under this consent;
 - iv. minimum requirements for vehicle maintenance to address noise and exhaust emissions;
 - v. behavioural requirements for drivers; and
 - vi. load coverage requirements.
- i) A **Flora and Fauna Management Plan** to detail measures to minimise impacts on flora and fauna, particularly populations of threatened plants, on the site during the operation of the development. The Plan shall be developed in consultation with NPWS and Council and include:
- i. details of the creation, landscaping and management of on-site vegetation to provide habitat for fauna species likely to occur on the site;
 - ii. details of strategic vegetation management, outlining timeframes for clearing and re-vegetation activities and a map illustrating the Plan. The

Plan should aim to maximise scope for new vegetation to establish and restore ecological integrity;

- iii. details of the schedule for clearing activities incorporating seasonal habitat requirements for species such as bats and other mammals, with the objective of avoiding incidents during sensitive hibernation and breeding periods.
 - iv. details of pre-clearance inspections, including the identification and inspection of trees containing tree hollows, including stags, prior to clearing of any vegetation;
 - v. details of how micro habitats including dead trees, stags, stumps and hollow branches will, where practical, be salvaged and relocated to areas depauperate of tree hollow habitat and in the recreation of habitat areas;
 - vi. details of measures to care for any animals injured or found during clearing activities, including the use of WIRES to attend to fauna as necessary, and the methods for their relocation if appropriate. This shall include measures for harbouring and releasing nocturnal animals at night;
 - vii. measures to re-instate or relocate plants and vegetation communities and to use local endemic species and local provenance seed for revegetation;
 - viii. details of the methods for strategically placing felled trees between cleared and remnant bushland to provide runways of ground cover for dispersion of animals;
 - ix. strategies for the establishment of wildlife corridor links to adjoining habitat areas and integration of rehabilitation works with nearby mines;
 - x. details of strategies for the exclusion of grazing stock on areas of native bushland reconstruction;
 - xi. measures to monitor the success of revegetated areas, including revegetation in the threatened species conservation area, and plant additional species where necessary;
 - xii. consideration of Aboriginal heritage management to ensure that activities under the Plan do not impact on Aboriginal heritage values; and,
 - xiii. details of the flora and fauna monitoring required under this consent.
- j) A **Waste Management Plan** to outline measures to minimise the production and impact of waste produced at the development during operation, through the implementation of waste reduction, reuse and recycling principles. The Plan shall meet the requirements of the **DECC** and Council. The Plan shall include, but not necessarily be limited to:
- i. identification of the types and quantities of waste materials produced on the site during operation of the development;
 - ii. programs aimed at minimising the production of waste at the site through the implementation of operational and management measures;
 - iii. details of potential reuse and recycling avenues for waste materials produced on the site, including collection and handling procedures;
 - iv. details of appropriate disposal routes in the event that reuse and recycling avenues are not available or are not practicable; and
 - v. programs for involving and encouraging employees and contractors to minimise domestic waste production on the site and reuse/recycle where appropriate.

7. ENVIRONMENTAL REPORTING

Incident Reporting

- 7.1 The Applicant shall notify the **DECC** and the Director-General of any incident with the potential for adverse off-site impacts on people or the environment as soon as practicable after the occurrence of the incident. The Applicant shall provide written details of the incident to the **DECC** and the Director-General within seven days of the date on which the incident occurred.

Annual Performance Reporting

7.2 The Applicant shall, throughout the life of the development, prepare and submit for the approval of the Director-General, an Annual Environmental Management Report (AEMR). The AEMR shall be prepared by an independent, qualified person(s), approved by the Director-General. The AEMR shall also serve as the Environmental Management Plan required under condition 6.1 of the existing consent. Requirements under condition 6.1 of the existing consent shall be incorporated into the AEMR. The AEMR shall review the performance of the development against the Site Environmental Management Plan (refer to condition 6.2 of this consent), the conditions of this consent and other licences and approvals relating to the development. The AEMR shall include, but not necessarily be limited to:

- a) Details of compliance with the conditions of this consent;
- b) A copy of the Complaints Register (refer to condition 5.2 of this consent) for the preceding twelve-month period (exclusive of personal details), and details of how these complaints were addressed and resolved;
- c) A comparison of the environmental impacts and performance of the development against the environmental impacts and performance predicted in the EIS **and the SEE for DA 250-09-01 Mod 2**.
- d) Results of all environmental monitoring required under this consent and other approvals, including interpretations and discussion by a suitably qualified person;
- e) A list of all occasions in the preceding twelve-month period when environmental performance goals for the development have not been achieved, indicating the reason for failure to meet the goals and the action taken to prevent recurrence of that type of incident;
- f) Evaluation of the effectiveness of the environmental protection requirements and procedures in the SEMP and this consent;
- g) Identification of trends in monitoring data over the life of the development to date;
- h) Evaluation of the development against the principles of Ecologically Sustainable Development;
- i) A list of variations obtained to approvals applicable to the development and to the site during the preceding twelve-month period;
- j) Environmental management targets and strategies for the following twelve-month period, taking into account identified trends in monitoring results; and,
- k) Identify any modifications required to the SEMP.

The Applicant shall submit a copy of the AEMR to the Director-General, the **DECC**, the RTA, Council every year, with the first AEMR to be submitted no later than twelve months after the commencement of operation of this consent. The Applicant shall make the AEMR available for public inspection on request.

Attachment 3



ABN 33 537 762 019

METROPOLITAN OFFICE
Level 12, 10 Valentine Avenue
PARRAMATTA NSW 2150

ERM Australia
PO Box 71
THORNTON NSW 2322

P O Box 3935
PARRAMATTA NSW 2124

Telephone: (02) 8836 5300
Fax: (02) 8836 5365

Our Ref: MN99H249

Attention: Jacinta Coulin

16 February 2010

**PROPOSED DEVELOPMENT ON CROWN LAND – CONSENT OF THE LAND AND
PROPERTY MANAGEMENT AUTHORITY TO THE LODGEMENT OF A SECTION 75W
APPLICATION UNDER THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT
1979 FOR THE MODIFICATION OF MINISTERS APPROVAL TO AN APPROVED
DEVELOPMENT**

Property Details: Subterranean Crown land, 15.24 metres below natural surface of
freehold land identified as Lot 196 in DP 752025.

Description of Proposed Development:

- a. Extraction of materials (sand & sandstone)
below 15.24 metres of natural surface level to
a limit 2 metres above the highest recorded
ground water level;

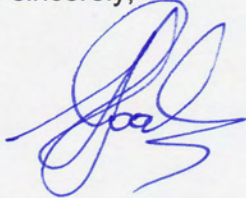
Upon investigation of your application, Owner's Consent is hereby provided to the lodgement of a Section 75W application with the consent authority for the proposed development described above. This letter forms part of the Owner's Consent and must be submitted to the consent authority.

This consent to lodge this development application is given on the understanding that:

1. The Development Application must be lodged within a period of **six (6) months** from the date of this letter;
2. It does not imply or presume the Minister for Lands' approval or support to the proposal, only the Minister's concurrence for the proposed development application to be fully considered through public planning procedures of the Environmental Planning and Assessment Act 1979;

3. Irrespective of any Development Consent given by the consent authority, **no development work shall commence on the Crown land** until a copy of the final Notice of Determination of the Section 75W application is submitted to this Office;
4. Any changes to the proposed development which may be required after the issue of this Owners Consent to lodge the application will need to be re-considered on merit and will require the payment of additional fees.

Yours sincerely,



Stephen Cook
For Program Manager, Commercial
Land and Property Management Authority
Crown Lands Division
Sydney Region

Attachment 4



Planning

Mining & Industry Projects

Contact: Kane Winwood

Phone: (02) 9228 6298

Fax: (02) 9228 6466

Email: kane.winwood@planning.nsw.gov.au

Mr David Dixon
Dixon Sands Pty Ltd
PO Box 234
KEMPS CREEK NSW 2178

Dear Mr Dixon

**Dixon Sands Quarry, Old Northern Road, Maroota (DA 250-09-01)
S75W Modification – Director-General's Requirements**

I refer to your request to modify the Minister's consent for the above development (DA 250-09-01), under Section 75W of the *Environmental Planning & Assessment Act 1979*.

I have attached a copy of the Director-General's requirements for the modification. These requirements have been prepared based on the information your company has provided to date.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your Environmental Assessment for the proposed modification. This will enable the Department to:

- confirm the applicable fee (see Division 1A, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- determine the number of copies (hard-copy or CD-ROM) of the Environmental Assessment that will be required for consultation purposes.

These requirements will be placed on the Department's website along with other relevant information which becomes available during the assessment of the proposed modification. As a result, I would appreciate it if you would ensure that any subsequent documents submitted to the Department are in a suitable format for the web.

If you have any enquiries about these requirements, please contact Kane Winwood.

Yours sincerely

David Kitto 27/4/10

David Kitto
Director
Mining & Industry Projects
As delegate for the Director-General

Director-General's Requirements

Section 75W of the Environmental Planning and Assessment Act 1979

Application Number	DA 250-09-01 Mod 3
Modification	The proposed modification involves - extracting construction sand from Lot 196 DP 752025 to a depth not exceeding 2 metres above the highest recorded wet weather groundwater level; and - rehabilitating the site.
Location	Old Northern Road, Maroota
Proponent	Dixon Sand (Penrith) Pty Ltd
Date of Issue	27 April 2010
General Requirements	The Environmental Assessment of the modification must include: - a summary of the existing and approved operations, including any relevant statutory approvals, and the existing environmental management and monitoring regime at the quarry; - a detailed description and justification of the proposed modification; - a risk assessment of the potential environmental impacts of the modification, identifying the key issues for further assessment; - a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: - a description of the existing environment; - an assessment of the potential impacts of the proposed modification, including any cumulative impacts, taking into consideration any relevant policies, guidelines, plans and statutory provisions (see below); and - a description of the measures that would be implemented to avoid, minimise, mitigate and (if necessary) offset the potential impacts of the proposed modification; - a statement of commitments, outlining all the proposed environmental management and monitoring measures; - a conclusion justifying the modification on economic, social and environmental grounds, taking into consideration whether the modification is consistent with the objects of the <i>Environmental Planning & Assessment Act 1979</i>; and - a signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.
Key Issues	Soil & Water – including a detailed assessment (including modelling) of the potential groundwater impacts of the proposal, with explicit consideration of the modification against the relevant findings of the Maroota Groundwater Study; Noise; Transport; Air Quality; Biodiversity; Heritage – including Aboriginal and non-Aboriginal heritage; Waste; Quarry Closure and Rehabilitation – including: - a detailed description of the proposed measures that would be undertaken during closure of the Old Northern Road Quarry; - a detailed revision of the quarry rehabilitation strategy, including justification for the proposed final land form and consideration of the objectives of any relevant strategic land use objectives; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy; and Social & Economic.

References	The environmental assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this modification.
Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups or affected landowners. In particular you should consult with the: • Department of Environment, Climate Change and Water; • NSW Office of Water; • Department of Industry and Investment; • Roads and Traffic Authority; and • Hills Shire Council. The consultation process, and the issues raised during this process, must be described in the Environmental Assessment.

Policies, Guidelines & Plans

Area	Policies, Guidelines & Plans
Risk	AS/NZS 4360:2004 Risk Management (Standards Australia) HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia) Risk Management Handbook for the Mining Industry (DPI) Risk Management Policy Framework for Dam Safety (Dam Safety Committee)
Soil and Water	
<i>Surface Water</i>	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ) National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ) National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC) National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC) Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC) State Water Management Outcomes Plan NSW Government Water Quality and River Flow Environmental Objectives (DECC) Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC) Managing Urban Stormwater: Soils & Construction (Landcom) Managing Urban Stormwater Volume 2E: Mines and Quarries (DECC) Managing Urban Stormwater: Treatment Techniques (DECC) Managing Urban Stormwater: Source Control (DECC) Floodplain Management Manual (DNR) Floodplain Risk Management Guideline (DECC) A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
<i>Groundwater</i>	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC) NSW State Groundwater Policy Framework Document (DLWC) NSW State Groundwater Quality Protection Policy (DLWC) NSW State Groundwater Quantity Management Policy (DLWC) Draft Draft Guidelines for the Assessment & Management of Groundwater Contamination (DECC)
Noise	
	NSW Industrial Noise Policy (DECC) Environmental Criteria for Road Traffic Noise (NSW EPA) Draft NSW Construction Noise Guideline (DECC)
Transport	
	Guide to Traffic Generating Development (RTA) Road Design Guide (RTA)
Air Quality	
	Protection of the Environment Operations (Clean Air) Regulation 2002 Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC) Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)

Biodiversity	
	Draft Guidelines for Threatened Species Assessment under Part 3A of the <i>Environmental Planning and Assessment Act 1979</i> (DEC)
	NSW Groundwater Dependent Ecosystem Policy (DLWC)
	Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)
	Policy & Guidelines - Fish Friendly Waterway Crossings (NSW Fisheries)
	State Environmental Planning Policy No. 44 – Koala Habitat Protection
Heritage	
<i>Aboriginal</i>	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC)
	NSW Heritage Manual (NSW Heritage Office & DUAP)
<i>Non- Aboriginal</i>	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Waste	
	Waste Classification Guidelines (DECC)
Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)
	Strategic Framework for Mine Closure (ANZMEC/MCA)
Social & Economic	
	Draft Economic Evaluation in Environmental Impact Assessment (DOP)
	Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)

Attachment 5

Our Reference:
Your Reference:
Contact:
Telephone

CAC 10M937 – SYD10_00405
B1929
Andrew Popoff
8849 2180



Principal
Nexus – Environmental Planning Pty Ltd
P.O. Box 212
CONCORD NSW 2137

Attention: Neil Kennan

**MODIFICATION OF DEVELOPMENT CONSENT FOR EXTRACTIVE INDUSTRY AT LOTS 1 & 2
DP 547255, OLD NORTHERN ROAD, MAROOTA**

Dear Sir/Madam,

I refer to your letter dated 14 May 2010 (Ref: DA-250-09-01) with regard to the above-mentioned development, which was referred to the Roads and Traffic Authority (RTA) for comment regarding any requirements for the Environmental Assessment.

The RTA has reviewed the submitted information and provides the following advisory comments for consideration in the Environmental Assessment:

1. The subject property is affected by a road proposal, in the manner illustrated by pink colour on the attached plan.

However, the RTA would raise no objections to the application on property grounds provided that any new buildings or structures are erected clear of the land required for road.
2. Daily and peak traffic movements likely to be generated by the proposed development including the impact on nearby intersections and the need / associated funding for upgrading or road improvement works (if required).
3. Details of any restrictions to the time of day / number of vehicle movements.
4. Provision of information detailing how truck movements will be mitigated during morning and afternoon school hours along Old Northern Road near the site.
5. Provision of information detailing how the Old Northern Road pavement in the vicinity of the site's intersection will be regularly maintained by the applicant and kept free of sand, clay and soil.
6. Provision of information detailing how traffic noise will be minimised.
7. Provision of information relating to the payment of contributions to Council in accordance with The Hills Shire Council's – Contributions Plan No 6 – Extractive Industries.

Roads and Traffic Authority

27-31 Argyle Street Parramatta NSW 2150
PO Box 973 Parramatta CBD NSW 2150 DX28555 Parramatta
www.rta.nsw.gov.au | 13 17 82

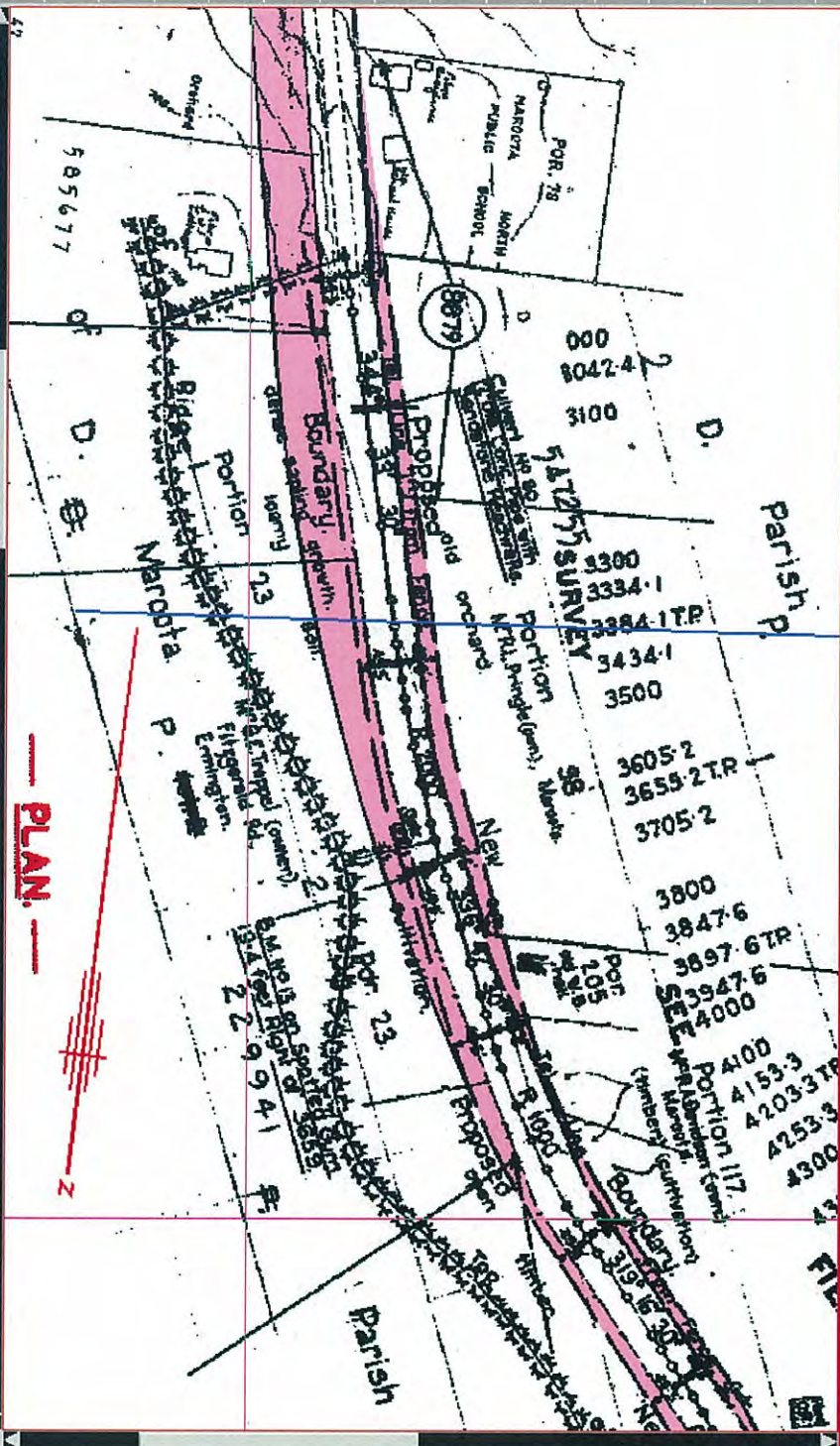
Any inquiries in relation to this matter can be directed to the undersigned on telephone 8849 2180 or facsimile 8849 2918.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'A. Popoff', with a stylized flourish at the end.

Andrew Popoff
A / Senior Land Use Planner
Transport Planning, Sydney Region

24 June 2010



Our reference : DOC10/21828
Contact : David Gathercole (02) 9995 6823;

Mr Neil Kennan
Principal
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

Dear Mr Kennan

Proposed Modification of Development Consent No.250-09-01
Dixon Sand (Penrith) Pty Ltd – Old Northern Rd, Maroota

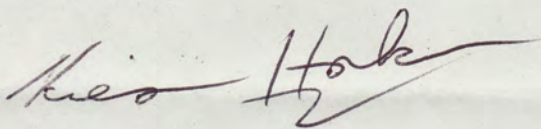
I refer to your correspondence received by the Department of Environment, Climate Change and Water ("DECCW") on 19 May 2010 seeking requirements for the preparation of an Environmental Assessment ("EA") for the proposed modification of Development Consent No.250-09-01.

DECCW understands that the Department of Planning ("DoP") issued the Director General's Requirements ("DGRs") for the modification on 27 April 2010. We have no additional requirements to those already issued in the DGRs.

Should DoP consult us regarding the EA then DECCW will review the report and refer comments directly to DoP.

If you require further information, please contact Mr David Gathercole on Ph 9995 6823.

Yours sincerely



27 May 2010

KIERAN HORKAN
Head Sydney Industry Unit
Environment Protection and Regulation Group

c.c David Kitto, Director Mining & Industry Projects, Department of Planning, GPO Box 39, Sydney NSW 2001





Industry & Investment

Our ref: L92/0339

2nd June 2010

Mr Neil Kennan
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

Dear Mr Kennan,

Re: Modification of development Consent 250-09-01, Lots 1 & 2 DP 547255, Old Northern Road, Maroota

I refer to your letter of 14 May 2010 concerning requirements for the Environmental Assessment to be prepared for the above proposal. This is a coordinated response from the Mineral Resources, Fisheries and Agriculture branches of Industry & Investment NSW (I & I NSW).

Details should be provided in the EA of the additional resources that will be extracted on Lot 196 if extraction to 2 metres above the groundwater table is approved.

I&I has no other additional requirements for the EA.

Yours sincerely

Iain Paterson

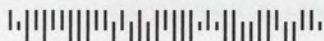
Chief Geoscientist, Land Use

THE HILLS SHIRE COUNCIL

129 Showground Road, Castle Hill NSW 2154
PO Box 75, Castle Hill NSW 1765

Telephone 02 9843 0555 **Email** council@thehills.nsw.gov.au
Facsimile 02 9843 0409 **www.thehills.nsw.gov.au**
DX 8455 Castle Hill ABN No. 25 034 494 656

06 July 2010



Mr Neil Kennan
Nexus Environmental Planning Pty Ltd
PO Box 212
CONCORD NSW 2137

Your Ref: 250-09-01
Our Ref: 796/00/HE

Dear Mr Kennan

**Proposed Section 75W Modification of Minister's Approval for Development
Application 250-09-01
Lots 1 and 2 DP 547255 and Lots 29 and 196 DP 752025, Old Northern Road,
Maroota**

I refer to your letter dated 14 May 2010 in relation to a proposed Section 75W Modification of Minister's Approval application to be lodged with the Department of Planning in respect to:

- (i) the amendment of Development Consent 250-09-01 (Land and Environment Consent Court Orders 10206 of 2003) to include Lots 29 and 196 DP 752025; and
- (ii) surrender Development Consent 796/2000/HE (Land and Environment Consent Court Orders 10273 of 2000).

In your letter you request comments from Council staff in respect to the submission of an Environmental Assessment in relation to the proposed modification. It is noted that the information provided to Council staff included only a cover letter, copy of the Land and Environment Consent Court Orders 10273 of 2000, copy of the Land and Environment Consent Court Orders 10206 of 2003 and Department of Planning Director -General Requirements.

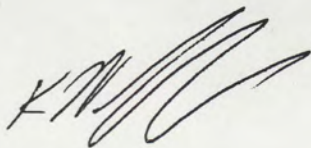
The following comments are provided for your inclusion in the Environmental Assessment (EA).

1. The submission of full details describing the proposal. In this respect it is assumed that the proposed modification will be, in effect, the same development approved under Land and Environment Consent Court Orders 10273 of 2000 with the exception of the depth of extraction on Lot 196.
2. The submission of full details in the EA confirming the proposal's relationship with the existing extractive industry operations upon the site

3. The preparation of a comprehensive review of the proposal in terms of impact upon the local groundwater resources having regard to the findings of the Maroota Groundwater Study. This will require consultation with the NSW Office of Water. The submission must confirm that the extractive industry operation will be restricted in depth to ensure a 2 metre freeboard above the high (wet weather) groundwater level, at any part of the site.
4. The submission of plans and supporting written evidence showing the proposed final landform configuration and end use of land. Specific details are to be provided regarding rehabilitation and landscape works upon cessation of extractive operations on the site.
5. The submission of a comprehensive staging plan and an associated rehabilitation staging program, if staging is proposed.
6. The submission of full details regarding the proposal's compliance with the requirements of Council's Development Control Plan Part D Section 6 - Extractive Industries and the provisions of Sydney Regional Environmental Plan No. 9 - Extractive Industry (Amendment No. 2), Sydney Regional Environmental Plan No. 20 - Hawkesbury - Nepean River & Baulkham Hills Local Environmental Plan 2005 and other relevant legislation, including the Section 91 "Integrated Development" provisions of the NSW EP & A Act, 1979 if relevant.
7. The EA 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.
8. The submission of a detailed traffic impact assessment report addressing the maximum number of truck movements associated with the operation.

I trust the above satisfies your enquiry. Should you have any further questions please contact me on 9843 0319.

Yours faithfully



Kristine McKenzie
PRINCIPAL EXECUTIVE PLANNER

CC: Mr Kane Winwood, Department of Planning, GPO Box 39, Sydney NSW 2001

Mr David Dixon, Dixon Sand, PO Box 148, Penrith NSW 2751

Attachment 6



Nexus Environmental Planning
Preliminary Assessment of
Potential Impacts to
Groundwater of Proposed
Extension of Dixon Sand
Operations, Lot 196 DP
752025, Maroota NSW



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Maroota NSW

17 June 2010

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Contents

1	Introduction	1
1.1	Background	1
1.2	Objective	2
1.3	Scope of Work.....	2
1.4	Information and Documents Reviewed	3
2	Site Condition and Surrounding Environment	5
2.1	Site Identification	5
2.2	Current Site Condition	5
2.3	Surrounding Land Use.....	6
2.4	Climate.....	6
2.5	Topography	7
2.6	Geology.....	8
2.7	Hydrogeology	8
2.7.1	Shallow Aquifer	9
2.7.2	Deep Aquifer	9
2.7.3	Site-specific Groundwater Conditions.....	10
2.8	Potential Sensitive Receptors.....	17
2.8.1	Local Groundwater Users.....	17
2.8.2	Groundwater Dependent Ecosystems	18
3	Conceptual Site Model.....	19
3.1	Site Conditions	19
3.2	Proposed Extension to Extraction Depths on Lot 196.....	21
4	Potential Impacts to Groundwater	23
5	Limitations	25
6	References.....	26

List of Figures

Figure Section

Figure F1: Site Location

Figure F2: Site Layout

List of Tables

Body Report

Table 1: Monitoring Well Elevations.....	14
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Tables Section

Table T1: Summary of Groundwater Elevation Results

Table T2: Groundwater Quality 2001 v 2008

List of Plates

Plates Section

Plate P1: Lot 196 Extraction area looking approximately north

Plate P2: Lot 196 looking north along eastern boundary

List of Appendices

Appendix A – Rainfall Data

Document History and Status

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1 Introduction

E3 Consulting Australia Pty Ltd (E3) have been commissioned by Nexus Environmental Planning (Nexus) on behalf of Dixon Sand (Penrith) Pty Limited (Dixon Sand), to undertake a review of existing information and documentation and provide a preliminary assessment on the potential impacts to groundwater associated with the proposed extension of the extraction operations currently conducted on Lot 196 DP 752025 of the Dixon Sands Quarry site located on Old Northern Road, Maroota NSW.

The Dixon Sands Quarry site comprises four separate parcels of land identified as Lots 1 and 2 DP 547255 and Lot 29 and Lot 196 DP 752025. In this document, Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255 will be collectively referred to as 'the Site' and each parcel of land will be referred to by its Lot number i.e. Lot 196 DP 752025 will be referred to as 'Lot 196'. The location of the Site is presented on Figure F1 and the layout of the Site and the location of each Lot is presented on Figure F2.

1.1 Background

E3 understand that sand extraction on Lots 29 and 196 commenced in the 1980s and that Dixon Sand took over an existing approved extraction operation on Lot 196 and commenced extraction operations under a development consent issued in November 1993.

In 2000, Development Consent No. 796/00/HE was issued by the Land and Environment Court of NSW that allowed for continued operations including extraction on Lots 29 and 196 to a depth of 15.24 metres below the original natural surface (m BNS). It is understood that the limit on the depth of extraction of 15.24 m BNS was in place as the resource present at depths below this was owned by the Crown as per the title. This Development Consent lapsed on 22 March 2010.

In 2004, Development Consent No. 250-09-01 was issued by the Land and Environment Court of NSW that allowed for operation of extractive industry, water management and rehabilitation on Lots 1 and 2 and the continued use of the existing control processing plant on Lot 196. This approval for extraction on Lot 1 and Lot 2 is applicable until 24 May 2022.

Given the lapse in the Development Consent DQ 796/00/HE on Lot 29 and Lot 196, Dixon Sand applied to the NSW Department of Planning (the NSW DoP), to modify Development Consent No 250-09-01 to include extraction and other associated activities on Lots 29 and 196. In addition, Dixon Sand also applied to

extend the depth of extraction on Lot 196 from 15.24 m BNS to two-metres above the groundwater table.

The proposed modifications to Development Consent No 250-09-01, being *“extracting construction sand from Lot 196 DP752025 to a depth not exceeding 2 metres above the highest recorded wet weather groundwater level; and rehabilitating the site”*, are currently being assessed by the NSW DoP under Section 75W of the *Environmental Planning and Assessment Act 1979* which requires the preparation of an Environmental Assessment on the potential economic, social and environmental impacts of the proposed modifications. The Director General Requirements (DGRs) for the Environmental Assessment have been issued to Dixon Sand. A specific DGR for the Environmental Assessment is that a detailed assessment be undertaken of the potential groundwater impacts of the proposed increase to the depth of extraction on Lot 196.

E3 understand that the proposed expansion of extraction activities are to increase vertical extraction depths in the north-western area of Lot 196 only and that no lateral expansion of the current areas subject to extraction on the Site is proposed.

This report presents a preliminary assessment of the conditions on the Site and within the local region and the potential impacts to groundwater of the proposed increase to the depth of extraction on Lot 196.

1.2 Objective

The objective of this preliminary assessment is to establish a conceptual model of the Site and of Lot 196 and to provide an outline of the potential impacts to groundwater of the proposed increase in the depth of the extraction operations on Lot 196.

The results of this assessment will be based on the outcomes of a review of information and documentation, provided to E3 by Nexus and Dixon Sand, that relates to the nature of the groundwater aquifers present beneath the Site and the extraction activities proposed for Lot 196.

1.3 Scope of Work

To achieve the objective of the preliminary assessment the scope of work undertaken was as follows:

- Conduct a site inspection and walkover;

- Review of information and documents provided by Nexus and Dixon Sand with reference to the location of Lot 196 and the proposed increase to the extraction depths on Lot 196;
- Update the conceptual model for Lot 196 that was developed during previous assessments;
- Assess for potential interactions and impacts to identified groundwater aquifers present of the proposed increase to the extraction depths on Lot 196; and
- Preparation of this report in accordance with the relevant requirements of the guidelines endorsed by NSW Department of Environment, Climate Change & Water (NSW DECCW).

1.4 Information and Documents Reviewed

Nexus and Dixon Sand provided the following information and documents to E3 for review:

- *Appendix C5 of EIS Construction Sands Quarry in North Maroota Operation NSW - Groundwater Impact Assessment Lots 196 and 29, North Maroota*; Lyall & Macoun Consulting Engineers; February 1999
- *Maroota Groundwater Study Technical Status Report*; Department of Land and Water Conservation (DLWC) July 2001 (herein referred to as the 'Maroota Groundwater Study');
- *Proposed Extension of Sand Operations, Lots 1 and 2 DP 547255, Old Northern Road, Maroota, Environmental Impact Statement*; Report No 500141EIS, Environmental Resources Management Australia Pty Ltd (ERM), August 2001 – Part of Section 4 provided only;
- *Department of Land & Water Conservation Form A Bore Licence No. 10BL159036 and attached plan and Form A Bore Licence No. 10BL159037 and attached plan*, prepared by Intertech Drillers for Dixon Sands for two production bores installed on Lot 196 dated 24 February 2003;
- *Dixon Sand Maroota Quarry Annual Environmental Management Report, 7 July 2003 to 6 July 2004*; ERM; October 2004;
- *Dixon Sand Maroota Quarry Lots 1, 2, 29 & 196, 4610 Old Northern Road, Site Environmental Management Plan Dixon Sand (Penrith) Pty Ltd* ERM, January 2005 (herein referred to as the 'SEMP');
- *Sand Quarry Old Northern Road, Maroota, Annual Environmental Management Report, 7 July 2004 to 6 July 2005*; ERM, October 2005;
- *Dixon Sand Quarry on Lots 29, 196 1 & 2, 4610 Old Northern Road, Maroota, Annual Environmental Management Report*; ERM, September 2006;

- *Dixon Sand Quarries on Old Northern Road & Haerses Road, Maroota, Annual Environmental Management Report; ERM January 2008;*
- *Dixon Sand Quarries on Old Northern Road & Haerses Road, Maroota, Annual Environmental Management Report 2007/08; ERM, July 2009; and*
- *Environmental Assessment Proposed modifications to Dixon Sand Maroota Quarry, Old Northern Road, Maroota, ERM, February 2010*

2 Site Condition and Surrounding Environment

2.1 Site Identification

The Site is located across four portions of land identified as Lot 1 and Lot 2 DP 547255 and Lot 29 and Lot 196 DP 752025 at 4610 Old Northern Road, Maroota. The Site is located in the Hills Shire Council area. The location of the Site is presented on Figure F1.

Lot 196 is located in the western portion of the Site and is square in shape. Lot 29 is a smaller “L” shaped parcel of land that is located to the south-west of Lot 196. Lots 1 and 2 are rectangular in shape and are located between Lot 29 and Old Northern Road. The layout of each Lot is presented on Figure F2.

E3 understands that Lot 196 has an area of approximately 28 ha, however, the area of Lot 29, Lot 1 or Lot 2 has not been provided to E3.

2.2 Current Site Condition

An inspection of the Site was conducted by Paul McCabe, E3 Principal Environmental Scientist on the 8th March 2010. The observations made during the inspection were as follows:

- The majority of the northern, central and eastern parts of Lots 29 and 196 is being used for extraction operations and appears to have been extensively excavated;
- Lot 196 contains an office and workshop area, weighbridge, sand processing plant, access roads, a series of cut slopes, ponds and platforms (Plate P1 and Plate P2);
- The south-western portion of Lot 196 is located within a gully that is covered by native stands of vegetation that appeared to be undisturbed;
- Large cleared but grassed areas are present across Lots 1 and 2 and a small dam is located on Lot 1 and two dams are located on Lot 2;
- Access to Lot 196 is via a road that runs from Old Northern Road to the north-eastern corner of Lot 196; and
- A number of minor access roads were noted to be present through Lots 1 and 2 and that these Lots could be accessed via Old Northern Road.

E3 understands the extraction activities conducted on Lot 196 to date have removed the majority of the original ridge-top landforms. The sand processing plant located on Lot 196 uses and recycles water sourced from the various dams

on Lot 196 and Dixon Sand have indicated that groundwater from the underlying aquifers is not used on the Site.

The current operations on the Site, including the management of surface water and the monitoring of groundwater, are understood to be undertaken in accordance with the Site Environment Management Plan (SEMP) that was developed by ERM in 2005 (ERM, 2005a).

2.3 Surrounding Land Use

The Site is surrounded by the following land use:

- North of Lot 1, Lot 29 and to the east of Lot 196 is a parcel of land of which two-thirds appears to be used for market gardening or other agricultural purposes. Large fields are present in the northern half and a large dam is present in the south-west corner of this parcel of land adjacent to the eastern boundary of Lot 196 and northern boundary of Lot 29. The remaining third of the land adjacent to the northern boundary of Lot 1 appears to be occupied by natural bushland;
- North of Lot 196 a large area of cleared land is present which appears to be part of a quarrying operation (PF Formation). This cleared area is surrounded by native bushland and native bushland directly surrounds the north-western boundary of Lot 196;
- East of Lots 1 and 2 is Old Northern Road and then some residential properties and market gardens or other agricultural land. To the east of Lot 2, a small parcel of land, located between the eastern boundary of Lot 2 and Old Northern Road, is occupied by Maroota Primary School;
- South of Lot 29 and Lots 1 and 2 large areas of cleared land are present which appear to be part of a quarrying operation (PF Formation). These cleared areas are surrounded by native bushland; and
- South and west of Lot 196 is native bushland.

2.4 Climate

The climate across the Maroota region is likely to be variable due to the variations in topography and the impact on both rainfall and temperature of the orographic effect as a result of the region being dominated by a series of plateaus and surrounding slopes and gullies.

The nearest weather station to the Site is located approximately 1 km to the east to south-east at Maroota on Old Telegraph Road. The second nearest weather station to the Site is located at Glenorie on Old Northern Road approximately 14 km to the south of the Site. The Bureau of Meteorology's records indicate that the

elevation of the weather station at Maroota is 203 m AHD and at Glenorie is 170 m AHD.

Rainfall records for both the Maroota and Glenorie weather station from 1902 to 2009 are patchy and of the last ten years, annual rainfall averages are provided for Maroota for 2009 only and for Glenorie for 2002, 2003, 2007, 2008 and 2009 only. A record of the rainfall data for both weather stations is provided as Appendix A.

As part of the requirements of the SEMP on the Site, ERM have recorded monthly temperature, rainfall and other climatic data from a weather station located in the eastern part of Lot 2, proximal to the boundary of Lot 2 with the school. The results of the climatic monitoring have been presented by ERM in the Annual Environmental Management Reports. E3 were provided with the annual reports dated 2004, 2005, 2006, 2008 and 2009. The available rainfall data from these reports has been presented in Table T1.

Given the lack of data from the weather station at Maroota and the patchiness of the data from the weather station at Glenorie it is not possible to compare the rainfall data recorded by ERM on Lot 2 and the local rainfall data. However, it is noted that for the years in which 12 months of data was presented by ERM, the annual rainfall totals are within the same range of values reported for the past 30 years at both the Maroota and Glenorie weather stations. This may indicate that the rainfall data collected by ERM on Lot 2 may be able to be relied on as being representative for the Site. However, confirmation of this representativeness may need to be further demonstrated on receipt of the ERM data for the 12 months to December 2009 which can then be compared with the 2009 data that is presented for the Maroota weather station.

2.5 Topography

Given the extraction activities that have historically been undertaken on Lots 29 and 196 the original surface elevations of these areas of the Site are likely to have been between 5 to 15 metres higher than the current surface elevations.

E3 understand that the north-western ridges previously located on Lot 196 were between approximately 180 and 200 m AHD. The undisturbed terrain located to the north and north-west of the Site have elevations of between 160 to 220 m AHD and Lots 1 and 2 have elevations of between 180 to 220 m AHD. The south-western corner of Lot 196 and further to the south and west have the lowest elevations on the Site of between 130 to 140 m AHD (NSW Department of Lands, 2006).

Based on the elevations of the undisturbed terrain surrounding the Site it is likely that, prior to the commencement of extraction activities, the topographically highest areas of the Site were in the north-west and were part of a series of ridges that formed the buttresses from the higher plateaus located to the north-west.

It can be seen from the existing surface topography and from the surrounding terrain that the overall topography of the Site slopes down from the north and north-east toward the south to south-west. On Lot 196 the slope from north to south appears to be relatively steep towards the gully present along the southern boundary of Lot 196.

2.6 Geology

The geological setting of the Maroota region is described in detail in the Maroota Groundwater Study (DLWC, 2001). The information provided in the Maroota Groundwater Study and on the relevant geological maps of the area (Herbert, 1983) indicate that the Site is located in a region that is underlain by a sequence of Tertiary aged sands and clays that are referred to as the Maroota Sands that overlie the Triassic aged Hawkesbury Sandstone Group.

The Maroota Sand unit is understood to comprise interbedded gravels, poorly sorted fine to coarse grained sands, silts and clays, and a unit of non-water bearing unconsolidated slightly clayey sands that are referred to as the Elluvial Sand unit (DLWC, 2001).

The Hawkesbury Sandstone Group comprises a sequence of well-bedded, massive, medium-grained, quartz-rich sandstones. It is common for the shallower sandstone units to be highly weathered, particularly along jointing features and then to grade with depth to medium to higher strength sandstone, with the frequency of jointing decreasing within the deeper massive sandstone units.

2.7 Hydrogeology

The hydrogeological setting of the Maroota region is described in detail in the Maroota Groundwater Study (DLWC, 2001). The Maroota Groundwater Study referred to the groundwater present within the Maroota Sands as the 'Shallow Aquifer' and the groundwater present within the Hawkesbury Sandstone as the 'Deep Aquifer'. These terms have been applied within this report for reference to the same aquifer systems.

2.7.1 Shallow Aquifer

The groundwater within the Shallow Aquifer is present in unconfined aquifer system within the layers or lenses of quartz sands, silty clays and clayey sands and flows laterally along contacts between the layers. In addition, the interface of the Maroota Sands and the Hawkesbury Sandstone may provide significant migration pathways for groundwater present in the Shallow Aquifer.

These varying layers within the Shallow Aquifer are likely to exhibit local differences in hydraulic conductivities and chemistry, however, previous investigations indicate that in general the Shallow Aquifer is highly permeable and has a hydraulic conductivity of approximately 4 m/day (DLWC, 2001) which is typical of a sand aquifer (Fetter, 1994; Janowski and Beck, 2000).

It is expected that recharge of the Shallow Aquifer would be primarily through rainfall infiltration. The Maroota Groundwater Study indicated that approximately 10% of average annual rainfall could be applied to estimate the average infiltration and recharge rate to the Shallow Aquifer. It is noted that local variations to this infiltration rate would occur within the Maroota region due to composition of the Maroota Sands and due to other factors such as land use and vegetation cover. It would be expected in areas where large exposed surfaces are present, such as those present across areas subject to quarrying, such as the Site, in particular Lot 196, that infiltration rates would be higher.

Lyall and Macoun (1999) stated that the Shallow Aquifer was present at depths of up to 30 m BNS. The Maroota Groundwater Study reported that the range of maximum groundwater elevations recorded between 1998 and 2000 from monitoring wells installed within the Shallow Aquifer within the Maroota Region was between 180.5 and 181.7 m AHD. However, it was also noted that the adoption of a regional high groundwater level or wet weather high groundwater level for the Shallow Aquifer was not appropriate and that such levels needed to be determined on a site specific basis. Similarly, the direction of groundwater flow is variable across the region due to the variation in topography and thickness of the Maroota Sand unit.

2.7.2 Deep Aquifer

The capacity of the underlying massive units of the Hawkesbury Sandstone to contain and transmit groundwater is low, however, where jointing is well developed and bedding planes are present, the ability for groundwater to migrate through the bedrock is significantly higher. Groundwater present in the sandstone bedrock is expected to be confined to zones of relatively higher permeability within jointing, bedding planes, fractures and weathered features in the sandstone and it is likely

that groundwater would flow along both vertical and horizontal migration pathways within the sandstone.

A wide range of permeabilities of the Hawkesbury Sandstone in the Maroota region have been reported. This is likely to be primarily due to the heterogeneity of the frequency and fracturing within the sandstone bedrock and the presence of numerous water bearing zones. The Maroota Groundwater Study estimated that the horizontal hydraulic conductivity of the Deep Aquifer is 0.1 m/day and that the vertical hydraulic conductivity of the Deep Aquifer is 0.001 m/day. These values were derived from published data on sandstone aquifers and from some limited data collated from the Maroota region.

It is expected that recharge of the Deep Aquifer would be primarily through rainfall infiltration, though some interconnectivity of the Shallow Aquifer to the Deep Aquifer is also likely to contribute. The Maroota Groundwater Study indicated that approximately 5% of average annual rainfall could be applied to estimate the average infiltration and recharge rate to the Deep Aquifer. It is noted that local variations to this infiltration rate would occur within the Maroota region due to the presence and thickness of the overlying Maroota Sands and the interconnectivity of the Maroota Sands to the Hawkesbury Sandstone.

Lyll and Macoun (1999) stated that the Deep Aquifer was present at depths of between 100 to 200 m BNS. The Maroota Groundwater Study reported that the range of maximum groundwater elevations recorded between 1998 and 2000 from monitoring wells installed within the Deep Aquifer within the Maroota Region was between 162.8 and 197.1 m AHD.

The direction of groundwater flow within the Deep Aquifer is likely to be variable across the region and is likely to follow preferential pathways within the sandstone rather than being influenced by the sub-surface topography.

2.7.3 Site-specific Groundwater Conditions

The documentation provided for review indicates that a network of groundwater monitoring wells are present on the Site and are regularly monitored in accordance with the requirements of the SEMP. The results of the monitoring by ERM is presented in the ERM Annual Environmental Management Reports. E3 were provided with the annual reports dated 2004, 2005, 2006, 2008 and 2009.

Dixon Sands also provided to E3 a copy of two Department of Land & Water Conservation (DLWC) Bore Licence Forms for groundwater production bores that were installed on Lot 196 in 2003. Dixon Sands also indicated to E3 the presence of a groundwater monitoring well on Lot 196 that was installed to the east of an

existing monitoring well (MW5) in 2004. No further information on this well was provided.

A description of the production bores and groundwater monitoring wells on the Site and the condition of groundwater sampled from the wells that are part of the groundwater monitoring network is presented below.

Groundwater Production Bores

Based on the information provided, it appears that two groundwater production bores have been installed on the Site as follows:

- Bore 159036:
 - Dixon Sands provided a NSW DLWC Bore Licence Form A for a production bore installed on Lot 196 on 24 February 2003. The Bore Licence Form indicated that bore was drilled using rotary air methods and was installed to 144.5 m BNS;
 - Strata details provided on the Bore Licence Form indicated that the top 12 m was weathered sandstones which graded into more competent sandstone with depth. Some thin layers (0.3-3 m thick) of shales and clays were present at depths between 25 to 70 m BNS. Water bearing zones were encountered at 104 to 105 m BNS, at 112.5-122.8 m BNS and at 127.0-127.8 m BNS;
 - The well construction details were not clear on the Bore Licence Form and no survey data for the top of the bore was provided;
 - It does not appear that this bore was included in the network of groundwater monitoring wells regularly sampled by ERM;
- Bore 159037
 - Dixon Sands provided a NSW DLWC Bore Licence Form A for a production bore installed on Lot 196 on 24 February 2003. The Bore Licence Form indicated that bore was drilled using rotary air methods and was installed to 156.8 m BNS;
 - Strata details provided on the Bore Licence Form indicated that the top 5 m were weathered clays and shales which graded into more competent sandstone at 16 m BNS. Some thin layers (0.3-3 m thick) of shales and clays were present at depths between 19 to 32 m BNS. Water bearing zones were encountered at 32.5 to 33 m BNS, at 82.5-82.8 m BNS, 131.0-132.8 m BNS and at 152.6-153.8 m BNS;
 - The well construction details were not clear on the Bore Licence Form and no survey data for the top of the bore was provided; and
 - It does not appear that this bore was included in the network of groundwater monitoring wells regularly sampled by ERM.

In addition, Dixon Sands have provided anecdotal information that a groundwater monitoring well (referred to on Figure F2 as 2004 MW) was installed in 2004 at a location approximately 50 m to the east of MW5. No borehole log or monitoring well construction details for this well were able to be provided and it does not appear that it was subject to the regular monitoring conducted by ERM on the Site.

Current Groundwater Monitoring Network

Based on the information reviewed, it appears that five groundwater monitoring wells were installed on the Site during previous investigations as follows:

- MW1 located on southern boundary of Lot 2:
 - Reported to have been installed by ERM in 2000 (ERM, 2001);
 - Borelog was provided in ERM (2001) and indicated that the borehole was completed to a depth of 15.5 m BNS. Approximately 1 m of clayey sand was present at the top of the borehole and the remainder of borehole was fine to medium grained sandstone which required coring;
 - No monitoring well construction details were provided in ERM (2001) or in any subsequent ERM or other reports provided for review;
- MW2 located on eastern portion of Lot 1;
 - Reported to have been installed by ERM in 2000 (ERM, 2001);
 - Borelog for MW 2 provided in ERM (2001) indicated that the borehole was completed to a depth of 25.3 m BNS. Approximately 0.8 m of silty sand and clayey sand was present at the top of the borehole and the remainder of borehole was fine to medium grained sandstone which required coring;
 - No monitoring well construction details were provided in ERM (2001) or in any subsequent ERM or other reports provided for review;
- MW3 located on north boundary of Lot 1;
 - Lyall and Macoun reported that MW3 was installed by Ground Test as DS2 in 1998 (Lyall and Macoun, 1999), however, ERM stated MW3 was installed by Douglas & Partners, as DS2, in 2000 (ERM, 2001);
 - Borelog for DS2/MW3 provided in ERM (2001) indicated that the borehole was completed to a depth of 33.8 m BNS. The top 2.6 m of the borehole reported lost core and the remainder of borehole was fine to medium grained sandstone, which contained some weathered sandstone and clays at fractures in the rock. The sandstone required coring. Given that core loss was reported for the top of the borehole, it is assumed that the top 2.6 m primarily

- consisted of sandstone or weathered sandstone that required coring;
- No monitoring well construction details were provided in ERM (2001) or in any subsequent ERM or other reports provided for review;
 - MW4 located on western portion of Lot 2;
 - Lyall and Macoun reported that MW4 was installed by Ground Test as DS3 in 1998 (Lyall and Macoun, 1999), however, ERM stated MW4 was installed by Douglas & Partners, as DS3, in 2000 (ERM, 2001);
 - Borelog DS3/MW4 provided in ERM (2001) indicated that the borehole was completed to a depth of 29.5 m BNS. The top 1.2 m of the borehole reported lost core and the remainder of borehole to a depth of 27.5 m was fine to medium grained sandstone. The last 2 m was stated to be fine grained shale. The sandstone and shale both required coring. Given that core loss was reported for the top of the borehole, it is assumed that the top 1.2 m primarily consisted of sandstone or weathered sandstone that required coring;
 - No monitoring well construction details were provided in ERM (2001) or in any subsequent ERM or other reports provided for review;
 - MW5 located on the southern portion of Lot 196 on southern bank of main dam;
 - Lyall and Macoun reported that MW5 was installed by Ground Test as DS1 in 1998 (Lyall and Macoun, 1999). No reference to either MW5 or DS1 is provided in ERM (2001);
 - Earliest reference to MW5 are in documents provided in the 2003/2004 Annual Environmental Management Report (ERM, 2004) and in the SEMP (ERM, 2005a);
 - No borehole log or monitoring well construction details for MW5 were provided in any of the reports provided for review; and
 - No information could be found on the depth of MW5 in any of the reports provided for review.

Based on the borelogs that were provided in ERM (2001), it appears that at the locations drilled, the Site is underlain by a thin horizon of weathered sandstone materials which do not appear to be water bearing which overlie the Hawkesbury Sandstone bedrock. It may be that these materials are part of the Eluvial Sand unit, described in the Maroota Groundwater Study as present in limited areas directly overlying the Hawkesbury Sandstone.

Survey data for the elevations of the top of casing and surface elevations for MW1 to MW4 were presented in ERM (2001). Survey data for the elevation of the top of the casing for each of the five monitoring wells is presented in ERM's 2004/2005 Annual Environmental Management Report (ERM, 2005b). The survey data for top of casing and surface elevations is presented in Table 1 below. Also included is the depth of MW1 and MW4 as taken from the borehole logs presented in ERM (2001). No information on the depths of any of the five monitoring wells is provided in the reports reviewed, however, it has been assumed that the depth of borehole is the depth of the monitoring well installed at that location.

Table 1: Monitoring Well Elevations

Monitoring Well	Top of Casing (m AHD)	Ground surface (m AHD)	Base of Borehole (m AHD)
MW1	182.98	182.6	167.1
MW2	215.80	215.49	190.19
MW3	196.45	195.42	161.62
MW4	188.92	187.83	158.33
MW5	167.44	Not Known	Not Known

The elevations presented in Table 1 above indicate that wells MW1 to MW4 have been finished above the ground surface. Information on the construction or depth of MW5 was not provided, however, given its location on the edge of a dam, it is likely that its top of casing is also above the ground surface.

The elevations of the monitoring wells indicates that the surface topography of the Site slopes from north-east to south-west, however, the relative level of the base of the boreholes indicates that at least three of the five monitoring wells (MW1, MW3 and MW4) are likely to have been installed and potentially screened through the same parts of the Deep Aquifer of the Hawkesbury Sandstone. It appears that MW2 may screen deeper parts of the Hawkesbury Sandstone than the other monitoring wells. No information on the depth or construction of MW5 was provided.

Groundwater Monitoring Program

Based on the documentation provided it appears that a groundwater monitoring program has been conducted continually on the Site since mid 2003 in accordance with the requirements set out in the SEMP. The monitoring program set out in the SEMP and conducted on the Site is as follows:

- Groundwater levels – Measured monthly for MW1, MW2, MW3, MW4 and MW5; and

- Groundwater quality parameters – Measured six monthly for MW1, MW2, MW3 and MW4.

The results of the groundwater monitoring program for each 12 month period since mid 2003 have been reported by ERM in the ERM Annual Environmental Management Reports. E3 were provided with the annual reports dated 2004, 2005, 2006, 2008 and 2009 which together provided results from mid 2003 to mid 2009. It is noted that groundwater level data was presented in graphical form in ERM (2004), however, no tabulated data was provided. The other Annual Environmental Management reports reviewed included groundwater levels in tabulated and graphical form.

Groundwater levels for MW3, MW4 and MW5 were also measured on a number of occasions throughout the second half of 1998 as reported by Lyall and Macoun (1999).

Groundwater Elevations

The groundwater levels measured and reported by Lyall and Macoun and ERM on the Site are presented on Table T1 and have been plotted on a graph as part of Table T1 to indicate the fluctuations in the groundwater levels for each monitoring well during that period. The ground surface elevations have also been provided as a reference.

Given the absence of information on monitoring well construction or information on depth to water bearing zones on the logs, the results, as summarised in Table T1, cannot be used to determine the actual depth to the water bearing zone/s at these locations. Given that no log for MW5 was provided and that the depth of MW5 is unknown the type and nature of the aquifer intersected cannot be assessed.

Based on the potential depth of MW1, MW2, MW3, MW4 and MW5 and the groundwater levels measured, it may be likely that the water bearing zone/s intersected and screened at these locations are present in semi-confined to confined conditions. This is supported by the geological and water bearing zone information provided for the production bores installed on Lot 196 in 2003 which indicated that the water bearing zones on Lot 196 were intersected at depths greater than 30 m BNS and not at the 5 to 10 m below the top of the casing as measured at MW1, MW2, MW3, MW4 and MW5.

The results presented in the graph indicate that the groundwater level fluctuations measured in MW1, MW3 and MW4 follow similar trends. While the groundwater levels in MW4 are 5-10 m deeper than MW1 and MW3, given that these wells are all assumed to be installed to similar depths (m AHD) the presence of a similar

trend in these three wells may confirm that these wells screen a similar part of the aquifer present in the Hawkesbury Sandstone and that groundwater between these well locations is hydraulically connected.

Conversely, it appears from the graph that while minimal groundwater fluctuations appeared to have occurred in MW5 and that MW2 follows a similar overall increase in groundwater levels as those measured in MW1, MW3 and MW4, it is unlikely, due to the groundwater levels, that the groundwater present in MW2 and MW5 is hydraulically connected or is hydraulically connected to MW1, MW3 or MW4. Notwithstanding this, it is unknown how MW2 or MW5 are screened and therefore no conclusions can be drawn as to which part of the aquifer is being measured at either location.

Based on the groundwater level data it appears that groundwater flow direction across the Site is generally to the south-west with the general Site topography. However, given that it is unknown how the groundwater monitoring wells are screened and whether the aquifer measured at each location is hydraulically connected only limited reliance can be placed on this inferred groundwater flow direction.

Groundwater Quality

Groundwater quality parameters (pH, temperature, dissolved oxygen, electrical conductivity and oxidation reduction potential) have been measured at MW1, MW2, MW3 and MW4 on a six monthly basis since mid 2003. ERM (2001) also reported water quality results for the same four monitoring wells that were measured in December 2000.

For the purpose of comparison the groundwater quality parameters reported in the 2008/2009 Annual Environmental Report (ERM, 2009) have been tabulated against those reported by ERM in 2001 (ERM, 2001) 2000 by ERM in Table T2. The results indicate some slight variation in the parameters between 2001 and 2008, however, overall it is noted that the range of results are within the water quality parameters range that are typical for the Hawkesbury Sandstone as provided in the Maroota Groundwater Study.

E3 also note that no calibration records for the water quality meter used by ERM to measure the water quality parameters in any of the monitoring rounds have been included in the Annual Environmental Management Reports or the previous ERM reports on the Site. The absence of calibration records affects the reliance that can be placed on the water quality data reported by ERM, however, it is considered that it can be relied on for qualitative rather than quantitative purposes.

2.8 Potential Sensitive Receptors

The Site is located within a region that comprises national parks and bushland, extractive industry, agricultural uses and a local residential community. The surrounding native bushland and the local residential populations are potentially sensitive receptors to above ground impacts, such as noise and dust, generated from the extractive operations that are conducted on the Site. However, for the purposes of this report, it is necessary to identify potentially sensitive receptors to groundwater migrating from the Site and the primary sensitive receptors have been identified to potentially include local users of groundwater and nearby groundwater dependant ecosystems. These are described in further detail below.

2.8.1 Local Groundwater Users

ERM (2001) reported that the results of a DLWC registered groundwater bore search indicated that there were 15 registered bores within 1 km of the Site with three of those bores located within 100 m of the Site. A review of the search results indicates that the three closest registered bores to the Site have been installed within the Deep Aquifer in sandstone at depths between 30 and 150 m BNS and that of the remaining registered bores, only one located approximately 1 km to the south-east and one located 0.8 km to the north-east have been installed in the Shallow Aquifer.

In addition, based on information provided by Dixon Sand it appears that two groundwater production bores were installed on Lot 196 in 2003. Based on the Bore Licence Forms provided to E3, it appears that these production bores intersect groundwater present in the Deep Aquifer at various water bearing zones at depths greater than 30 m BNS. Dixon Sand indicated that currently no groundwater is extracted from these wells for any use on the Site and it is unknown how much water has been historically extracted.

The Maroota Groundwater Study indicated that the Shallow Aquifer is known to be used within the Maroota region as a ready and accessible supply of water for agricultural and mining purposes. However, the results of ERM (2001) indicate that in certain areas the Deep Aquifer is also used as a supply of water for irrigation purposes.

A review of the groundwater levels measured by ERM from the network of existing groundwater monitoring wells on the Site, conducted to comply with the SEMP (ERM, 2005), indicated that the groundwater flow direction may be to the south-west. The reliance that can be placed on this inferred flow direction is discussed in further detail in Section 2.7.3, however, if this flow direction is reliable, then the groundwater migrating from the Site is not migrating toward known nearby

registered groundwater bores. Consequently, local groundwater use may not be a receptor to groundwater migrating from the Site. However, no conclusions on this can be drawn until groundwater flow directions can be confirmed.

2.8.2 Groundwater Dependent Ecosystems

Information on the groundwater dependant ecosystems present within the Maroota region were provided in the Maroota Groundwater Study. The following groundwater dependant ecosystems were identified:

- Native bushland which in some areas and during dry periods is reliant on access to groundwater through root systems and to spring discharges sourced by groundwater from the Maroota Sand unit and from the Hawkesbury Sandstone;
- Low-lying creek and cave systems which require ongoing damp conditions from groundwater discharge to maintain conditions in which ferns and similar species require; and
- Wetlands and swamps systems located in lower lying areas which require a continuity of groundwater supply to maintain flora and fauna.

Whilst it is noted that the Maroota Groundwater Study indicated that the closest mapped groundwater dependent ecosystem to the Site is located approximately 500 m to the south of the Site, it is also evident that the Site, particularly Lot 196 is directly surrounded to the west, north-west and south-west by groundwater dependant ecosystems include native bushland and a creek located in the gully on the south of Lot 196.

If the groundwater flow direction across the Site is considered to be to the west to south-west then the groundwater dependant ecosystems identified above are a sensitive receptor to groundwater migrating from the Site.

3 Conceptual Site Model

The conceptual site model (CSM) has been developed to describe the conditions on the Site and on Lot 196 so as to assist in the identification and assessment of potential impacts to groundwater of the proposed extension of the extraction on Lot 196. The CSM has been developed based on the information available at the time of preparation of this report.

3.1 Site Conditions

The Site is located within a topographically high region that comprises a mixture of land uses including national parks, state forest, agriculture, residential and extraction and quarrying activities.

The Maroota region is underlain by two major geological units; the Maroota Sands and the Hawkesbury Sandstone, and by two aquifer systems; the Shallow Aquifer present in the Maroota Sands and by a Deep Aquifer present in the Hawkesbury Sandstone. The Maroota Sands are understood to be limited in extent and as such the Shallow Aquifer has a finite capacity for groundwater storage. Both the groundwater present in the Shallow Aquifer and the Deep Aquifer are beneficially used in the local region for agricultural purposes, irrigation and for quarry activities.

Based on the elevations of the undisturbed terrain surrounding the Site it is likely that, prior to extraction activities, the highest areas of the Site were in the north-west and in the north-east and were part of a series of ridges that formed buttresses from the higher plateaus located to the north-west. It can be seen from the existing surface topography and from the surrounding terrain that the overall topography of the Site slopes down from between 180- 220 m AHD the north and north-east to 140 to 160 m AHD in the south to south-west. On Lot 196 the slope from north to south appears to be relatively steep towards the gully present along the southern boundary of Lot 196. The current surface elevations on the areas subject to excavation on Lot 196 have not been provided.

Logs of drilling undertaken at four locations across Lot 1 and Lot 2 and in two locations on Lot 196, indicate that the Site is generally underlain by a shallow horizon of non-water bearing clayey sands, silts and weathered sandstone that at depths from 0.8 to 12 m BNS rapidly grades to massive sandstone. It is not clear from the logs from Lots 1 and 2 where water bearing zone/s within the sandstone were encountered and the absence of a geological log or data on the depth of the well installed on Lot 196 (MW5) makes it difficult to draw any conclusions with respect to the geology at this location or on the conditions or depth at which water bearing zone/s are present underlying Lot 196 at this location. However, the logs

for the production bores located on Lot 196 indicate that water-bearing zones were encountered at depths greater than 30 m BNS.

Based on the logs of production bores located on Lot 196 and monitoring wells located on Lots 1 and 2 it appears that the Maroota Sands unit and its Shallow Aquifer do not underlie these areas of the Site, but rather that Lot 196 and the remainder of the Site is underlain by a shallow and narrow non water bearing unconsolidated horizon of weathered clays, sandstones and shales which may be part of the Eluvial Sand unit that grades rapidly to massive sandstones of the Hawkesbury Sandstone. The Maroota Groundwater Study indicated that the Maroota Sand unit potentially only laterally extends to the very eastern parts of Lot 1 and Lot 2 and is not present underlying Lot 196.

Groundwater present in the Deep Aquifer in the Hawkesbury Sandstone underlying the Site is expected to be confined to zones of relatively higher permeability and it is likely that groundwater would flow along both vertical and horizontal migration pathways within the sandstone. The numerous water bearing zones indicated on the logs of the production bores located on Lot 196 confirms the presence of such semi-confined to confined water bearing zones within the Deep Aquifer underlying Lot 196. In addition, based on the potential depths of the wells on Lots 1 and 2 and the groundwater levels measured, it may be likely that the water bearing zone/s intersected and screened at these locations are also present in semi-confined to confined conditions.

Given the absence of information, on logs for wells located on Lots 1 and 2, on the depth at which water bearing zones were intersected, the unknown construction of the groundwater monitoring wells present and the distances between each well it is difficult to determine whether the wells and bores on the Site intersect the same water bearing zone/s. Groundwater level fluctuations measured at the four well locations on Lots 1 and 2, indicates that the groundwater at these locations may have some hydraulic connection, however, the groundwater intersected on the southern boundary of the extraction area on Lot 196 had little groundwater level fluctuation and is unlikely to be hydraulically connected to the parts of the Deep Aquifer intersected on Lots 1 and 2.

It is expected that the excavated surfaces of Lot 196 and Lot 29 would have some influence on the local recharge rates to the underlying aquifer, however, not enough information is currently available on the current surface levels, the underlying geology or on the depth to groundwater for any conclusions to be drawn on current or potential future rates of infiltration on Lot 196. Similarly, the absence of such information precludes the establishment of an inferred groundwater flow direction across the Site, however, based on current data and the local topography it appears to be flowing to the south-west.

The Maroota Groundwater Study provided estimates that the horizontal hydraulic conductivity of the Deep Aquifer is 0.1 m/day and that the vertical hydraulic conductivity of the Deep Aquifer is 0.001 m/day. These values were derived from published data on sandstone aquifers and from some limited data collated from the Maroota region. It appears that to date no hydraulic conductivity testing has been undertaken on the Site and as such no specific comments can be made on the potential rate of migration of groundwater present in the aquifer underlying the Site.

The potentially sensitive receptors to groundwater migrating from beneath the Site have been identified to include local users of groundwater and nearby groundwater dependant ecosystems. As described above, the mechanisms for the fate and transport of groundwater migrating from the Site have not been able to be well defined, however, based on an assumption that groundwater is present in the Deep Aquifer within the Hawkesbury Sandstone underlying the Site, migration pathways would be both lateral and vertical. Based on published hydraulic conductivity values and on the inferred groundwater flow direction, it is considered that groundwater present in the Deep Aquifer underlying the Site would migrate relatively slowly to the south-west and primarily affect nearby groundwater dependant ecosystems.

3.2 Proposed Extension to Extraction Depths on Lot 196

It is understood that the proposed expansion of extraction activity is to increase vertical extraction depths in the north-western area of Lot 196 *“to a depth not exceeding 2 metres above the highest recorded wet weather groundwater level”*.

It is noted that a high wet weather groundwater level on Lot 196 has not yet been established and while groundwater levels in the southern part of the extraction area on Lot 196 have been monitored for a number of years, the absence of information on the hydrogeological conditions at this location make it difficult to calculate such a level. The monitoring data indicates that groundwater levels at this location are between 4.5 to 5.5 m below the top of the well casing and are therefore perhaps 3.5 to 4.5 m BNS. However, these groundwater levels are not considered to be indicative of depth to water bearing zone/s and the geological information for areas to the west and north of this location indicates that the depth to water bearing zone/s is much greater and could be deeper than 30 m BNS. It is likely that the groundwater levels are indicative of the fact that the water bearing zone/s intersected are present in semi-confined to confined conditions.

If the Maroota Sand Unit is present underlying Lot 196, then the depths to groundwater reported by ERM may represent the depth to the water bearing zone and could be used to establish the high wet weather groundwater level and

subsequently the maximum depth of extraction. However, based on the surrounding surface topography, the geological and water bearing zone information provided on the production bore licences, the logs from Lots 1 and 2 and the information provided in the Maroota Groundwater Study, it is considered that it is more likely that Lot 196 is directly underlain by a non-water bearing shallow horizon of weathered sandstone and then the Hawkesbury Sandstone and that the water bearing zone intersected by MW5 on Lot 196 is part of a confined or semi-confined system of the Deep Aquifer and that the depths to groundwater measured in MW5 are not representative of the depth to the water bearing or saturated zone, which could be subsequently be defined as the high wet weather groundwater level. It is considered that the depth to the high wet weather groundwater level, present for the Deep Aquifer, beneath Lot 196 could be at greater than 30 m BNS.

4 Potential Impacts to Groundwater

The CSM for the Site and for Lot 196, as described in Section 3, has been developed based on available information. Given the absence of sufficient information on the geology underlying Lot 196 and the depth to the aquifer, a number of assumptions were made in the CSM in relation to the type of aquifer system that maybe present underlying Lot 196 and the Site. The CSM currently indicates that Lot 196 is not directly underlain by the Maroota Sand unit or a Shallow Aquifer, but rather is directly underlain by a narrow non-water bearing weathered sandstone profile and perhaps a non-water bearing Ellunival Sand unit that is directly underlain by the Hawkesbury Sandstone and a Deep Aquifer.

However, in identifying the potential impacts to groundwater of the proposed extension of the depth of extraction on Lot 196, a highly conservative CSM has been adopted that assumes the following:

- The Maroota Sands and the Shallow Aquifer maybe present directly underlying Lot 196 and that it overlies the Hawkesbury Sandstone and the Deep Aquifer;
- The rate of migration of groundwater present in the Shallow Aquifer is within the published values for a sand aquifer; and
- The direction of groundwater flow within the Shallow Aquifer from Lot 196 may be to either the south-west, south or south-east.

Based on the above assumptions it is considered that the potential impacts to groundwater of the proposed extension of the depth of extraction on Lot 196 are as follows:

- **Increase in recharge rates to the aquifer** - via increased infiltration of rate through the decrease in the thickness of the overlying materials and a reduction in vertical infiltration distance;
- **Change in aquifer properties** – increased recharge rates may create mounding of groundwater which may influence groundwater flow directions and pathways and rates of migration;
- **Increase in risk of change to groundwater quality** – via changes in the chemistry of water recharging to the aquifer due to the decrease in the thickness of the overlying materials and a reduction in vertical infiltration distance;
- **Increase in risk of contamination of aquifer** – from the equipment used on Lot 196, in particular the equipment used in the extraction activities. This risk is increased from the current risk of this occurring due to the

decrease in the thickness of the overlying materials and a reduction in vertical infiltration distance;

- **Increase in risk of adverse impact to potentially sensitive receptors** - from groundwater migrating from Lot 196 that has changed/been impacted. Sensitive receptors may include local users of groundwater and nearby groundwater dependant ecosystems.

It is considered that the potential impacts to groundwater provided above would apply to Lot 196 regardless of the type and nature of the aquifer that is present beneath Lot 196. However, it is also considered that the risk of these impacts to groundwater are much greater if Lot 196 is underlain by the Maroota Sands and the Shallow Aquifer, rather than if the Maroota Sands and the Shallow Aquifer are not present underlying Lot 196 and that Lot 196 is directly underlain by the Hawkesbury Sandstone and a Deep Aquifer. This is primarily due to the fact that an aquifer present in alluvial materials such as those of the Maroota Sands has a significantly higher vulnerability to impact due to its composition, properties and its shallow nature than an aquifer present at depth within a massive bedrock such as the Hawkesbury Sandstone.

The geology and the hydrogeological system underlying Lot 196 are currently not well understood and the potential impacts to groundwater of the proposed extension of the depth of extraction on Lot 196 cannot be adequately assessed until further information is available on the sub-surface conditions at Lot 196. This information could be provided by conducting well installation and monitoring works on Lot 196, particularly in areas proximal to the proposed extraction areas. It is recommended that at least one monitoring well is installed along the northern or western boundary of the proposed extraction areas where extraction activities will not extend to ensure that the well will not be destroyed during future quarrying activities. The information from the drilling of this well will be able to be used in conjunction with information from the production bore logs to determine the high wet weather groundwater level underlying Lot 196.

5 Limitations

This report has been prepared for the sole purpose of providing a preliminary assessment of impacts to groundwater of proposed extension in depth of extraction on Lot 196 DP 752025 at Maroota NSW in accordance with generally accepted consulting practice. No other warranty or guarantee, expressed or implied is made as to the advice indicated in this report.

This report should not be used for any other purpose by Nexus Environmental Planning and Dixon Sand without our prior written consent. Accordingly, neither E3 nor any member or employee of E3 accepts responsibility or liability in any way whatsoever for the use of this report for any purpose other than that for which it has been prepared.

This report should not be released to any other party, in whole or in part, without the express written consent of E3. E3 accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report by any third party.

E3 has relied upon and presumed accurate information provided by Nexus Environmental Planning, Dixon Sand and/or any third party (or absence thereof) in making the assumptions made in this report. Nothing in this report should be taken to imply that E3 has verified or audited any of the information supplied to us other than as expressly stated in this report. We have assumed this information to be both adequate and accurate for the purposes of this report.

Where findings, observations and conclusions are based solely upon information provided by Nexus Environmental Planning, Dixon Sand and/or a third party and E3 do not accept, to the maximum extent permitted by law, any liability for any losses, claims, costs, expenses, damages (whether in statute, in contract or tort for negligence or otherwise) suffered or incurred by Nexus Environmental Planning, Dixon Sand or any third party as a result of or in connection with E3's reliance on any such the information to the extent that such information is false, misleading or incomplete and E3 give no warranty or guarantee, express or implied as to such findings, observations and conclusions.

If further information becomes available, or additional assumptions need to be made, E3 reserves its right to amend any statements or opinions made in this report.

6 References

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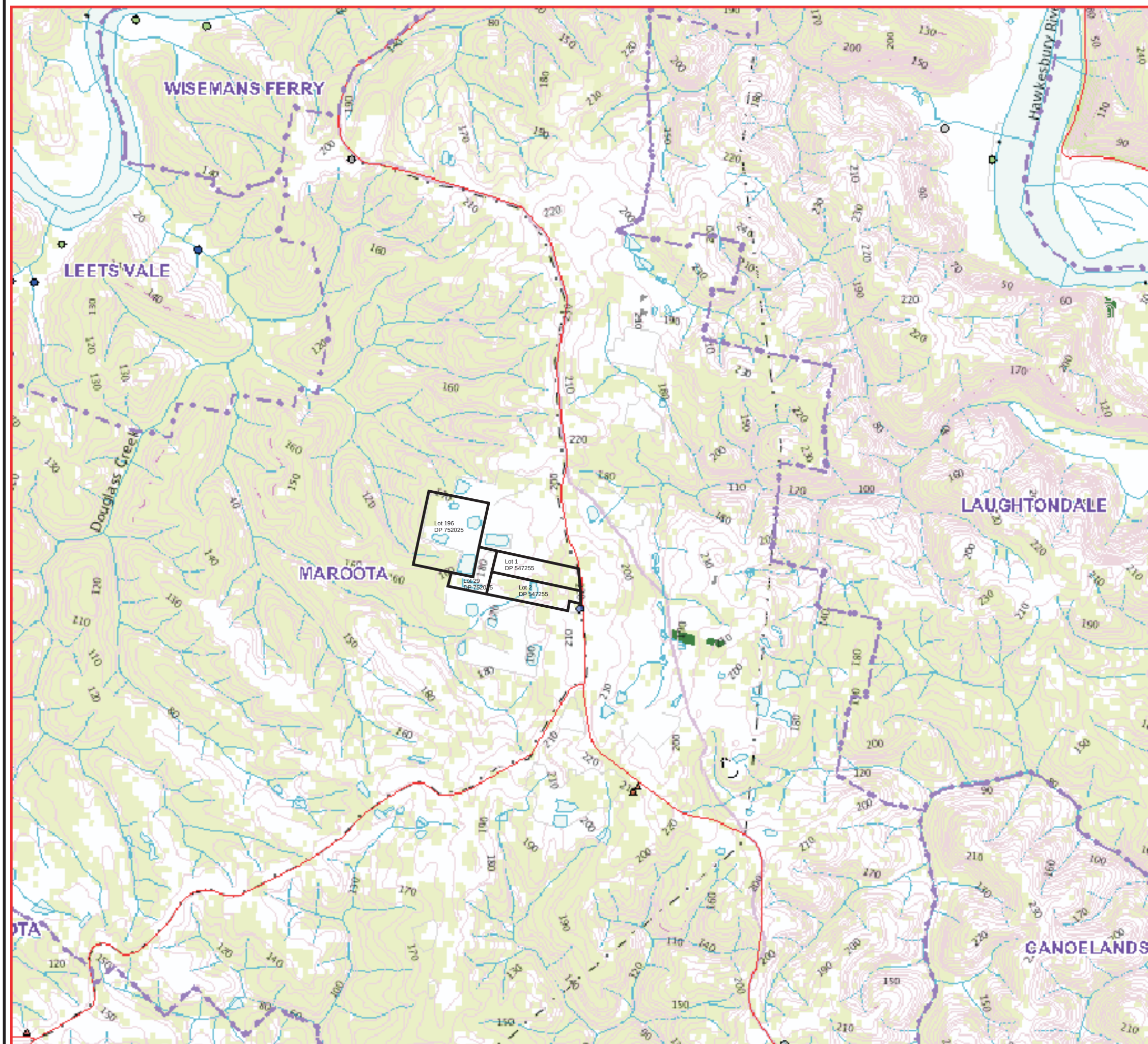
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FIGURES

Figure F1: Site Location

Figure F2: Site Layout



PROJECT-FILE NAME SO9173-01-F003
 DATE 27/05/2010
 DRAWN CG
 APPROVED RO

LEGEND

-  DAM or POND
-  VEGETATION
-  SITE BOUNDARY
-  RELATIVE ELEVATION CONTOUR LINES (mAHD)
-  DRAINAGE LINES (CREEKS, RIVERS)

BASE MAP SOURCE
 DEPARTMENT OF LANDS
 SPATIAL INFORMATION EXCHANGE (SIX)



0 metres 750

CLIENT
 Nexus Environmental Planning

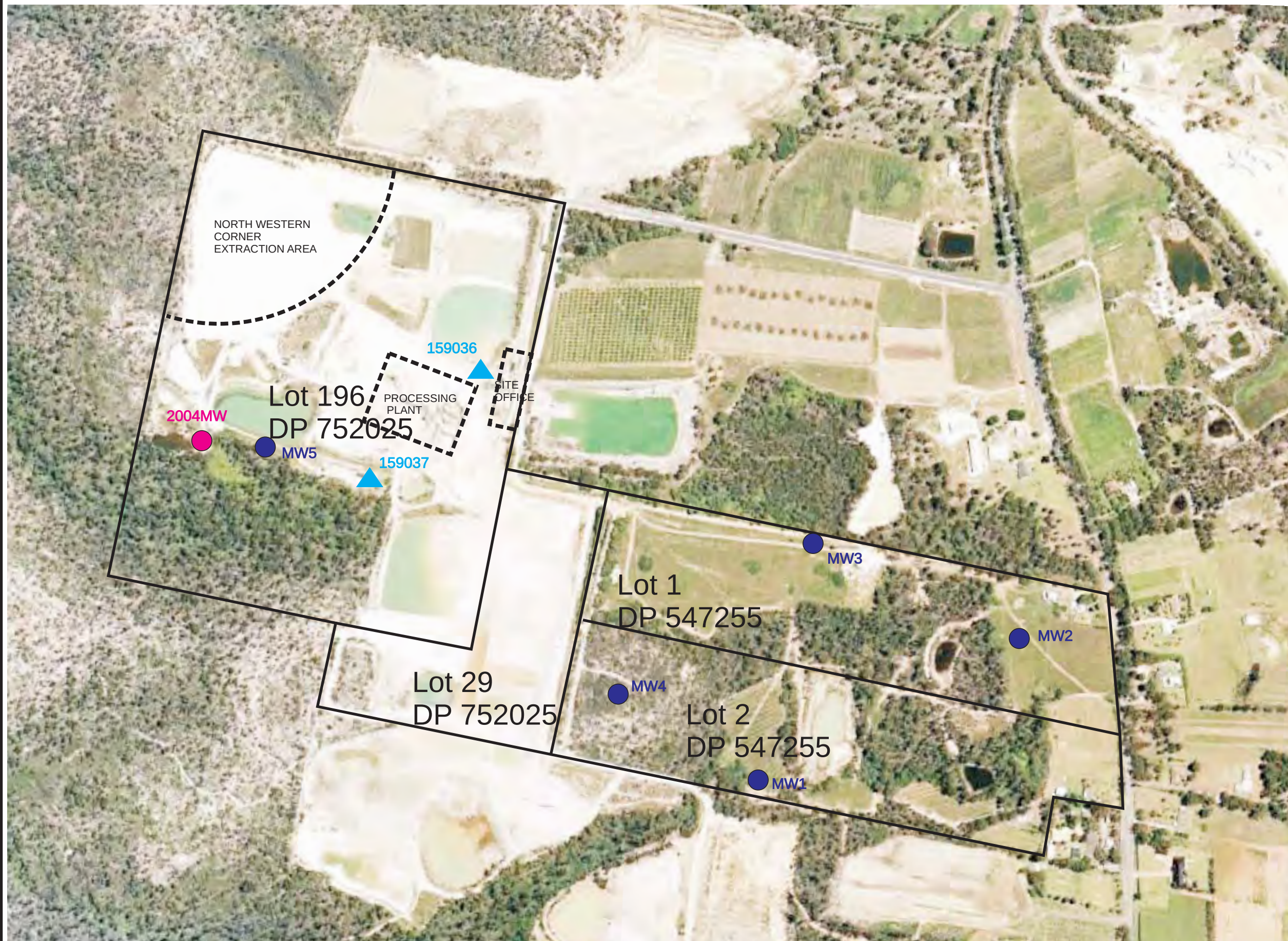
PROJECT
**Preliminary Assessment of
 Potential Impacts to
 Groundwater of Proposed
 Extension of Dixon Sand
 Operations, Lot 196 DP 752025,
 Maroota NSW**

TITLE
 Site Location



FIGURE

F1



PROJECT-FILE NAME SO9209 Figures
 DATE 27/05/2010
 DRAWN CG
 APPROVED RO

LEGEND

-  SITE BOUNDARY
-  MONITORING WELL AND IDENTIFICATION LABEL
-  MONITORING WELL INSTALLED IN 2004
-  PRODUCTION BORES INSTALLED IN 2003

BASE MAP SOURCE
 DEPARTMENT OF LANDS
 SPATIAL INFORMATION EXCHANGE (SIX)



0 metres 250

CLIENT
 Nexus Environmental Planning

PROJECT
**Preliminary Assessment of
 Potential Impacts to
 Groundwater of Proposed
 Extension of Dixon Sand
 Operations, Lot 196 DP 752025,
 Maroota NSW**

TITLE
 Site Layout

TABLES

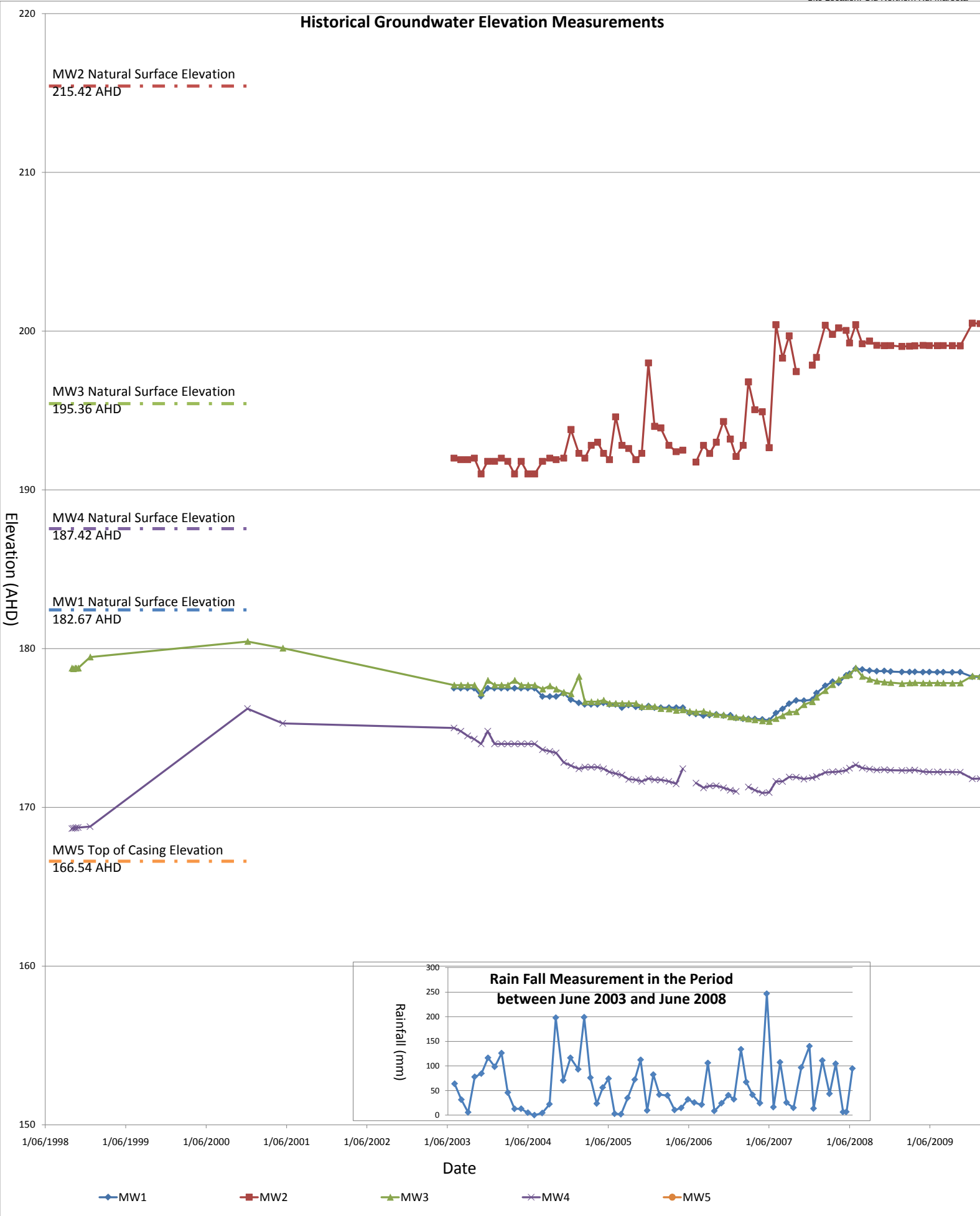
Table T1: Summary of Groundwater Elevation Results

Table T2: Groundwater Quality 2001 v 2008

Groundwater Gauging Summary (incomplete data)											
Well ID	MW1		MW2		MW3		MW4		MW5		RAIN
Date Installed	Nov-00		Nov-00		Aug-98		Aug-98		Aug-98		FALL
Natural Surface Elevation (AHD)	182.67		215.42		195.36		187.42		Not Known		DATA
TOC Elevation (AHD)	182.98		215.80		196.45		188.43		167.44		
DATE MEASURED	Depth from TOC (m)	Elevation (AHD)	Depth from TOC (m)	Elevation (AHD)	Depth from TOC (m)	Elevation (AHD)	Depth from TOC (m)	Elevation (AHD)	Depth from TOC (m)	Elevation (AHD)	
29/09/1998	NA	NA	NA	NA	NA	178.77	NA	168.66	NA	NA	NA
6/10/1998	NA	NA	NA	NA	NA	178.73	NA	168.69	NA	NA	NA
14/10/1998	NA	NA	NA	NA	NA	178.77	NA	168.69	NA	NA	NA
19/10/1998	NA	NA	NA	NA	NA	178.76	NA	168.72	NA	NA	NA
28/10/1998	NA	NA	NA	NA	NA	178.77	NA	168.73	NA	NA	NA
21/12/1998	NA	NA	NA	NA	NA	179.47	NA	168.79	NA	NA	NA
5/12/2000	NA	NA	NA	NA	NA	180.45	NA	176.22	NA	NA	NA
14/05/2001	NA	NA	NA	NA	NA	180.03	NA	175.29	NA	NA	NA
1/07/2003	NA	177.50	NA	192.00	NA	177.70	NA	175.00	NA	NA	63.8
1/08/2003	NA	177.50	NA	191.90	NA	177.70	NA	174.80	NA	NA	31.4
1/09/2003	NA	177.50	NA	191.90	NA	177.70	NA	174.50	NA	NA	5.6
1/10/2003	NA	177.50	NA	192.00	NA	177.70	NA	174.30	NA	NA	77.8
1/11/2003	NA	177.00	NA	191.00	NA	177.20	NA	174.00	NA	NA	84.4
1/12/2003	NA	177.50	NA	191.80	NA	178.00	NA	174.80	NA	NA	116.4
1/01/2004	NA	177.50	NA	191.80	NA	177.70	NA	174.00	NA	NA	98.2
1/02/2004	NA	177.50	NA	192.00	NA	177.70	NA	174.00	NA	NA	126
1/03/2004	NA	177.50	NA	191.80	NA	177.70	NA	174.00	NA	NA	45.8
1/04/2004	NA	177.50	NA	191.00	NA	178.00	NA	174.00	NA	NA	12.8
1/05/2004	NA	177.50	NA	191.80	NA	177.70	NA	174.00	NA	NA	13
1/06/2004	NA	177.50	NA	191.00	NA	177.70	NA	174.00	NA	NA	5
1/07/2004	NA	177.50	NA	191.00	NA	177.70	NA	174.00	NA	NA	NA
6/08/2004	6.00	176.98	24.00	191.80	19.00	177.45	14.80	173.63	4.80	NC	4.3
8/09/2004	6.00	176.98	23.80	192.00	18.80	177.65	14.90	173.53	5.00	NC	22.1
7/10/2004	6.00	176.98	23.90	191.90	19.00	177.45	15.00	173.43	5.00	NC	198
10/11/2004	5.80	177.18	23.80	192.00	19.20	177.25	15.60	172.83	4.80	NC	70.5
13/12/2004	6.20	176.78	22.00	193.80	19.30	177.15	15.80	172.63	4.50	NC	116.5
18/01/2005	6.40	176.58	23.50	192.30	18.20	178.25	16.00	172.43	4.80	NC	93
14/02/2005	6.50	176.48	23.80	192.00	19.80	176.65	15.90	172.53	5.60	NC	199
15/03/2005	6.50	176.48	23.00	192.80	19.80	176.65	15.90	172.53	5.00	NC	76
13/04/2005	6.50	176.48	22.80	193.00	19.80	176.65	15.90	172.53	4.80	NC	23.5
10/05/2005	6.40	176.58	23.50	192.30	19.70	176.75	16.00	172.43	5.10	NC	56
6/06/2005	6.50	176.48	23.90	191.90	19.90	176.55	16.20	172.23	5.20	NC	74
4/07/2005	6.50	176.48	21.20	194.60	19.90	176.55	16.30	172.13	5.20	NC	2.8
2/08/2005	6.70	176.28	23.00	192.80	19.90	176.55	16.40	172.03	5.20	NC	1.8
1/09/2005	6.54	176.44	23.20	192.60	19.90	176.55	16.66	171.77	5.46	NC	34.8
4/10/2005	6.65	176.33	23.90	191.90	19.90	176.55	16.70	171.73	5.60	NC	72.2
31/10/2005	6.70	176.28	23.50	192.30	20.10	176.35	16.80	171.63	5.40	NC	112.4
30/11/2005	6.60	176.38	17.80	198.00	20.10	176.35	16.62	171.81	4.94	NC	9.4
28/12/2005	6.70	176.28	21.80	194.00	20.10	176.35	16.70	171.73	4.90	NC	82.4
25/01/2006	6.70	176.28	21.90	193.90	20.23	176.22	16.70	171.73	4.80	NC	41.6
3/03/2006	6.70	176.28	23.00	192.80	20.25	176.20	16.80	171.63	4.95	NC	40
5/04/2006	6.70	176.28	23.40	192.40	20.34	176.11	16.95	171.48	5.53	NC	10.4
5/05/2006	6.70	176.28	23.30	192.50	20.31	176.14	16.00	172.43	5.13	NC	14.6
5/06/2006	7.05	175.93			20.40	176.05			5.45	NC	32
4/07/2006	7.10	175.88	24.05	191.75	20.45	176.00	16.90	171.53	5.50	NC	25.6
7/08/2006	7.20	175.78	23.00	192.80	20.40	176.05	17.20	171.23	5.50	NC	21.2
4/09/2006	7.17	175.81	23.51	192.29	20.52	175.93	17.08	171.35	5.38	NC	106
4/10/2006	7.12	175.86	22.80	193.00	20.60	175.85	17.07	171.36	5.15	NC	8.4
6/11/2006	7.20	175.78	21.49	194.31	20.63	175.82	17.20	171.23	5.43	NC	24.2
7/12/2006	7.18	175.80	22.60	193.20	20.75	175.70	17.35	171.08	5.64	NC	40.4
2/01/2007	7.35	175.63	23.70	192.10	20.78	175.67	17.43	171.00	5.34	NC	32.2
3/02/2007	7.40	175.58	23.00	192.80	20.80	175.65			5.30	NC	133.8
27/02/2007	7.40	175.58	19.00	196.80	20.88	175.57	17.15	171.28	5.36	NC	67.2
28/03/2007	7.41	175.57	20.75	195.05	20.94	175.51	17.35	171.08	5.39	NC	41.4
1/05/2007	7.44	175.54	20.88	194.92	21.00	175.45	17.52	170.91	5.46	NC	24.2
1/06/2007	7.51	175.47	23.14	192.66	21.04	175.41	17.50	170.93	5.30	NC	246.8
2/07/2007	7.04	175.94	15.40	200.40	20.86	175.59	16.80	171.63	4.91	NC	16.2
1/08/2007	6.78	176.20	17.50	198.30	20.68	175.77	16.80	171.63	5.37	NC	107.4
31/08/2007	6.45	176.53	16.10	199.70	20.45	176.00	16.52	171.91	5.16	NC	25.6
2/10/2007	6.25	176.73	18.35	197.45	20.43	176.02	16.53	171.90	5.33	NC	14.8
6/11/2007	6.26	176.72			19.98	176.47	16.65	171.78	5.09	NC	96.8
14/12/2007	6.20	176.78	17.95	197.85	19.80	176.65	16.57	171.86	4.95	NC	140
2/01/2008	5.78	177.20	17.45	198.35	19.51	176.94	16.49	171.94	4.50	NC	13.4
11/02/2008	5.32	177.66	15.43	200.37	19.10	177.35	16.23	172.20	4.52	NC	111
15/03/2008	5.07	177.91	16.00	199.80	18.72	177.73	16.20	172.23	4.88	NC	43.4
12/04/2008	5.15	177.83	15.60	200.20	18.40	178.05	16.18	172.25	5.04	NC	104.4
16/05/2008	4.67	178.31	15.76	200.04	18.16	178.29	16.10	172.33	5.11	NC	6.4
31/05/2008	4.57	178.41	16.55	199.25	18.10	178.35	15.96	172.47	5.25	NC	6.4
28/06/2008	4.25	178.73	15.40	200.40	17.67	178.78	15.75	172.68	5.20	NC	94.6
28/07/2008	4.30	178.68	16.60	199.20	18.20	178.25	15.95	172.48	5.05	NC	NA
30/08/2008	4.37	178.61	16.43	199.37	18.38	178.07	16.02	172.41	5.15	NC	NA
2/10/2008	4.41	178.57	16.70	199.10	18.50	177.95	16.08	172.35	5.20	NC	NA
5/11/2008	4.39	178.59	16.72	199.08	18.56	177.89	16.06	172.37	5.17	NC	NA
4/12/2008	4.43	178.55	16.71	199.09	18.59	177.86	16.09	172.34	5.23	NC	NA
24/01/2009	4.46	178.52	16.77	199.03	18.65	177.80	16.11	172.32	5.27	NC	NA
28/02/2009	4.46	178.52	16.75	199.05	18.61	177.84	16.10	172.33	5.24	NC	NA
24/03/2009	4.45	178.53	16.73	199.07	18.60	177.85	16.08	172.35	5.22	NC	NA
30/04/2009	4.47	178.51	16.70	199.10	18.62	177.83	16.18	172.25	5.23	NC	NA
29/05/2009	4.46	178.52	16.71	199.09	18.62	177.83	16.20	172.23	5.25	NC	NA
4/07/2009	4.47	178.51	16.72	199.08	18.61	177.84	16.20	172.23	5.25	NC	NA
31/07/2009	4.47	178.51	16.71	199.09	18.62	177.83	16.21	172.22	5.26	NC	NA
10/09/2009	4.48	178.50	16.72	199.08	18.63	177.82	16.21	172.22	5.27	NC	NA
16/10/2009	4.47	178.51	16.73	199.07	18.62	177.83	16.22	172.21	5.26	NC	NA
10/12/2009	4.76	178.22	15.30	200.50	18.18	178.27	16.63	171.80	4.95	NC	NA
15/01/2010	4.77	178.21	15.33	200.47	18.20	178.25	16.62	171.81	4.87	NC	NA

Minimum AHD	175.47		191.00		175.41		168.66		NC
Maximum AHD	178.73		200.50		180.45		176.22		NC
Minimum mBNS	3.94		14.92		14.91		11.20		4.50
Maximum mBNS	7.20		24.42		19.95		18.76		5.64

Notes:
AHD = Australian Height Datum TOC = Top of Casing NA = Data not available mBNS = metres Below Natural Surface NC = Not Calculable
Highlighted values are approximate values based on graphs in ERM Annual Environmental Management Plan 7 July 2003 to 6 July 2004, October 2004
Rainfall data from ERM reports.



Groundwater Quality 2001 v 2008

Parameter	pH		EC (uS/cm)		DO (mg/L)		ORP (mV)		T (C)	
Date Measured	2001	2008	2001	2008	2001	2008	2001	2007*	2001	2008
Well ID										
MW1	4.17	4.06	236.00	205.90	1.45	2.63	364	597	18.17	18.70
MW2	3.90	3.65	731.00	469.00	6.04	4.63	412	523	20.91	17.20
MW3	4.63	5.55	144.00	206.80	5.39	4.72	342	447	22.76	16.60
MW4	4.37	5.14	60.00	104.10	6.19	5.99	324	408	22.31	17.50

Notes:

EC = Electrical Conductivity in microSiemens per centimetre

DO = Dissolved Oxygen in milligrams per Litre

ORP = Oxidation Reduction Potential in millivolts

T = Temperature in degrees Centigrade

* = No readings were reported for 2008. readings from 2007 were adopted.

' ' = Data not available

2001 = ERM Australia Pty Ltd; August 2001; Proposed Extension of Sand Operations, Lots 1 and 1 DP 547255, Old Northern Road, Maroota, Environmental Impact Statement

2008 = ERM Australia Pty Ltd; July 2009; Dixon Sand Quarries on Old Northern Road & Haerses Road, Maroota, Annual Environmental Management Report 2007/08

PLATES



Plate P1: Lot 196 Extraction area looking approximately north



Plate P2: Lot 196 looking north along eastern boundary

Appendix A – Rainfall Data

Monthly Rainfall (millimetres)

MAROOKA (OLD TELEGRAPH ROAD)

Station Number: 067014 · State: NSW · Opened: 1925 · Status: Open · Latitude: 33.46°S · Longitude: 151.00°E · Elevation: 203 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1925							0.0	59.2	10.4	30.5	92.1	11.9	
1926	41.9	6.9	238.6	114.6	113.8	28.4	54.8	20.0	49.0	9.2	6.1	223.1	906.4
1927	98.5	15.3	45.7	401.3	20.2	15.5	5.1	0.0	28.5	35.8	175.9	0.0	841.8
1928	42.0	0.0	116.1	132.4	10.7	115.6	73.4	5.8	4.8	49.9	15.0	14.0	579.7
1929	0.0	379.0	48.3	61.0	19.8	83.1	44.2	92.5	60.0	180.3	72.3	23.7	1064.2
1930	66.6	22.7	136.3	29.5	35.0	294.9	72.9	22.1	3.5	68.1	23.1	117.5	892.2
1931	27.2	75.6	156.8	282.2	73.0	12.2	230.0	15.3	65.7	57.4	103.0	84.7	1183.1
1932	10.7	73.5	113.1	96.0	13.7	10.1	10.6	74.7	155.6	70.6	58.4	42.4	729.4
1933	152.7	19.8	64.0	93.8	66.1	37.8	88.2	8.4	119.8	53.8	112.0	123.9	940.3
1934	76.3	178.3	55.9	92.6	52.8	58.1	158.4	82.6	154.1	57.3	120.1	73.2	1159.7
1935	56.3	82.7	57.9	23.3	3.3	11.1	28.3	6.3	52.4	101.1	54.4	92.3	569.4
1936	136.9	97.1	92.6	66.0	53.7	61.9	19.2	10.6	18.5	17.9	0.5	115.0	689.9
1937	62.0	64.9	118.6	43.9	15.8	210.4	36.3	74.7	8.7	54.0	157.3	100.1	946.7
1938	201.3	76.2	28.4	55.3	105.5	0.0	23.3	101.9	20.8	83.5	50.9	31.6	778.7
1939	70.9	0.0	192.4	89.5	15.4	10.5	10.4	37.6	41.4	55.1	73.7	23.4	620.3
1940	55.4	13.7	4.8	160.3	23.8	2.0	15.5	27.0	74.9	37.9	60.9	220.8	697.0
1941	121.0	54.6	32.7	62.6	13.7	28.7	15.3	17.9	39.1	49.0	44.5	22.1	501.2
1942	6.1	59.7	437.7	0.0	23.1	63.3	43.7	15.2	34.0	220.3	179.5	35.2	1117.8
1943	68.0	19.8	18.8	41.4	370.1	11.0	1.5	92.0	114.8	33.8	121.1	76.5	968.8
1944	46.7	46.5	21.6	51.0	53.9	8.4	39.2	80.7	97.6	15.2	8.4	0.0	469.2
1945	177.8	110.7	39.6	89.2	81.3	300.0	45.2			1.5	53.5	76.7	
1946	31.7	76.2	94.5	432.6	33.0	99.1	0.0	0.0	18.4	37.7	87.5		
1947		204.4	36.6	82.5	45.5	25.4	12.0	28.9	23.6	39.1	131.0	375.0	
1948	178.3	61.5	42.9	21.6	111.9	134.6	4.8	12.2	98.1	7.9	24.7	80.4	778.9
1949	249.2	161.6	125.1	37.2	113.7	353.8	68.6	85.6	125.1	57.8	88.3	79.3	1545.3
1950	175.7	244.4	130.4	103.8	56.8	445.4	149.4	50.0	66.7	137.4	208.3	5.3	1773.6
1951	395.5	78.3	141.6	15.3	32.0	240.8	26.4	2.0	77.3	25.7	9.9	33.8	1078.6
1952	23.3	44.2	140.7	155.9	18.1	96.0	250.6	336.2	4.0	93.9	38.3	48.2	1249.4
1953	48.2	85.7	31.8	7.2	1.5	0.8	17.8	19.6	47.8	66.8	24.9	1.8	353.9
1954		215.1	36.1	30.4	26.7	10.2							
1960	0.0												
1964					21.6	322.9	10.2	35.2	13.1	85.0	140.9	65.5	
1965	35.1	6.8	2.1	48.5	18.0	63.0	119.6	0.8	79.3	169.0	18.6	85.3	646.1
1966	14.5	98.6	42.9	83.3	35.6	39.1	16.8	42.0	24.7	44.3	77.5	78.3	597.6
1967	59.2	90.5	185.2	22.6	23.9	160.9	24.8	177.2	22.8	71.4	17.1	13.6	869.2
1968	212.1	31.2	37.9	22.6	129.1	15.5	31.0	18.1	19.8	2.6	34.8	92.8	647.5
1969	26.9	191.6	121.8	99.0	41.9	148.9	21.2	163.1	29.9	98.2	191.0	30.2	1163.7
1970	157.4	20.1	85.6	14.0	14.8	21.3	42.7	80.3	174.0	33.6	68.8	190.4	903.0
1971	136.5	89.2	62.9	34.5	135.1	9.4	21.6	23.1	29.9	5.1	60.3	132.3	739.9
1972	354.4	68.1	99.3	57.1	36.0	50.8	1.8	35.7	13.7	158.0	66.8	33.3	975.0
1973	100.6	287.7	55.4	20.2	19.0	42.6	72.5	60.4	56.4	152.6	104.5	94.1	1066.0
1974	174.5	70.4	220.8	179.4	165.2	208.6	6.2	29.8	18.8	53.8	62.2	0.4	1190.1
1975	14.4	159.8	82.4	60.4	16.2	179.0	72.6	39.4	35.4	99.4	42.0	18.2	819.2
1976	205.2	213.2	232.2	38.0	8.8	78.8	62.6	17.8	51.9	153.7	63.2	21.8	1147.2
1977	45.4	136.7	164.2	5.8	188.8	94.0	10.0	22.8	50.3	10.4	35.0	10.9	774.3
1978	288.4	25.4	360.4	19.8	96.2	305.8	7.4	21.8	158.6	65.8	137.0	23.0	1509.6
1979	85.6	23.5	125.5	23.0	111.8	111.2	7.8	8.2	38.2	25.3	23.1	4.0	587.2
1980	69.1	57.4	29.2	9.6	103.8	57.4	24.3	7.0	4.3	61.5	29.2	138.5	591.3

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown

Monthly Rainfall (millimetres)

MAROOTA (OLD TELEGRAPH ROAD)

Station Number: 067014 · State: NSW · Opened: 1925 · Status: Open · Latitude: 33.46°S · Longitude: 151.00°E · Elevation: 203 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1981	174.8	251.4	14.2	137.2	101.7	23.6	33.4	6.6	7.6	150.2	136.2	78.2	1115.1
1982	78.2	43.6	195.0	2.9	2.0	21.6	20.0	0.4	131.4	46.8	4.0	15.0	560.9
1983	29.6	88.4	179.2	73.0	109.6	45.4	23.4	14.6	52.8	121.6	57.2	111.2	906.0
1984	153.6	124.8	145.4	107.8	64.2	50.8	146.0	13.0	33.2	26.0	144.4	62.8	1072.0
1985	1.8	62.9	36.4	157.8	89.8	73.8	26.3	16.2	54.5	146.8	79.8	66.2	812.3
1986	138.8	40.4	12.6	29.2	37.8	11.0	25.6	497.4	59.4	21.0	205.3	14.1	1092.6
1987	38.6	81.5	146.6	51.0	45.4	51.0	24.6	240.0	9.4	174.6	110.6	60.2	1033.5
1988	170.5	159.8	82.0	467.2	93.0	45.0	115.0		111.2	0.6	82.2	176.4	
1989	125.4	83.7	173.8	246.9	79.0	162.4		19.2	0.4	19.8	68.8	95.0	
1990	100.8	464.9	145.0	239.6	107.3	10.4	112.2	190.8	99.4	32.8	42.2	91.2	1636.6
1991	94.5	52.9	38.2	10.5	42.0	145.6	67.6	4.5	19.0	10.8	41.9	195.4	722.9
1992	59.5	464.6	64.6	147.5	14.0	66.0	9.6	31.8	14.5	21.0	117.2	166.0	1176.3
1993	82.4	63.4	74.3	36.6	12.4	20.7	59.6	47.5	56.9	53.6	91.2	68.3	666.9
1994	46.6	112.7	17.2	98.7	22.0	28.5	69.0	12.8	2.4	23.4	66.4	69.8	569.5
1995	119.5	55.9	200.6	14.0	141.3	50.0	0.0	0.0	147.5	18.0	99.6		
1996	50.0		66.6	26.0	103.7	41.5	50.6	157.5	92.0	33.8	82.6	47.6	
1997	96.0	171.0	4.0	12.0	48.0	51.0	84.0	5.0					
1999								42.4	63.9	173.7		99.0	
2000	37.9		230.8					13.5	32.2		191.0		
2001	123.0												
2002	51.0	245.0		46.0	46.0			14.0		21.0	0.0	75.0	
2003	20.8		74.6	60.1			47.2	39.2	6.0	88.2	91.2	84.3	
2004	82.8	137.6	61.7	16.7	8.0				21.8	216.2	85.2	106.1	
2005	84.5	133.4	91.4	34.6	51.1	60.8		2.6	49.8	98.0	134.2		
2006		57.6		14.8			36.4	33.0	153.8	10.4	34.1	59.2	
2007	42.5	183.5	102.4	59.8	20.4	365.5			37.6	10.1	120.6	203.6	
2008	128.2		66.8	132.0	7.3	135.8	22.8	43.1	93.6	72.6		87.7	
2009	53.8	166.0	39.2	107.2	145.0	53.0	20.2	4.4	9.6	108.4	20.6	92.4	819.8

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown

Monthly Rainfall (millimetres)

MAROOTA (OLD TELEGRAPH ROAD)

Station Number: 067014 · State: NSW · Opened: 1925 · Status: Open · Latitude: 33.46°S · Longitude: 151.00°E · Elevation: 203 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	96.9	110.2	101.0	84.8	60.3	92.4	46.8	52.3	54.2	66.7	78.2	77.8	904.6
Lowest	0.0	0.0	2.1	0.0	1.5	0.0	0.0	0.0	0.4	0.6	0.0	0.0	353.9
5th percentile	8.2	8.9	13.2	8.3	7.6	8.7	1.6	0.6	4.1	6.5	7.1	2.6	540.0
10th percentile	20.2	19.8	21.0	13.8	12.1	10.3	5.7	4.0	7.4	10.4	16.9	11.6	572.6
Median	73.6	78.3	82.0	56.2	42.0	51.0	26.4	22.8	40.2	53.8	68.8	74.1	880.7
90th percentile	180.6	226.8	196.1	162.2	116.9	262.4	113.6	113.0	125.7	153.7	145.7	169.1	1188.0
95th percentile	232.5	276.8	231.6	266.3	143.5	317.8	148.6	185.4	154.0	174.1	185.8	200.7	1522.1
Highest	395.5	464.9	437.7	467.2	370.1	445.4	250.6	497.4	174.0	220.3	208.3	375.0	1773.6

Statistics calculated over the period 1961-1990

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	115.1	114.3	116.8	86.6	70.2	89.0	41.5	68.5	51.1	75.2	77.9	66.8	935.7
Lowest	1.8	6.8	2.1	2.9	2.0	9.4	1.8	0.4	0.4	0.6	4.0	0.4	560.9
5th Percentile	14.4	21.0	13.0	6.8	10.6	10.6	6.5	2.2	5.3	3.3	17.5	6.1	587.8
10th percentile	20.7	24.5	21.7	11.8	15.6	13.7	7.6	6.8	8.7	8.3	21.3	12.5	593.2
Median	100.7	86.1	110.6	49.8	64.2	51.0	24.7	23.0	35.4	61.5	66.8	65.5	904.5
90th percentile	208.6	232.3	207.9	209.5	131.5	190.8	113.6	184.0	119.3	155.4	142.3	134.8	1182.2
95th percentile	269.3	278.6	229.4	245.1	156.2	276.6	118.4	227.7	150.4	165.7	177.0	165.0	1461.7
Highest	354.4	464.9	360.4	467.2	188.8	322.9	146.0	497.4	174.0	174.6	205.3	190.4	1636.6

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

<http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml>.

Product code: IDCJAC0001 reference: 01905527



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Monthly Rainfall (millimetres)

GLENORIE (OLD NORTHERN RD)

Station Number: 067010 · State: NSW · Opened: 1902 · Status: Open · Latitude: 33.59°S · Longitude: 151.01°E · Elevation: 170 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1914	37.3												
1927								0.8	13.0	71.2	161.4	63.9	
1928	44.5	189.9	103.1	31.5	19.2	182.5	104.7	17.0	5.6	43.7	7.9	48.3	797.9
1929	10.5	332.0	73.1	58.7	79.8	69.8	46.5	76.3	51.9	150.3	66.0	31.5	1046.4
1930	71.2	10.9	95.8	59.2	43.9	193.9	65.9	30.0	2.5	62.2	32.8	106.3	774.6
1931	62.9	45.0	265.7	280.0	84.6	17.6	291.6	8.9	71.0	38.0	174.6	65.7	1405.6
1932	4.1	132.5	81.4	74.5	14.4	17.2	51.7	59.7			52.7	13.7	
1933	118.4	6.9	49.8	97.0		17.0	92.5	42.9	63.8	108.5	77.2	75.7	
1934	77.5	163.2	29.5	116.2		15.4	229.5	204.4	164.0	60.6	93.4	31.5	
1935	92.7	201.7	38.6	21.4	2.9	32.3	13.8	2.6	43.8	75.1	65.7	82.2	672.8
1936	125.2	137.7	117.6	64.1	59.6	72.9	15.5	25.1	20.3	36.4	3.0	82.2	759.6
1937	52.7	87.5	130.2	67.6	6.1	239.9	35.6	76.1	14.5	76.4	53.3	47.0	886.9
1938	179.1	26.9	40.3	45.1	89.6	6.9	36.9	106.2	37.1	92.9	27.2	24.5	712.7
1939	63.8	1.5	242.1	120.3	27.5	6.9	14.7	44.7	39.1	60.8	32.3	27.7	681.4
1940	33.8	16.5	48.8	55.4	27.9	12.7	16.9	25.4	76.5	26.8	74.4	211.6	626.7
1941	129.5	57.3	32.4	83.4	21.1	31.8	21.6	24.6	31.8	45.0	21.0		
1942		15.0	571.3	26.7	23.1	76.5	41.9	19.3	26.2	292.7	143.4	48.7	
1943	57.2	21.8	20.7	29.5	394.1	15.2	5.4	150.6	137.3	41.7	168.1	120.2	1161.8
1944	40.1	30.7	58.7	38.1	71.1	0.0	0.0	84.3	45.6	11.4	0.0	5.9	385.9
1945	125.4	99.4	27.7	101.7	80.3	276.9	52.5	31.9	1.3	26.9	64.7	47.2	935.9
1946	25.4	51.8	106.6	390.9	32.0	136.1	0.0	0.5	38.1	41.4	65.1	9.6	897.5
1947	28.0	157.7	33.2	93.7	39.9	13.9	9.2	21.9	25.6	37.7	97.8	299.3	857.9
1948	177.3	37.8	85.6	12.8	120.9	106.5	0.0	3.6	50.1	8.1	4.8	59.7	667.2
1949	270.7	88.1	109.8	17.3	101.6	307.8	72.1	82.1	126.9	37.2	73.7		
1950	134.9	194.5	111.9	116.2	78.9	504.3	167.3	40.8	66.0	82.4	125.9	58.1	1681.2
1951	397.8	49.3	100.6	6.6	61.7	297.7	12.0	34.3	54.0	21.4	7.9	1.8	1045.1
1952		48.5	124.1	187.5	23.6	141.4	268.5	302.8	17.5	86.4		18.6	
1953		172.6	32.6	13.0	444.2	0.0	20.6	17.5	24.3	45.0	28.0		
1954		251.9	16.3	10.1	20.6	10.9	80.4	21.3	30.9	132.1	120.6		
1960	0.0												
1961	49.1	59.2	93.5	57.1	13.2	42.2	36.4	187.3	26.9	93.2	307.8	157.5	1123.4
1962	159.3	139.5	53.0	34.6	249.8	2.0	63.3	99.8	90.9	44.9	8.8	159.4	1105.3
1963	115.9	113.9	267.4	232.3	196.8	155.6	49.1	201.2	58.6	47.3	22.5	194.7	1655.3
1964	71.6	19.9	139.7	88.3	24.7	371.4	9.5	19.8	14.3	80.4	121.8	48.3	1009.7
1965	21.0	11.0	3.8	70.7	23.4	88.5	152.5	14.8	72.5	190.8	22.3	72.2	743.5
1966	21.6	103.2	85.4	110.3	51.8	83.4	10.9	40.7	33.8	75.1	103.7	78.8	798.7
1967	140.9	145.7	141.3	23.9	27.0	185.8	25.8	217.5	53.0	65.9	32.3	21.3	1080.4
1968	173.8	35.6	66.0	17.8	151.5	10.1	35.2	20.4	10.4	0.8	26.1	122.1	669.8
1969	79.5	191.4	90.2	121.5	39.0	150.3	17.9	159.6	49.4	124.9	220.7	12.0	1256.4
1970	208.8	20.0	62.2	31.5	15.7	14.6	0.0	24.9	215.6	21.5	87.6	192.1	894.5
1971	147.8	171.7	69.0	43.4	114.3	17.6	22.0	23.6	30.2	2.1	71.3	141.3	854.3
1972	278.7	68.6	132.3	73.1	41.7	65.1	2.8	41.4	17.6	188.9	85.9	47.9	1044.0
1973	74.3	287.8	37.1	14.2	26.2	38.5	89.6	64.3	27.0	132.9	117.3	46.2	955.4
1974	168.6	86.8	192.4	161.9	173.2	246.0	7.0	29.2	20.4	50.0	72.6	19.0	1227.1
1975	18.6	103.3	101.0	62.2	20.8	197.6	132.2	21.6	56.0	145.0	32.0	22.4	912.7
1976	216.6	286.9	293.2	26.8	20.8	92.0	100.6	25.4	35.6	174.8	49.2	34.6	1356.5
1977	125.3	163.6	171.1	6.6	158.4	113.8	1.8	21.2	46.4	13.6	33.2	51.2	906.2
1978	301.0	8.7	370.2	45.2	121.4	334.5	9.2	20.0	143.6	62.6	154.0	76.4	1646.8

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown

Monthly Rainfall (millimetres)

GLENORIE (OLD NORTHERN RD)

Station Number: 067010 · State: NSW · Opened: 1902 · Status: Open · Latitude: 33.59°S · Longitude: 151.01°E · Elevation: 170 m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1979	77.4	27.0	98.4	17.4	98.6	113.2	9.8	8.4	37.0	19.0	33.0	10.6	549.8
1980	104.0	52.0	32.8	12.0	132.0	57.6	34.2	9.5	1.4	79.4	29.8	129.0	673.7
1981	120.3	186.8	16.0	127.8	138.2	27.0	34.7	9.2	3.6	184.0	166.4	44.0	1058.0
1982	77.6	54.9	195.2	2.8	1.1	34.2	20.6	1.0	170.0	59.0	7.0	18.0	641.4
1983	14.3	52.4	140.4	56.6	111.5	49.7	13.1	11.4	53.0	111.2	26.8	116.0	756.4
1984	217.7	143.7	163.1	90.9	58.7	89.6	155.8	7.5	49.6	22.8	186.6	45.0	1231.0
1985	10.7	20.7	41.9	185.3	106.8	95.2	42.4	22.7	71.5	164.4	84.8	58.4	904.8
1986	160.3	22.4	11.6	30.0	40.0	9.9	36.4	328.8	60.8	57.0	231.6	24.0	1012.8
1987	45.4	56.6	153.4	52.0	71.4	45.2	34.8	307.8	11.8	196.3	115.6	67.4	1157.7
1988	204.2	164.5	64.5	432.0	106.5	51.4	128.6	42.4	122.2	0.0	139.2	154.2	1609.7
1989	103.4	43.8	157.8	300.6	115.0	155.6	18.2	32.4	10.4	21.2	45.6	64.2	1068.2
1990	92.6	539.4	80.2	262.6	122.0	16.6	80.4	182.8	131.4	40.0	24.4	51.0	1623.4
1991	51.0	59.0	26.6	10.9	40.9	221.6	58.8	1.0	6.4	9.5	38.6	183.4	707.7
1992	40.9	354.0	56.0	77.4	19.4	80.8	6.4	17.9	14.2	40.4	95.8	170.2	973.4
1993	58.0	101.3	115.0	40.8	15.4	23.6	64.3	56.6	53.3	71.8	71.0	56.6	727.7
1994	48.2	106.3	73.6	90.6	25.8	57.6	34.4	10.8	6.6	24.8	54.2	105.0	637.9
1995	113.8	64.2	231.6	19.4	130.4	54.0	3.0	1.0	155.2	22.8	78.4	89.6	963.4
1996	126.0	47.4	46.8	36.0	111.6	35.4	58.6	124.2	93.0	26.2	98.4	45.8	849.4
1997	115.6	177.0	18.2	5.0	51.0	52.4	77.2	2.8	90.6	56.0	29.8	54.4	730.0
1998	96.6	36.2	8.8	108.4	313.2	89.6	73.7	255.8	45.4	39.8	85.6	24.8	1177.9
1999	113.2	174.6	44.9	136.5	30.8	48.8	147.2	73.6	31.0	188.0	66.6	134.0	1189.2
2000	32.8	17.0	256.2	71.4	36.2	34.8	26.0		46.2	63.2	147.8	71.0	
2001	86.4	125.6	159.0		111.6	8.2	59.8	41.8	15.2	44.2	66.0	46.6	
2002	70.6	262.6	92.6	55.6	34.4	24.4	12.0	16.8	19.0	3.4	15.2	73.8	680.4
2003	14.2	75.6	72.6	68.2	206.4	26.2	36.4	30.8	5.0	112.9	97.6	73.4	819.3
2004	68.8	136.2	58.2	21.6	6.0	6.0		38.2	26.0	234.2	77.0	75.4	
2005	76.0	154.0		30.8	53.0	76.6	20.4	5.0	51.2	81.0	145.1	40.4	
2006	100.0	67.6	29.0	10.2	12.2		56.6	43.2	173.8	5.6	40.0	45.0	
2007	37.6	168.8	93.6	60.2	19.2	380.0	24.4	108.2	33.0	17.6	145.0	199.2	1286.8
2008	91.2	186.6	71.8	74.2	26.6	138.2	31.4	40.8	77.6	67.4	90.6	104.8	1001.2
2009	42.2	189.6	59.2	115.2	141.0	53.2	38.4	10.0	9.4	102.6	14.8	73.9	849.5
2010	38.2	213.6	89.8	34.4									

Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown

Monthly Rainfall (millimetres)

GLENORIE (OLD NORTHERN RD)

Station Number: 067010 · State: NSW · Opened: 1902 · Status: Open · Latitude: 33.59°S · Longitude: 151.01°E · Elevation: 170 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	98.4	113.3	103.6	80.0	80.1	95.6	52.9	60.9	52.0	72.3	78.4	75.7	969.6
Lowest	0.0	1.5	3.8	2.8	1.1	0.0	0.0	0.5	1.3	0.0	0.0	1.8	385.9
5th percentile	13.1	11.0	16.2	9.2	10.1	6.6	1.3	1.0	4.7	5.1	7.7	11.4	638.1
10th percentile	21.2	18.7	27.1	12.4	15.5	10.0	5.8	4.3	8.0	12.5	15.0	18.7	670.1
Median	77.6	88.1	83.4	57.9	51.4	54.0	35.2	29.6	38.6	58.0	68.8	58.4	909.5
90th percentile	194.2	206.5	213.4	173.6	156.3	243.6	130.8	185.1	129.1	169.6	157.7	159.0	1349.5
95th percentile	233.6	287.1	266.1	267.0	221.6	315.8	159.2	227.1	157.4	189.4	177.6	193.1	1622.7
Highest	397.8	539.4	571.3	432.0	444.2	504.3	291.6	328.8	215.6	292.7	307.8	299.3	1681.2

Statistics calculated over the period 1961-1990

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	120.0	112.7	117.5	93.0	85.7	98.5	45.8	73.2	57.5	82.3	88.7	76.0	1050.9
Lowest	10.7	8.7	3.8	2.8	1.1	2.0	0.0	1.0	1.4	0.0	7.0	10.6	549.8
5th Percentile	16.2	15.0	13.6	9.0	14.3	10.0	2.2	7.9	6.7	1.4	14.9	14.7	654.2
10th percentile	20.8	20.0	31.1	14.0	20.3	14.1	6.6	9.1	10.4	12.4	22.5	18.9	673.3
Median	109.9	77.7	95.9	56.8	85.0	74.2	34.5	25.1	47.9	64.2	71.9	54.8	1028.4
90th percentile	216.7	200.9	202.4	235.3	159.9	202.4	129.0	202.8	132.6	184.5	190.0	157.7	1611.1
95th percentile	251.2	287.4	281.6	283.5	186.2	294.7	143.4	267.2	158.1	189.9	226.7	177.4	1636.3
Highest	301.0	539.4	370.2	432.0	249.8	371.4	155.8	328.8	215.6	196.3	307.8	194.7	1655.3

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

<http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml>.

Product code: IDCJAC0001 reference: 01905531



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Attachment 7

GROUNDWATER ASSESSMENT FOR DIXON SAND OPERATIONS, LOT 196 DP752025, MARROOTA NSW



GROUNDWATER ASSESSMENT FOR DIXON SAND OPERATIONS, LOT 196 DP752025, MAROOTA NSW

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**Nexus Environmental Planning on behalf of
Dixon Sand (Penrith) Pty Limited**

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Revision A	19-11-2010	First Draft
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	Name	Position	Signature	Date
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EXECUTIVE SUMMARY

Dixon Sand (Penrith) Pty Ltd owns and operates a sand quarry comprising four separate parcels of land identified as Lots 1 and 2 DP 547255 and Lot 29 and Lot 196 DP 752025. This investigation was undertaken to clearly define the significance, delineate the extent and determine the degree of continuity that perched groundwater may have with the regional groundwater table. It was also undertaken to assist with the identification of the 'wet weather' regional groundwater level to justify the proposed modifications to the existing licence consent conditions and potentially extend the depth of extraction on Lot 196 from 15.24m BNS (below natural surface) to two-metres above the regional groundwater table.

Shallow monitoring bores indicated the presence of groundwater at various depths above relatively impermeable discontinuous layers (aquitards) such as clay lenses, shale or ironstone bands across the study area. These shallow groundwater bodies have, in previous investigations, been referred to as 'perched' aquifers in these terms: *'an aquifer that forms in the otherwise generally unsaturated zone above a more significant / regional aquifer in the saturated zone'*.

From the data obtained from this study (and in previous studies), the 'perched' groundwater is identified as being representative of small semi-isolated perched zones of temporarily stored groundwater, rather than a hydrogeologically extensive and persistent perched aquifer system. For this reason the shallow groundwater encountered across the study area is of low significance in relation to the groundwater resource, having limited resource potential itself due to the discontinuous nature, limited lateral extent and low storage capacity of the semi-confining layers (i.e. consistent with interpretations in DLWC, 2001).

The total or partial removal of semi-isolated perched zones is unlikely to have any major impact on the local hydrogeological regime, other than potentially increasing the rate of rainfall recharge, due to the partial removal of low permeability layers. The discontinuous nature and variability in the geological make up of the semi-confining layers (i.e. intermittent clay bands and iron stone) means that temporary storage of isolated zones of perched water does occur (as evident from the MW1-5 monitoring bore series). These perched zones will provide some localized recharge to the deeper aquifer via slow drainage through shallow semi confining layers. However, this recharge contribution is negligible when compared to the larger scale recharge mechanisms associated with the Hawkesbury sandstone. These mechanisms would include mass infiltration via complex networks of structurally controlled fracture zones (secondary porosity) at a more regional level throughout the sandstone unit.

This investigation has identified that the regional groundwater level fluctuates seasonally by generally 1m, and up to 3m in some cases, over the longer term. The estimated groundwater elevation of the underlying 'wet weather' regional Hawkesbury Sandstone aquifer around Lot 196 is at 108.65mAHD. The proposed modification to the extraction depth is 127.5mAHD, giving potentially 18.5m of separation (i.e. the lowest level of the proposed excavation would be 18.5m above the regional water table).

Nine registered groundwater abstraction bores were identified within 1km of Lot 196 quarry site. All of the bores listed were terminated at depths well below the extent of the semi-confining impermeable layers identified across the study area. For this reason, none of the production bores would significantly rely on or abstract from the shallow groundwater located in the area, and would therefore not be impacted by an extension of the quarrying activity.

TABLE OF CONTENTS

1.	INTRODUCTION.....	1
1.1	Background	1
1.2	Key Project issues	1
1.3	Project Objectives.....	2
1.4	Scope of Work	2
1.5	Site Description.....	2
2.	PREVIOUS STUDIES	3
3.	HYDROGEOLOGY	4
3.1	The Maroota Sand	4
3.2	Weathered Profile of the Underlying Hawkesbury Sandstone	4
3.3	Hawkesbury Sandstone.....	4
4.	SITE INVESTIGATIONS.....	5
4.1	Drilling Program.....	5
4.2	Additional Drilling Program for Lots 1 and 2	5
5.	HYDROGEOLOGICAL ASSESSMENT	7
5.1	Hydrogeology of the Site	7
5.1.1	Perched Aquifer Zones Geometry	7
5.1.2	Rainfall.....	8
5.1.3	Wet weather groundwater levels	8
5.2	Conceptual Model.....	8
6.	POTENTIAL IMPACTS.....	9
6.1	Regional Aquifer Impact	9
6.2	Impacts on Other Users.....	9
7.	CONCLUSIONS.....	10
8.	REFERENCES.....	11

TABLES

Table 4.1: Deep Monitoring Bore Summary.....	6
Table 4.2: Shallow Monitoring Bore Summary.....	6
Table 5.1: Perched Aquifer Identification Summary.....	7
Table 6.1: Summary of Registered Bores in the Area	9

FIGURES (compiled at end of report)

Figure 1.1: Site Layout and groundwater monitoring network
Figure 3.1: Regional Geology and registered bores
Figure 5.1: Hydrogeological Cross Section of north western extraction area
Figure 5.2: Hydrogeological cross section of the region
Figure 5.3: Hydrographs of MW1, MW4, BH1, BH2 and BH3

APPENDICES

Appendix A: Composite Bore Logs

1. INTRODUCTION

1.1 Background

Dixon Sand (Penrith) Pty Ltd owns and operates a sand quarry off Old Northern Road. The quarry comprises four separate parcels of land identified as Lots 1 and 2 DP547255 and Lot 29 and Lot 196 DP 752025.

In 2000, Development Consent No. 796/00/HE was issued by the Land and Environment Court of NSW that allowed for continued operations including extraction on Lots 29 and 196 to a depth of 15.24 metres below the original natural surface (m BNS). It is understood that the limit on the depth of extraction of 15.24m BNS was in put in place because the resource present at depths below this was owned by the Crown as per the title. This Development Consent lapsed on 22 March 2010.

In 2004, Development Consent No. 250-09-01 was issued by the Land and Environment Court of NSW that allowed for the operation of extractive industry, water management and rehabilitation on Lots 1 and 2 and the continued use of the existing control processing plant on Lot 196. This approval for extraction on Lot 1 and Lot 2 is applicable until 24 May 2022.

Given the lapse in the Development Consent No. 796/00/HE on Lot 29 and Lot 196, Dixon Sand applied to the NSW Department of Planning (the NSW DoP), to modify Development Consent No 250-09-01 to include extraction and other associated activities on Lots 29 and 196. In addition, Dixon Sand also applied to extend the depth of extraction on Lot 196 from 15.24m BNS to two-metres above the regional groundwater table.

The proposed modifications to Development Consent No 250-09-01, was defined as “extracting construction sand from Lot 196 DP752025 to a depth not exceeding 2 metres above the highest recorded wet weather groundwater level; and rehabilitating the site”. The modifications are currently being assessed by the NSW DoP under Section 75W of the Environmental Planning and Assessment Act 1979. Part of the assessment requires the preparation of an Environmental Assessment (EA) of the potential economic, social and environmental impacts of the proposed modifications.

The Director General's Requirements (DGRs) for the EA have been issued to Dixon Sand. A specific DGR for the EA outlines the need for a detailed assessment to be undertaken of the potential groundwater impacts of the proposed increased depth of extraction on Lot 196.

The potential groundwater impacts as a result of the increase in extraction depth have been identified and addressed in a report produced by E3 Consulting Australia Pty Ltd, entitled *Preliminary Assessment of Potential Impacts to Groundwater of Proposed Extension of Dixon Sand Operations, Lot 196, DP 752025, Maroota NSW*. The assessment concluded that the hydrogeological system underlying Lot 196 is not well understood and that further information could be provided by installing a monitoring bore on Lot 196, so that the high wet weather groundwater level could be determined.

RPS Aquaterra was commissioned by Nexus Environmental Planning, on behalf of Dixon Sand (Penrith) Pty Ltd to refine the conceptual model, and more specifically to determine the high wet weather groundwater level beneath Lot 196.

1.2 Key Project issues

The key technical issues pertinent to Lot 196 are as follows:

- The total depth of extraction that will be permitted on Lot 196 will be limited by the depth of the regional water table “to a depth not exceeding 2 metres above the highest recorded wet weather groundwater level”, which until recently has not been well defined.
- The current depth of extraction permitted on Lot 196 has been based on information obtained from a series of shallow monitoring bores which have been interpreted as monitoring a shallow ‘perched’ groundwater body of limited significance and not the regional water table.

1.3 Project Objectives

The objectives of this assessment were to:

- Review existing hydrogeological studies, with reference to the location of Lot 196 and the Maroota area.
- Install a monitoring piezometer on the western boundary of Lot 196 to refine the conceptual hydrogeological understanding of Lot 196 that was developed during previous assessments.
- Determine the wet weather groundwater level beneath Lot 196, such that the depth of extraction can be accurately determined.
- Ascertain the significance of the shallow groundwater body in order to provide regulators with sufficient information to make informed decisions in relation to the modification of the current consent condition.

1.4 Scope of Work

The main components of works for this study included:

- A site inspection and walk over.
- Review of existing hydrogeological information.
- Coordination and supervision of a drilling program.
- Groundwater monitoring, data analysis and reporting.

1.5 Site Description

The quarry comprises four separate parcels of land identified as Lots 1 and 2 DP547255 and Lot 29 and Lot 196 DP 752025, at 4610 Old Northern Road, Maroota (Figure 1.1).

The majority of the northern, central and eastern parts of Lots 29 and 196 are being used for extraction operations.

Lot 196 is an area of approximately 28 ha and is located in the western portion of the Site. The north western extraction area is located on Lot 196. It is proposed to continue extraction from this area to an approximate depth of 47.5m below the existing ground surface (127.5m AHD).

Lot 196 also contains an office and workshop area, weighbridge, sand processing plant, access roads, a series of cut slopes, ponds and platforms.

The south-western portion of Lot 196 is located within a gully that is covered by stands of native vegetation that appeared to be undisturbed.

2. PREVIOUS STUDIES

The hydrogeological system underlying Lot 196 has been previously assessed by ERM (2005) and in more recent times by E3 (2010). However, due to the limited amount of groundwater data available, the regional hydrogeological system has not been well defined or understood. For this reason the potential impacts to groundwater from the proposed extension of depth of extraction could not previously be adequately assessed.

Five monitoring bores were established in the area by ERM in 2005 (MW1 to MW5 - Figure 1.1). The bores are shallow in depth (ranging from 15.5 - 33.8m below ground level) and have been reported to be monitoring a shallow perched groundwater body, which is discontinuous and only exists during and shortly after wet periods (E3, 2010; and ERM, 2005). The elevation of the perched water table ranges from 170 to 200mAHD.

The presence of a shallow groundwater body was also identified in logs of boreholes drilled in the Maroota area by Farley and Lewers Ltd (1978) and DLWC (2001), which reported the presence of shallow clay lenses that are of limited lateral extent.

MW5 is located on Lot 196 and recorded a groundwater level of approximately 5.0m below ground level. This piezometer is considered to be monitoring groundwater sitting above a thin low permeability layer such as a clay or shale lens or ironstone band, all of which are commonly found at shallow depths in this area.

These low permeability units can cause temporary perched aquifer systems to occur well above the deeper regional groundwater level of the Hawkesbury Sandstone, and have limited resource value because they have small extent and limited storage (DLWC, 2001).

The 'wet weather' regional groundwater level beneath Lot 196 could not be established on the basis of MW5 alone. The E3 study concluded that Lot 196 is underlain by a non water-bearing shallow horizon of weathered sandstone which overlies the Hawkesbury Sandstone, and that the water-bearing zone intercepted by MW5 is not representative of the depth to water-bearing or saturated regional aquifer system. However, information obtained from the drilling records of deeper production bores GW105044 and GW105047 located to the west and north (Figure 3.1), indicated that the depth to the water bearing zone(s) is likely to be greater than 30m below ground level (E3, 2010).

3. HYDROGEOLOGY

3.1 The Maroota Sand

The Maroota Sand is a sandy formation of limited areal extent, which was deposited mainly in two palaeochannels located to the east of the site, eroded into the exposed surface of the Hawkesbury Sandstone (Figure 3.1).

Away from the palaeochannels, the presence of considerable clay and cemented layers gives rise to localised perched water tables. From a resource viewpoint, the perched water table aquifers have limited value due to their small extent and storage. These water bodies are found at variable elevations and depend upon rainfall infiltration for their persistence. The Maroota Sand, where it occurs below water table, as in the deeper sections of the palaeochannels, constitutes a substantially unconfined, or water table, aquifer open to direct rainfall infiltration

3.2 Weathered Profile of the Underlying Hawkesbury Sandstone

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 (recharge) 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.

3.3 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 inter pore spaces, such as kaolinitic clay and iron oxides. Although the rock has negligible primary permeability, fracturing and jointing features, where they are open and interconnected, provide secondary permeability and storativity.

A review of the bore records held by the NSW Office for Water for the Maroota area (including observation bores established during their Stage 2 Maroota Groundwater Study), showed 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 rock mass. Three nested bores (GW075000/1,2,3) located approximately 2.6 km to the south are approximately 22m, 43.5m and 110m deep, and reflect groundwater levels at 14.4m (Maroota Sand), 27.7m (Hawkesbury Sandstone) and 29 m (Hawkesbury Sandstone) below ground level respectively. The water level at 14.4 m is interpreted to be a localised shallow groundwater body of limited significance, while the two deeper levels at 27.7m and 29.0m are considered to represent the regional groundwater aquifer system. The slightly lower level for the deep bore suggests a downward flow gradient.

Most of the bores in the area are located at high elevations along the Maroota Ridge (located to the east of Lot 196), which represents both a topographic divide and a groundwater divide.

Groundwater gradients measured in recent investigations in closely spaced bores are variable and steep in places due to the low permeability of the rock mass. 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 topographic divides.

4. SITE INVESTIGATIONS

4.1 Drilling Program

Following on from the recommendation made in the E3 report, a groundwater monitoring bore (BH1) was installed on the western boundary of the north western extraction area (Figure 1.1). The bore was drilled to a depth of 75m so that the wet weather groundwater level of the regional aquifer underlying Lot 196 could be established.

In addition, two monitoring bores (BH2 and BH3) were drilled on Lot 1, DP204159 to determine the groundwater elevation to the east (Figure 1.1).

The three monitoring bores (BH1, BH2 and BH3) were drilled along an east to west transect and completed within the Hawkesbury Sandstone Aquifer. BH1 is located on the western boundary of the north western extraction area, and BH2 and BH3 are located on Lot 1, DP204159 (Figure 1.1). These three monitoring bores, together with other deeper bores in the area, have been used to infer the regional groundwater levels beneath and around Lot 196.

Drilling was undertaken by Terratest Pty Ltd, who used conventional rotary (air) hammer techniques. Air hammer drilling uses compressed air, which is used to work the hammer and return drill cuttings to the surface. One of the major advantages of conventional air hammer drilling is that water-bearing zones and yields can be identified when formation water is discharged with the cuttings.

The geological log, water strike information and construction details of BH1, BH2 and BH3 are presented in Appendix A and summarized in Table 4.1.

The construction of each piezometer comprised of surface casing installed within upper unconsolidated sequence of the sandstone. Each monitoring bore was drilled at 90mm diameter to accommodate 50mm diameter PVC casing to depths of up to 75m.

The screened intervals were 3 to 6m in length and consisted of Class 12, 50mm diameter, machine slotted PVC (0.8mm aperture). Graded gravel pack was installed within the bore annulus and extended 2m above the top of the screens. A 5m bentonite and cement/grout seal was installed into the annulus of the borehole above the gravel packed zone.

Each monitoring bore was surveyed relative to the Australian Height Datum (AHD).

4.2 Additional Drilling Program for Lots 1 and 2

In February 2011, two additional monitoring bores (BH6 and BH7) were drilled on the northern and southern boundaries of Lots 1 and 2 (Figure 1.1) as part of investigations associated with modifications to the consent conditions for those areas. Information obtained from these investigations has therefore been considered in this study in order to support this assessment and to determine (to a greater degree of certainty) the wet weather groundwater level of the Hawkesbury Sandstone aquifer and help delineate and quantify the significance of the shallow groundwater zones identified in this and in previous investigations.

BH6 was drilled along the northern boundary of Lot 1, and BH7 was drilled along the southern boundary of Lot 2, with both being completed within the Hawkesbury Sandstone (Figure 1.1). Both monitoring bores were drilled in close proximity to existing shallow monitoring bores (MW1 and MW3) and was done to further demonstrate the degree of separation between the perched localised zones and the deeper regional aquifer identified in previous drilling programs.

The geological log, water strike information and construction details of BH6 and BH7 are presented in Appendix A and are discussed in more detail in Section 5.2.1 and summarised in Table 4.1.

Each monitoring bore was surveyed relative to the Australian Height Datum (AHD).

A summary of both the deep and key shallow boreholes, relevant to this study have been listed in Tables 4.1 and 4.2.

Table 4.1: Deep Monitoring Bore Summary

Monitoring Bore	Easting	Northing	Ground RL (m AHD)	Screen Interval (mbgl)	Bore Depth (m)	Top of Stand pipe (m AHD)	GWL (m AHD)	GWL (mbgl)
BH1	312290	6297040	166.18	68-74	75	166.89	108.95	-
BH2	313426	6297209	201.88	67-70	70	202.33	164.88	-
BH3	313805	6297092	193.54	57-60	60	194.06	160.94	-
BH6	313151	6296826	195.41	54-60	60	~195.91*	164.51	-
BH7	313068	6296495	181.47	54-60	60	~181.97*	160.77	-
GW105044	312044	6297105	-	-	144.5	-		61.8
GW105047	312504	6296897	-	-	156.8	-		60.0

*approximate standpipe height. Not surveyed at time of reporting standpipe height above ground level assumed at 0.5m

mbgl – meters below ground level.

Table 4.2: Shallow Monitoring Bore Summary

Monitoring Bore	Easting	Northing	Ground RL (m AHD)	Screen Interval (mbgl)	Bore Depth (m)	Top of Stand pipe (m AHD)	GWL (m AHD)
MW1	-	-	182.6	-	15.5	182.98	175 – 178*
MW2	-	-	215.49	-	25.3	215.8	192 – 200*
MW3	-	-	195.42	-	33.8	196.45	175 – 178*
MW4	-	-	187.83	-	29.5	188.92	171 – 173*
MW5	-	-	-	-	-	167.44	162 – 163*

*GWL ranges taken from July 2007 to June 2008 - Annual Environmental Management Report (ERM July 2009)

mbgl – meters below ground level.

5. HYDROGEOLOGICAL ASSESSMENT

5.1 Hydrogeology of the Site

Based on the bore logs for BH1, the production bores located on Lot 196 and the monitoring wells located on Lots 1 and 2, it appears that the Maroota Sands unit and its shallow aquifer do not underlie these areas. Information from the logs indicate that Lot 196 and the remainder of the site is underlain by a shallow and narrow non water bearing unconsolidated horizon of weathered clays, sandstones and shales, which may be part of the Eluvial Sand unit that grades rapidly to massive sandstones of the Hawkesbury Sandstone. The Maroota Groundwater Study indicated that the Maroota Sand unit potentially extends laterally only to the very eastern parts of Lot 1 and Lot 2 and is not present under Lot 196.

MW5 which is located on Lot 196 revealed evidence of a shallow water table at about 5.0m below ground level (162mAHD). Shallow perched groundwater zones are commonly found to exist above relatively impermeable layers (aquitards) such as clay lenses, shale or ironstone bands throughout the area. These shallow groundwater bodies are commonly referred to as 'perched' aquifers and are defined as 'an aquifer that forms in the otherwise generally unsaturated zone above the regional aquifer in the saturated zone'. The use of the term 'perched' aquifer in this case, can be misleading as it suggests that the perched aquifer could be of significant importance hydrogeologically and from a potential resource perspective. The perched groundwater identified in this area is reported to have limited resource value because of its isolated nature, limited extent and low storage capacity (DWLC, 2001).

5.1.1 Perched Aquifer Zones Geometry

The lateral extent and depth of the perched groundwater zones can be inferred from the observations made from the drilling program. The drill logs indicate the presence of clay bands across the site at depths ranging from approximately 180 to 165mAHD or around 10 to 20m below ground level (Refer to Table 5.1). The drilling records also indicate that the first water strike (during drilling) was observed between these low permeability layers (Table 5.1). The occurrence of thinly banded clay layers does appear to be relatively common across the middle of the site (BH2, 6 and 7) with two separate bands observed approximately 5m apart. The clay bands do not appear to be as prevalent in BH1 and BH3 (located to the east) indicating that the clay sequence is likely to thin and pinch out to the east and west, reducing the capacity of the layer to retain water (Figure 5.2). The thinly banded and laterally discontinuous nature of the clay units and the iron stone sequences means that any perched water that is temporarily stored will eventually drain out via topographic lows, leakage in to the regional Hawkesbury sandstone (Figure 5.2), or drain slowly through the low permeability unit itself.

Table 5.1: Perched Aquifer Identification Summary

Borehole Number	Semi Impermeable layer description	Semi Impermeable layer depth (m bgl)	1 st Water Strike (m bgl)	2 nd Water Strike (m bgl)	Ground RL (m AHD)	Groundwater Depth (m AHD)
BH1	Clay bands	6.0	7.8 - 10	59.8	166.18	108.24*
BH2	Harder sandstone bands	10.1 – 10.8 13.6 – 13.9 16.1- 16.8	7.8	37.7	201.88	164.43*
BH3	Iron stone bands	10 and 34	13.5	34.8	193.54	160.42*
BH6	Clay bands	5.2 and 21.9	18.2	53.9	195.41	164.01*
BH7	Clay bands	14.7 and 16.4	18.2	55.5	181.47	160.27*
MW1	-	-	-	-	182.6	177.60
MW2	-	-	-	-	215.49	199.00
MW3	-	-	-	-	195.42	176.42
MW4	-	-	-	-	187.83	170.83
MW5	-	-	-	-	167.44	162.00

*represents regional groundwater depths observed from the deeper "BH" series of monitoring bores.

5.1.2 Rainfall

The groundwater levels recently monitored in MW1 and MW4 did not respond greatly to a 53mm rainfall event, which occurred on the 3rd to 5th of November 2010. The flat line hydrographs (Figure 5.3) supports the theory that the shallow groundwater encountered in this area is not indicative of a significant perched aquifer. Typically, rainfall is the principal mechanism of recharge to a perched system therefore a response to rainfall would normally be apparent following rainfall recharge capture and containment. In this case, it is likely that rainfall recharge gradually drains where the semi-confining layers discontinue or thin out, supporting the interpretation that storage in these shallow groundwater zones is both temporary and of limited capacity.

5.1.3 Wet weather groundwater levels

Due to the short duration of groundwater monitoring on BH1, the seasonal variations of the groundwater elevations in the deep Hawkesbury Sandstone aquifer have not yet been established. However, longer term groundwater monitoring has been carried out on monitoring bores VEL-MW1 to VEL-MW3 at the neighbouring quarry (PF Formation). The locations of the monitoring bores are presented in Figure 3.1 and hydrographs showing the groundwater elevation since 1998 have been reported in URS (2006). The groundwater levels show a typical annual seasonal fluctuation of up to 1m, with a long-term climate-driven range of 1 to 3m. Receding groundwater levels were evident across most bores during extended periods of below average rainfall.

Therefore, it is expected that the seasonal fluctuations of BH1 would also show a seasonal range of about 1m or up to 3m over a longer term and therefore the 'wet weather high groundwater level' beneath lot 196 would be at a minimum elevation of about 109 to 111 mAHD. This is 16.5 to 18.5m below the proposed extraction depth of 127.5mAHD.

An east to west cross section of the north western extraction area (Figure 5.1) shows the estimated groundwater elevation of the underlying regional Hawkesbury Sandstone aquifer (108.65mAHD). The proposed extraction depth of the north western pit (108.65m AHD) is also shown for reference, indicating approximately 18.5m of separation between the proposed base of the excavation and the regional groundwater table.

Groundwater levels in the deep aquifer of the Hawkesbury Sandstone, underlying Lot 196, have been confirmed by BH1 (Figure 5.1). The groundwater levels recorded to date are shown in Figure 5.3. The most current groundwater elevation was measured on 11 November 2010 at 59.94m below ground level (108mAHD).

5.2 Conceptual Model

As part of this assessment a conceptual model was developed to graphically represent the various hydrogeological processes identified in the vicinity of Lot 196 and how these localised processes link in with more regional systems. The conceptual model has been developed based on the information obtained from previous studies (E3, 2010; and ERM, 2005), licensed bores and the monitoring bores (BH1, BH2, BH3, BH6 and BH7).

Diagram 1 (Figure 5.2) shows the conceptual model section at a more regional scale. The groundwater divide, (which coincides with the topographic divide of the Maroota Ridge) permits groundwater flow both to the east and west towards the upper tributaries of the Hawkesbury River. At lower elevations, the tributaries represent areas of possible groundwater discharge from the Hawkesbury Sandstone aquifer. To the west and away from the divide (towards Lot 196) the regional groundwater table exhibits a steep hydraulic gradient (due to low permeability and secondary porosity) towards a topographic low / tributary discharge point to the west of Lot 196. The 'wet weather' regional groundwater level is shown to occur well below the base of the proposed extraction area (127.5mAHD), with the groundwater elevations observed from BH1 showing approximately 16.5 to 18.5m of separation. The model also serves to show that the shallow groundwater encountered is representative of semi-isolated pockets of groundwater that accumulate temporarily above discontinuous combinations of low permeability clay bands and iron stone. Due to the limited storage potential of these low permeability layers, the shallow groundwater will gradually drain, providing some slow and low volume recharge to the regional aquifer (Diagram 2).

6. POTENTIAL IMPACTS

6.1 Regional Aquifer Impact

The total or partial removal of the shallow perched groundwater zones is unlikely to have any major impacts to the local hydrogeological regime, other than potentially increasing the rate of rainfall recharge (due to the partial removal of low permeability layers) to the regional aquifer system. As mentioned, the shallow groundwater system will recharge the deeper aquifer via gradual drainage, however, this level of recharge is negligible when compared to the larger scale recharge mechanisms associated with the Hawkesbury sandstone. These mechanisms would include mass infiltration via complex networks of structurally controlled fracturing (secondary porosity) at a more regional level throughout the sandstone unit.

No information was made available as to whether there had been any impacts by sand extraction previously, either on this or on the adjoining quarry sites.

6.2 Impacts on Other Users

The impact of the extended quarrying is also likely to have a minimal impact on existing users in the immediate vicinity. A summary review of other registered groundwater bores (using information contained in the NSW Groundwater Archive) in the area is summarised in Table 6.1 and is also shown on Figure 3.1

Table 6.1: Summary of Registered Bores in the Area

Registered Borehole Number	Licence Number	Geological Termination and Recorded Depth (m bgl)	Total Bore Depth (m bgl)	Recorded Groundwater Depth (m bgl)
GW060051	10BL130437	Sandstone (109.7)	172	172
GW108866	10BL165806	Not listed	36.5	18
GW055962	10BL121786	Sandstone (9.0)	22.0	-
GW048741	10BL107252	Sandstone (30.0)	30	-
GW034628	Govt.	Sandstone (83.52)	91.4	35
GW105192	10BL161673	Sandstone (234)	234	46
GW102133	10BL159032	Grey Sandstone (150)	150	-
GW101528	10BL158453	Sandstone (108)	150	20.5
GW016348	10BL006847	-	73	48

A review of the database has indicated that there are nine registered groundwater abstraction bores within 1km of Lot 196. All of the bores listed were terminated at depths well below the extent of the low permeability layers observed in the site investigation drilling and from the borehole log review. Therefore none of these production bores would significantly rely on or abstract from groundwater stored above these layers and would therefore not be significantly impacted by an extension of the quarrying activity. Continued observations from the borehole network will be required to monitor general groundwater behaviour as part of the ongoing operations licensing requirements.

7. CONCLUSIONS

Following a review of the information made available and from the findings made in this assessment the following conclusions have been drawn:

- Lot 196 and the remainder of the site is underlain by a series of shallow and limited extent zones of non water-bearing unconsolidated horizons of weathered clays, sandstones and shales. These low permeability layers permit temporary storage of groundwater at various shallow depths. These temporary perched storages have limited resource value because, like the Maroota Sand, they are discontinuous and of limited extent and low storage.
- Seasonal groundwater fluctuations observed from BH1 show seasonal ranges of about 1m. These fluctuations could range up to 3m over the longer term. Therefore the 'wet weather high groundwater level' beneath Lot 196 would be at a minimum elevation of about 109 to 111m AHD. This is 18.5 to 16.5m below the proposed extraction depth of 127.5m AHD.
- The total or partial removal of the shallow perched groundwater zones is unlikely to have any major impacts to the local hydrogeological regime, or to the regional aquifer system, other than potentially increasing the rate of rainfall recharge to the regional aquifer system. However, this potential increase in recharge is negligible when compared to the larger scale recharge mechanisms associated with the Hawkesbury sandstone.
- There are nine registered groundwater abstraction bores within 1km of Lot 196. All of the bores listed were terminated at depths well below the extent of the low permeability layers. Therefore none of these production bores would significantly rely on or abstract from groundwater stored above these layers and would therefore not be significantly impacted by an extension of the quarrying activity.
- Continued observations from the borehole network will be required to monitor general groundwater behaviour as part of the ongoing operations licensing requirements

8. REFERENCES

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E3, 2010. Preliminary Assessment of Potential Impacts to Groundwater of Proposed Extension of Dixon Sand Operations, Lot 196 DP 752025, Maroota NSW

ERM, 2005. Environmental Resources Management Australia Pty Ltd Dixon Sand Maroota Quarry Lots 1, 2, 29 & 196, 4610 Old Northern Road, Site Environmental Management Plan Dixon Sand (Penrith) Pty Ltd January 2005.

DWLC, 2001. NSW Department of Land and Water Conservation (2001) Maroota Groundwater Study Technical Status Report.

FIGURES

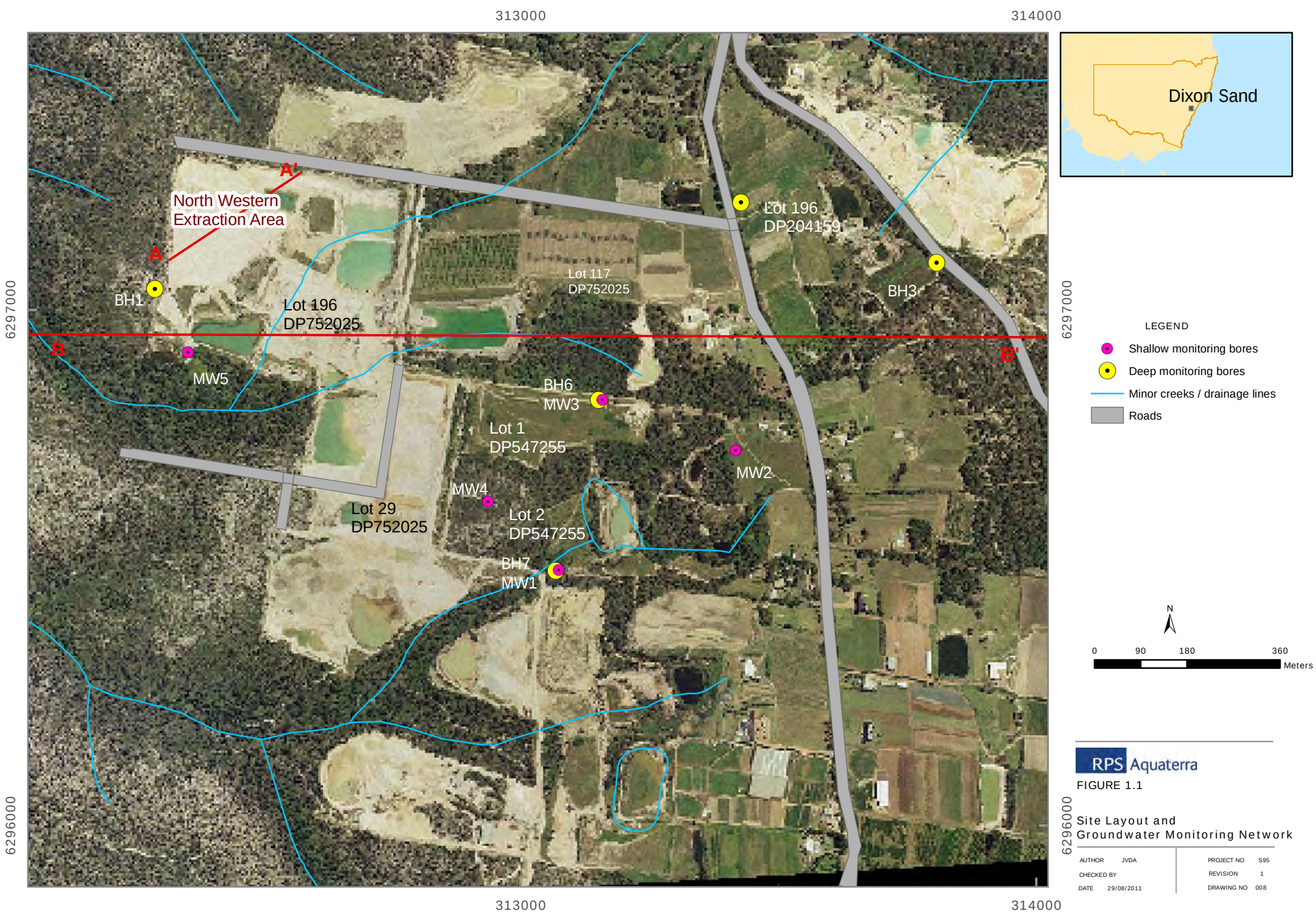
Figure 1.1: Site Layout and groundwater monitoring network

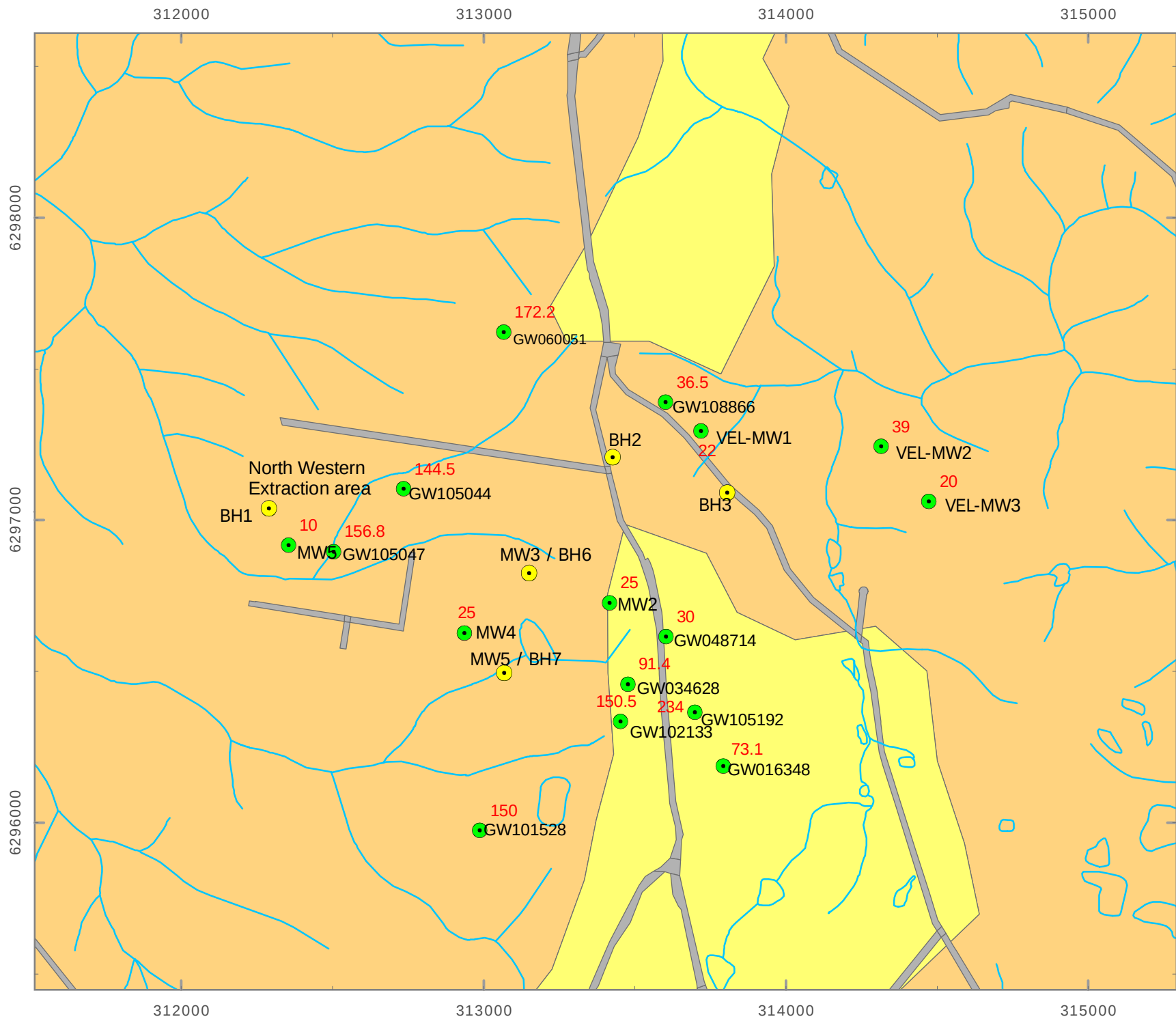
Figure 3.1: Regional Geology and registered bores

Figure 5.1: Hydrogeological Cross Section of north western
extraction area

Figure 5.2: Hydrogeological cross section of the region

Figure 5.3: Hydrographs of MW1, MW4, BH1, BH2 and BH3





LEGEND

- New monitoring bores
- Registered bores / monitoring bores

91.4 Bore Termination Depth

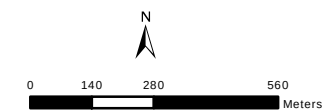
— Minor rivers / Drainage lines

— Roads

Geology

■ Hawkesbury Sandstone

■ Sand

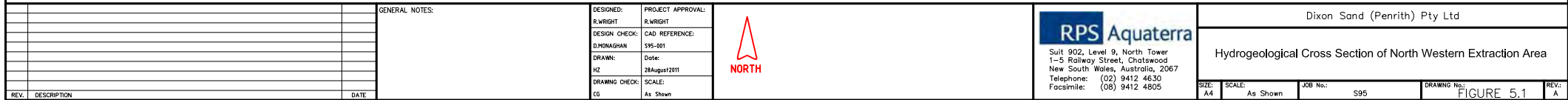


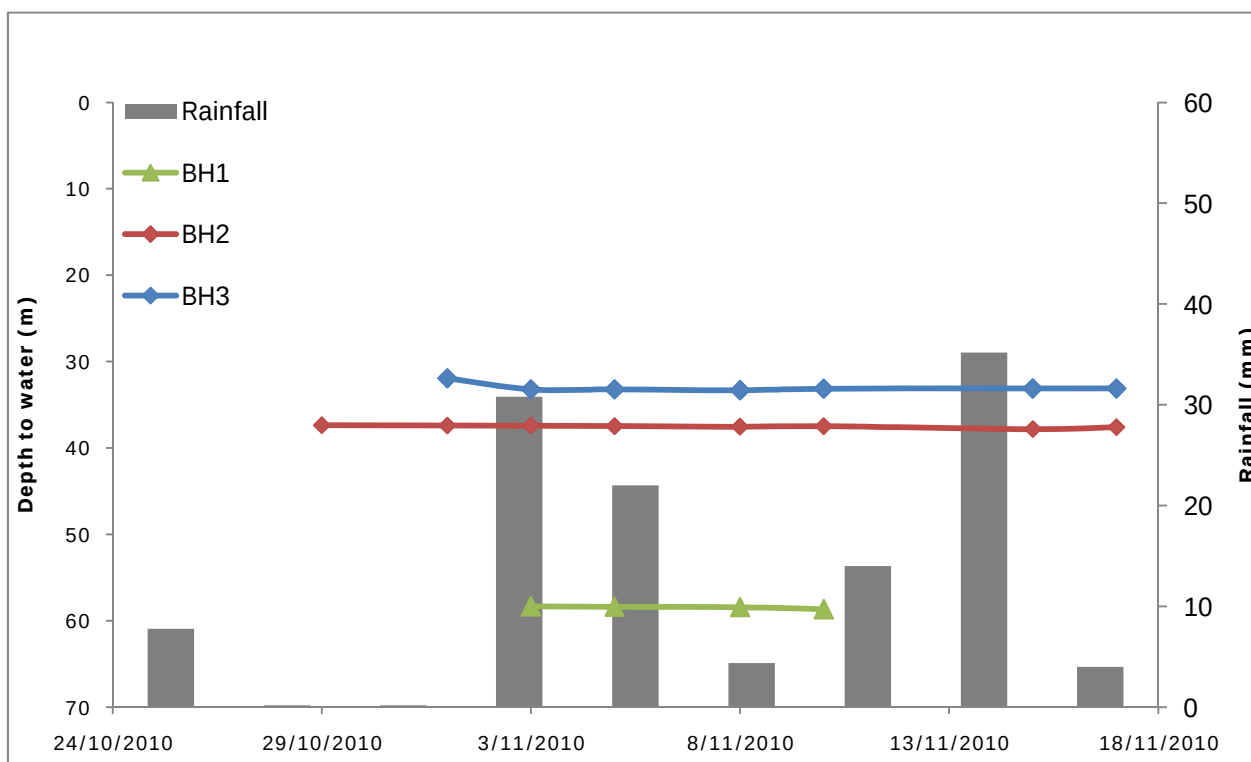
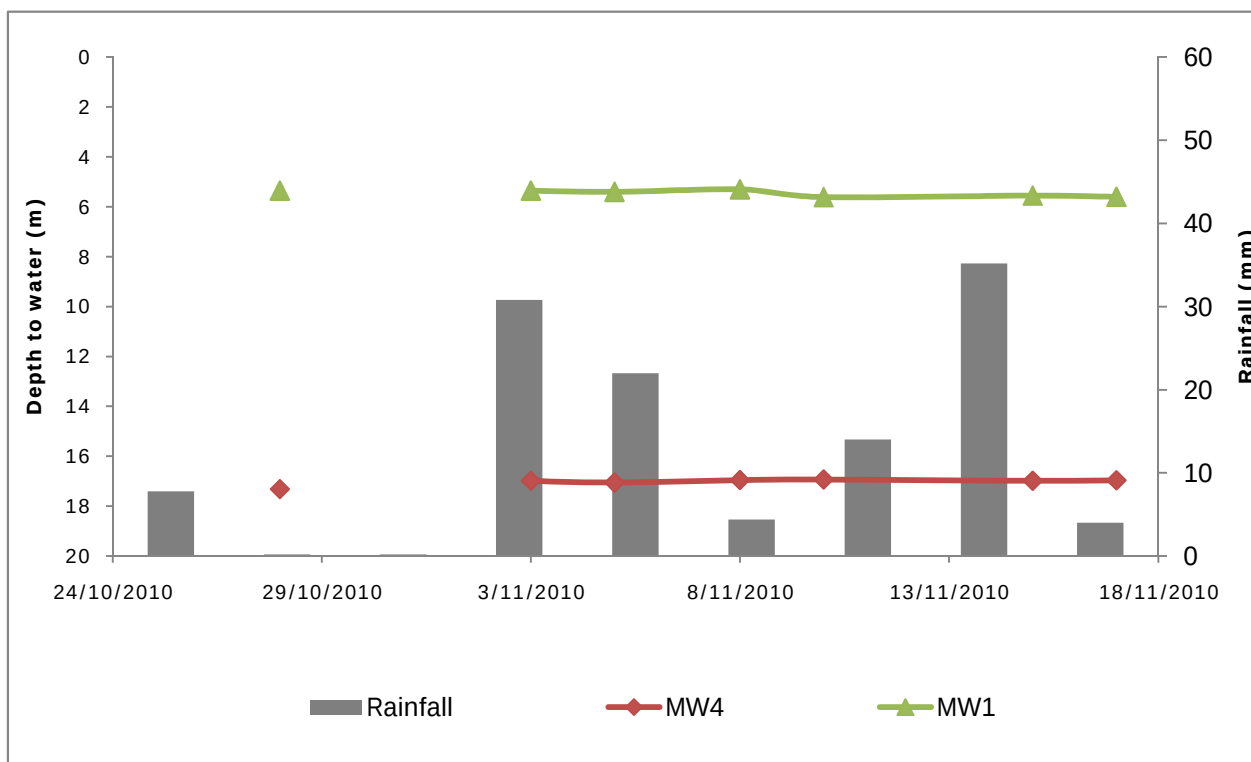
RPS Aquaterra

FIGURE 3.1

Regional Geology and Registered Bore Summary

AUTHOR	JVDA	PROJECT NO	S95
CHECKED BY	PD	REVISION	1
DATE	29/08/2011	DRAWING NO	009





APPENDIX A: COMPOSITE BORE LOGS

Level 9, North Tower
1-5 Railway St, Chatswood
NSW 2067
Tel: (+61) (02) 9412 4630
Fax: (+61) (02) 9412 4805
www.aquaterra.com.au

Client: Dixon Sand (Penrith) Pty Ltd

Project: S95

Commenced:

Completed: 22/10/10

Drilled: Terratest

Logged By:

Method: Rotary Air

Fluid:

Bit Record:

Area: Maroota

East: 312290.45

North: 6297040.00

Collar (RL): 166.18

Static Water Level: 57.94

Date: 15/11/2010

Depth (mbgl)	Geology	Graphic Log	Lithological Description	Field Notes	Well Completion	
					Diagram	Notes
0	Sandstone		Sandstone: Sandstone white			
	Sandstone		Sandstone: Sandstone brown/white			
	Sandstone		Sandstone: Sandstone yellow brown			
10	Sandstone		Sandstone: Sandstone white brown gray yellow some clay bands. 7.8 m water 1 l/m, 10 m water 10 l/m			
	Sandstone		Sandstone: Sandstone gray some large grains			
20	Sandstone		Sandstone: Sandstone very hard			
	Siltstone		Siltstone: Siltstone shale			
	Sandstone		Sandstone: Sandstone very hard. 23.8 m water 2 l/m			
30	Sandstone		Sandstone: Sandstone brown to gray. 37.7 m water 1 l/m			Fill to top 50 mm blank PVC
40	Sandstone		Sandstone: Sandstone gray dry			
50	Sandstone					
60	Sandstone		Sandstone: Sandstone coarse grain some shale			Bentonite Seal 58 to 63 m
70	Sandstone		Sandstone: Sandstone gray. 59.8 m water 13 l/m. 75 m EOH			2mm sand gravel pack 63 m to 75 m 50 mm slotted PVC from 68 to 74 m 1m sump

Level 9, North Tower
1-5 Railway St, Chatswood
NSW 2067
Tel: (+61) (02) 9412 4630
Fax: (+61) (02) 9412 4805
www.aquaterra.com.au

Client: Dixon Sand (Penrith) Pty Ltd

Project: S95

Commenced:

Completed: 27/10/10

Drilled: Terratest

Logged By:

Method: Rotary Air

Fluid:

Bit Record:

Area: Maroota

East: 313426.48

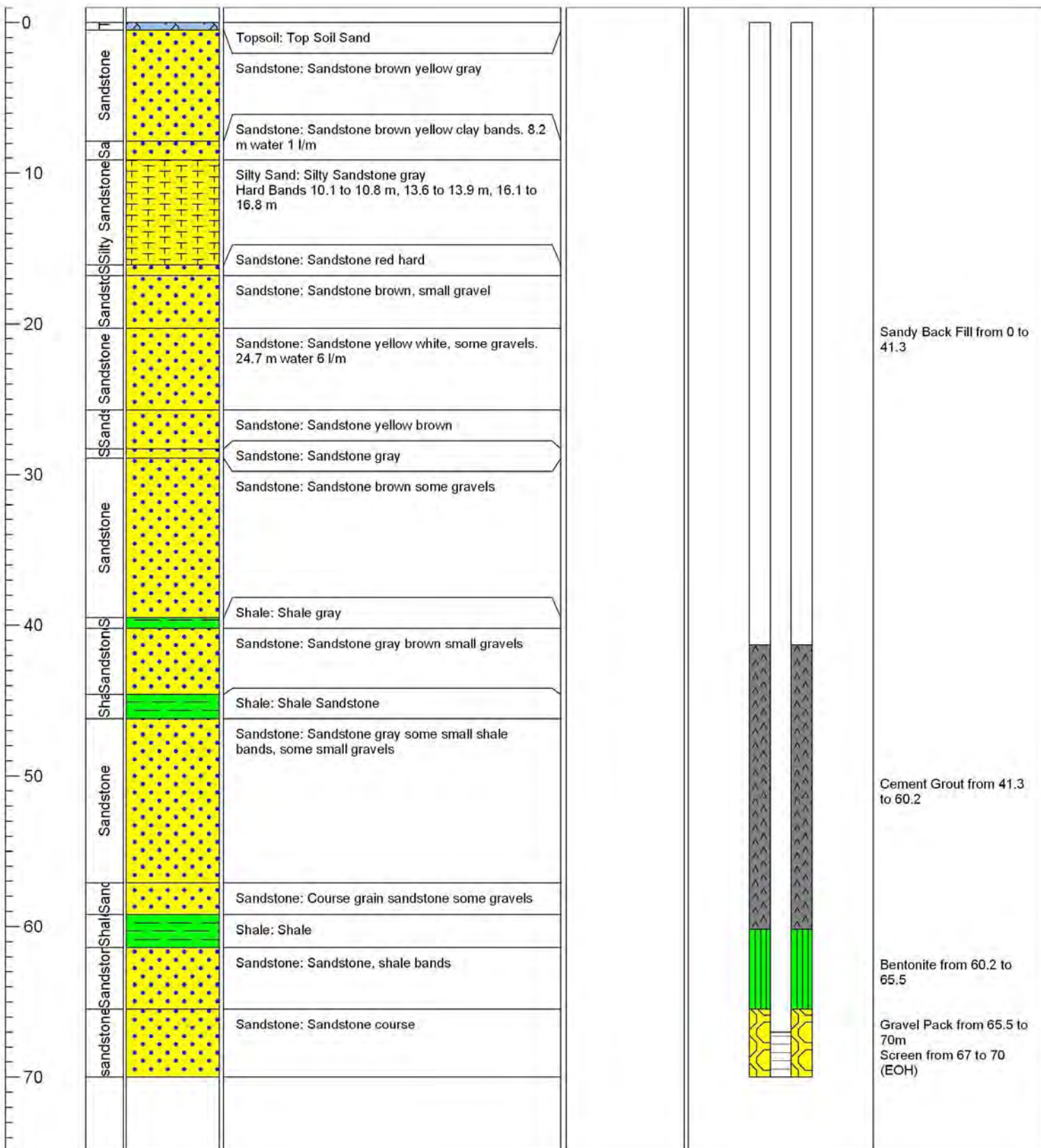
North: 6297209.18

Collar (RL): 201.88

Static Water Level: 37.35

Date: 15/11/2010

Depth (mbgl)	Geology	Graphic Log	Lithological Description	Field Notes	Well Completion	
					Diagram	Notes



Level 9, North Tower
1-5 Railway St, Chatswood
NSW 2067
Tel: (+61) (02) 9412 4630
Fax: (+61) (02) 9412 4805
www.aquaterra.com.au

Client: Dixon Sand (Penrith) Pty Ltd

Project: S95

Commenced:

Completed: 28/10/2010

Drilled: Terratest

Logged By:

Method: Rotary Air

Fluid:

Bit Record:

Area: Maroota

East: 313805.95

North: 6297091.59

Collar (RL): 193.54

Static Water Level: 32.58

Date: 15/11/2010

Depth (mbgl)	Geology	Graphic Log	Lithological Description	Field Notes	Well Completion	
					Diagram	Notes

0			Top Soil Sand: Top soil sand			
			Sandstone : Sandstone yellow brown			
			Sandstone: Sandstone white			
			Sandstone: Sandstone orange			
			Sandstone: Sandstone white			
10			Sandstone: Sandstone brown, some small iron stone bands. 13.5 m water 5 l/m			
			Sandstone: Sandstone orange			
20			Sandstone: Sandstone yellow orange, 18.6 to 18.7 m hard			
			Sandstone: Sandstone white brown, ironstone gravels			
30			Sandstone: Sandstone brown, some small ironstone bands. 34.8 m water 2 l/m			
			Shale: Shale			
40			Sandstone: Sandstone gray shale bands			
			Ironstone: Ironstone			
			Sandstone: Sandstone yellow brown, some ironstone bands			
50			Sandstone: Sandstone white brown, some small ironstone bands			
			Sandstone: Sandstone gray, some small shale bands. Water 54.6 m 10 l/m			
60						
70						

Blank PVC

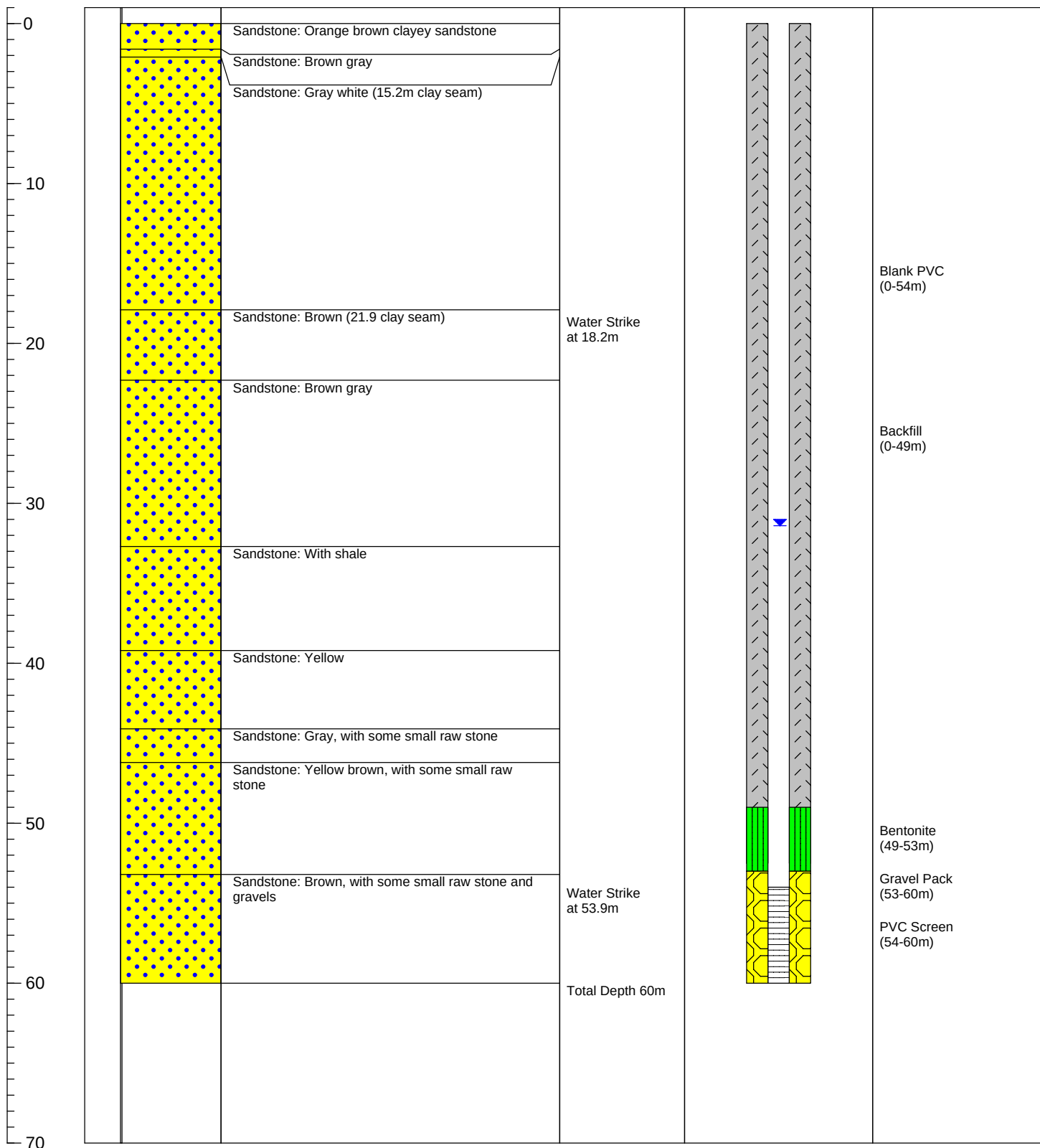
Grout

Bentonite

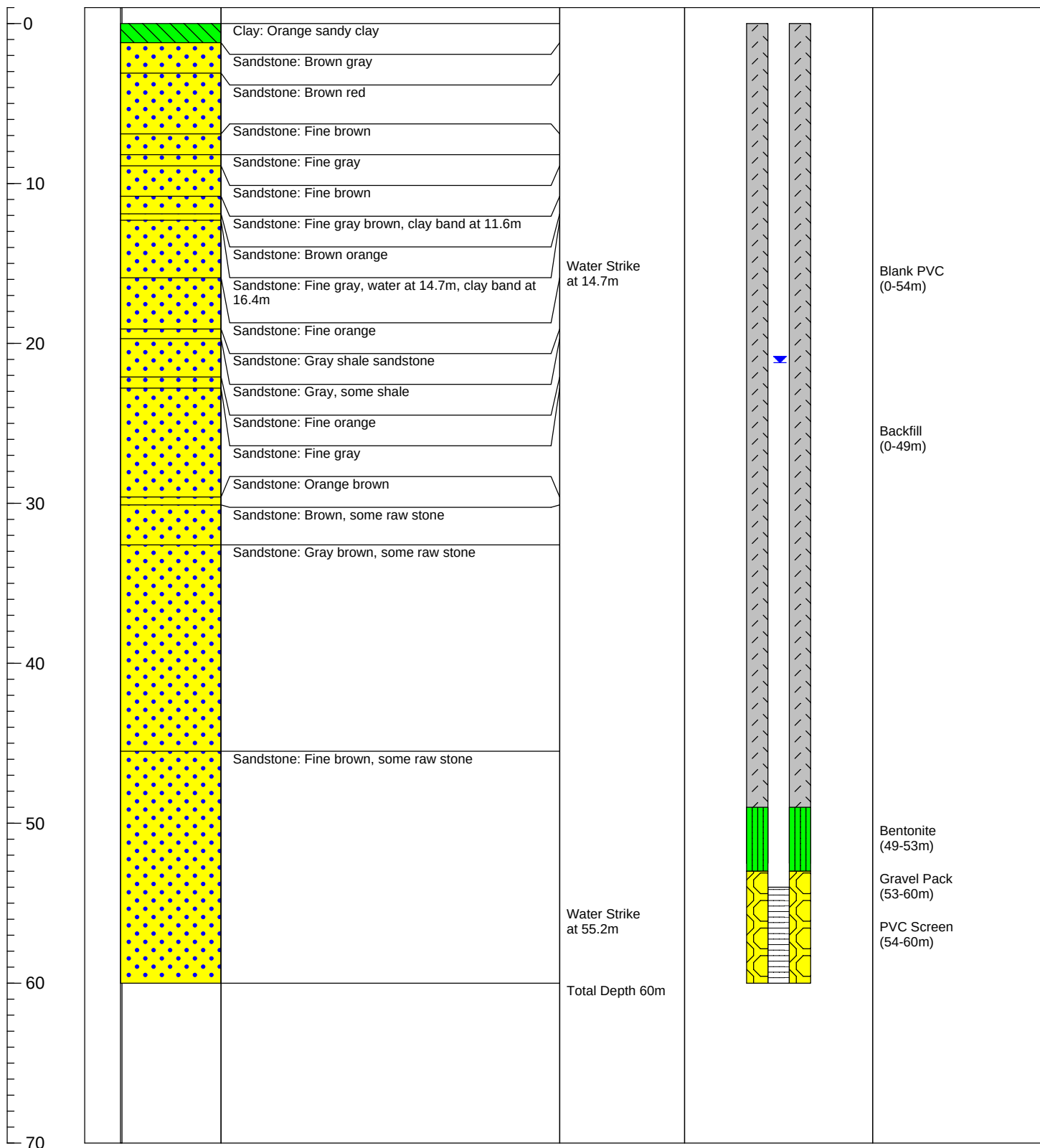
Gravel Pack

Screen

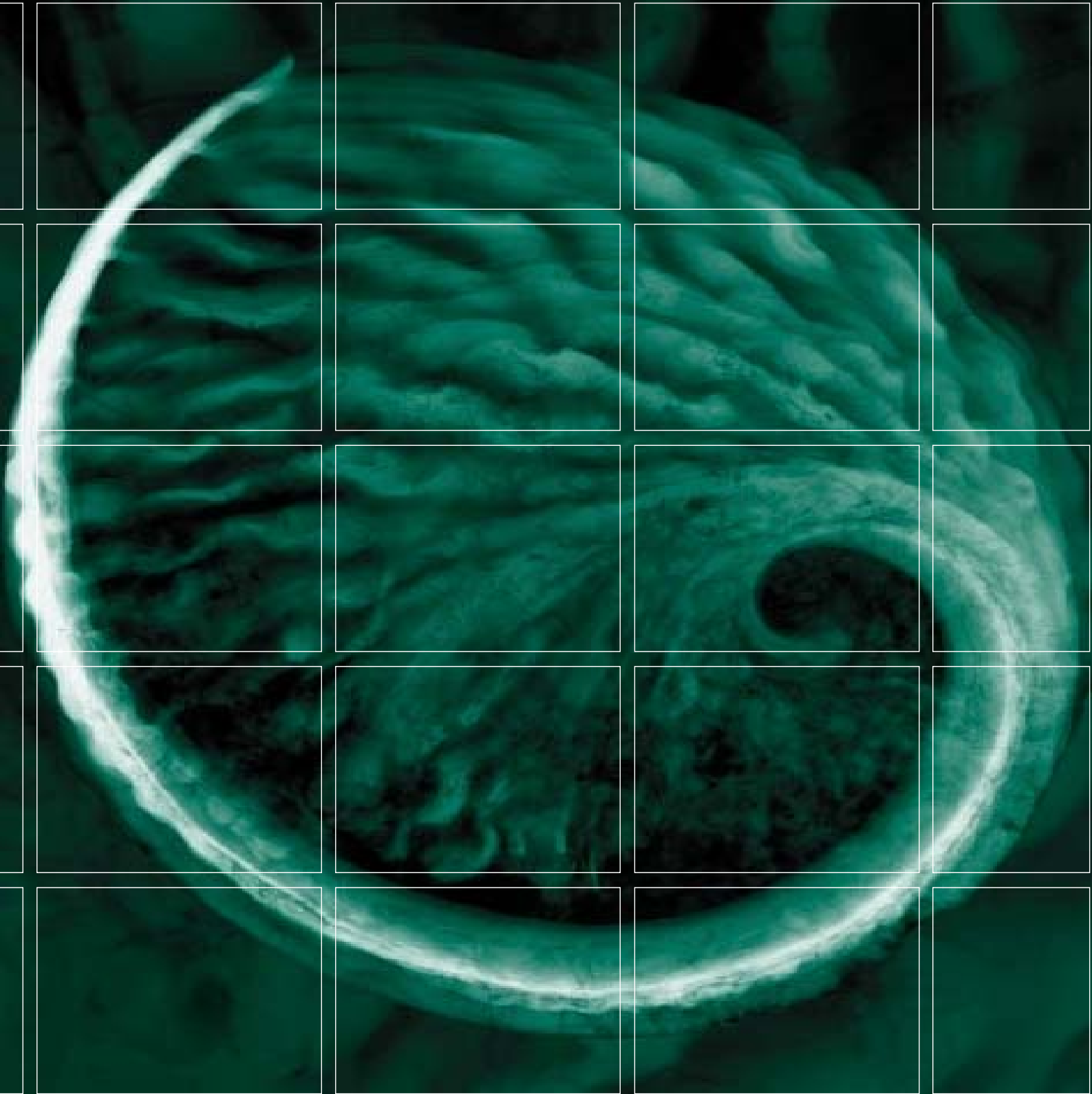
RPS Aquaterra Suit 902, Level 9, North Tower 1-5 Railway Street, Chatswood NSW, 2067 Australia Tel: (+61) (02) 9412 4630 Fax: (+61) (02) 9412 4805			COMPOSITE WELL LOG			Well No: BH6		
			Client: Dixon Sand (Penrith) Pty Ltd			Project: S95		
			Commenced: 31/01/2011		Method: Rotary Air		Area: Maroota	
			Completed: 01/02/2011		Fluid:		East:	
			Drilled: Terratest		Bit Record:		North:	
			Logged By:				Collar (RL):	
			Static Water Level: 31.4mbgl			Date: 01/02/2011		
Depth (mbgl)	Geology	Graphic Log	Lithological Description	Field Notes	Well Completion			
					Diagram	Notes		



 Suit 902, Level 9, North Tower 1-5 Railway Street, Chatswood NSW, 2067 Australia Tel: (+61) (02) 9412 4630 Fax: (+61) (02) 9412 4805			COMPOSITE WELL LOG			Well No: BH7		
			Client: Dixon Sand (Penrith) Pty Ltd			Project: S95		
			Commenced: 02/02/2011		Method: Rotary Air		Area: Maroota	
			Completed: 03/02/2011		Fluid:		East:	
			Drilled: Terratest		Bit Record:		North:	
			Logged By:				Collar (RL):	
			Static Water Level: 21.2mbgl			Date: 03/02/2011		
Depth (mbgl)	Geology	Graphic Log	Lithological Description	Field Notes	Well Completion			
					Diagram	Notes		



Attachment 8



**Dixon Sand Maroota Quarry Lots 1, 2,
29 & 196, 4610 Old Northern Road**
Site Environmental Management Plan

Dixon Sand (Penrith) Pty Ltd

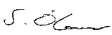
January 2005

0018928SEMP FINAL

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Approved by:	<u>Kelly Pearsall</u>
Position:	<u>Project Manager</u>
Signed:	<u></u>
Date:	<u>28 January, 2005</u>
Approved by:	<u>Mike Shelly</u>
Position:	<u>Project Director</u>
Signed:	<u></u>
Date:	<u>28 January, 2005</u>
Partner:	<u></u>
	<u>Steve O'Connor</u>

Environmental Resources Management Australia Pty Ltd Quality System

Dixon Sand Maroota Quarry Lots 1, 2, 29 & 196, 4610 Old Northern Road *Site Environmental Management Plan*

Dixon Sand (Penrith) Pty Ltd

January 2005

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This report has been prepared in accordance with the scope of services described in the contract or agreement between Environmental Resources Management Australia Pty Ltd ABN 12 002 773 248 (ERM) and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and ERM accepts no responsibility for its use by other parties.

CONTENTS

1	INTRODUCTION	
1.1	SCOPE AND PURPOSE OF DOCUMENT	1
1.2	DOCUMENT LAYOUT	2
2	SEMP OBJECTIVES	
3	SITE WORKS AND ENVIRONMENTAL INTERACTIONS	
3.1	SITE ACTIVITIES	3
3.2	SITE ENVIRONMENTAL ISSUES	4
4	ENVIRONMENTAL MANAGEMENT PLANS	
5	EMP RESPONSIBILITIES	
6	DOCUMENT CONTROL AND REVISION	
6.1	CONTROL OF SEMP DISTRIBUTION	6
6.2	SEMP REVIEW	7
7	ENVIRONMENTAL REQUIREMENTS	
7.1	CONSENTS AND LICENCES	7
8	INSPECTION, MONITORING AND REPORTING	
9	TRAINING	

APPENDICES

ANNEX A	ENVIRONMENTAL PROCEDURES
ANNEX B	DETAILED ECOLOGY AND REHABILITATION MANAGEMENT PLANS
ANNEX C	DEVELOPMENT CONSENTS
ANNEX D	LICENCES
ANNEX E	MONITORING SHEETS

LIST OF FIGURES

<i>FIGURE 1</i>	<i>SITE LOCATION</i>	<i>1</i>
<i>FIGURE 2</i>	<i>SITE PLAN</i>	<i>1</i>

1.1 SCOPE AND PURPOSE OF DOCUMENT

Dixon Sand (Penrith) Pty Limited (Dixon Sand) has development consent to extract sand on Lots 1 and 2 DP 547255 and Lots 29 and extract and process sand on lot 196 DP 752025 Old Northern Road, Maroota.

Quarrying started on Lots 29 and 196 in the early 1980's, with Dixon Sand operating from 1992 to December 1998, under consent issued in November, 1993. Quarrying has not yet commenced on Lots 1 and 2. The location of the site and Lots 1, 2, 29 and 196 are shown on *Figures 1 and 2*.

Development consent (No. 796/00/HE) for continued operations on Lots 29 and 196 was granted on 7 July, 2000 by the Land and Environment Court of NSW. The Land and Environment Court of NSW granted development consent No. 250-09-01 for the expansion of extraction into Lots 1 and 2 on 24 May 2004 (refer to *Annex C*). Both development consents were granted subject to various conditions.

Consent condition 6.1 of development consent No. 796/00/HE requires:

'The proponent shall submit to Council every twelve (12) months after the endorsed date of this consent an Environmental Management Plan in which Council is to be satisfied of the overall performance and management of the operation.'

Consent condition 6.2 of development consent No. 250-09-01 requires:

'The Applicant shall prepare and implement a Site Environmental Management Plan (SEMP) to detail an environmental management framework, practices and procedures to be followed during the operation of the development. The SEMP shall cover operations on both the existing quarry site and the quarry extension.'

This Site Environmental Management Plan (SEMP) has been prepared in response to this second condition, to provide guidance to staff and contractors on the environmental requirements of both quarry sites. The SEMP also provides the framework for the documentation of monitoring procedures for inclusion in the Annual Environmental Management Report (AEMR), as required under consent condition 7.2 of consent No. 250-09-01.

All employees and contractors of Dixon Sand, and site users such as truck drivers, are required to comply with the requirements contained within this SEMP as a condition of employment and/or access to the site.



Source: Gregory's Sydney Directory - 56th Edition

Figure 1 Locality Plan



0 4km
Approximate Only

Dixon Sand - Maroota, NSW



Source: Southern Environmental 1999

Figure 2 Site Plan

Dixon Sand - Maroota, NSW

1.2

DOCUMENT LAYOUT

This SEMP provides a system of management for potential environmental impacts associated with the quarry. The SEMP details the system, objectives, how the document is controlled and revised, legislative requirements for the site and monitoring and review of the SEMP. Environmental plans are provided in *Annex A*.

Copies of the conditions of consent, licences and monitoring sheets are also provided as appendices.

SEMP OBJECTIVES

The objectives of this SEMP are to:

- satisfy the Department of Infrastructure, Planning and Natural Resources, Baulkham Hills Shire Council, stakeholders, and other relevant authorities of the environmental management and performance of the operation and compliance with the conditions of consent;
- provide a system to manage the site to minimise potential environmental impacts;
- ensure all site users are aware of the environmental protection measures and their own environmental responsibilities;
- monitor site actions and environmental performance to determine compliance with required actions; and
- provide a system to quickly identify and correct environmental degradation or non-compliance with consent requirements.

SITE WORKS AND ENVIRONMENTAL INTERACTIONS

SITE ACTIVITIES

Site activities are required to be carried out in accordance with the descriptions provided in the Environmental Impact Statements (EIS) (Southern Environmental 1999; Supplementary Information 22/11/99; and Environmental Resources Management Australia Pty Limited (ERM) 2001). These documents are to be referred to for more information on the development and its environmental interactions and controls.

Site activities include sand extraction, processing and rehabilitation, including:

- continued extraction of sand to a maximum depth of 15.24 metres from the original natural surface within Lots 96 and 196;
- trucking of sand from Lots 1 and 2 to the processing plant on Lot 196;
- processing and stockpiling of sand at the processing plant, and construction of plant extensions;
- operation of facilities and ancillary activities such as the workshop, water and tailings storage dams, erosion control structures and bunds;

- loading of processed sands onto customers' trucks and transport off-site; and
- continuation and completion of rehabilitation of the whole site, with revegetation and re-establishment of the original creeklines through the site.

3.2 *SITE ENVIRONMENTAL ISSUES*

The EIS's identified potential environmental impacts and mitigation measures, which have been used to identify key site issues. Environmental plans based on these key issues, include:

- water flow and quality management;
- erosion and sediment control;
- noise;
- traffic movements;
- air quality;
- waste management;
- protection of flora and fauna;
- bushfire management;
- heritage management;
- rehabilitation of extracted areas; and
- social impacts on the local community.

Management plans have been created for key environmental issues, as well as for monitoring, training, incident and complaint management and other relevant issues.

Plans are designed so that they may be separated and provided to employees or contractors in accordance with their relevant site activities.

Each environmental plan lists objectives and actions, monitoring and reporting requirements, who is responsible for completing actions and where additional information may be obtained.

Table 4.1 provides a list of Environmental Plans for the site. Environmental Plans are provided in Annex A.

Table 4.1 *List of Environmental Plans*

Plan No.	Environmental Plans
EP 1	Induction and Training
EP 2	Incident Management
EP 3	Complaints Management
EP 4	Environmental Review and Reporting
EP 5	Traffic and Transport Management
EP 6	Hours of Operation
EP 7	Permissible Extraction Program
EP 8	Buffer Zones and Protection of Adjoining Lands
EP 9	Water Management
EP 10	Erosion and Sediment Control
EP 11	Heritage Management
EP 12	Noise and Vibration Management
EP 13	Air Quality Management
EP 14	Flora and Fauna Management
EP 15	Rehabilitation and Landscape
EP 16	Bushfire Management
EP 17	Community Relations
EP 18	Waste Management

While on the site, it is the responsibility of all employees, contractors and visitors of Dixon Sand to:

- be aware of SEMP requirements relevant to their work;
- not cause or let anything happen that may harm the environment (such as fuel spills, disturbance to plants and animals in buffer areas, uncontrolled dirty water runoff or excessive noise); and
- notify management of any incident or accident that may potentially harm the environment.

The Environmental Officer is responsible for implementation of the SEMP, annual review of the EMP and preparation of the Annual EMR to be forwarded to Council. Responsibilities for actions within each environmental plan are listed within the individual plan.

DOCUMENT CONTROL AND REVISION**CONTROL OF SEMP DISTRIBUTION**

To ensure the correct environmental procedures and plans are used on site, issue of this SEMP is controlled using a document register. The register is retained at the Maroota site and will be included in each annual EMR.

A copy of this SEMP is to be held by those indicated in *Table 6.1*.

Table 6.1 **SEMP Document Distribution**

Company	Contact Person
Dixon Sand (Penrith) Pty Ltd	David Dixon
Manaldo Pty Ltd (owner of Lots 29 and 196)	D Gouskos
Baulkham Hills Shire Council (BHSC)	Kristine McKenzie – Snr Town Planner
Department of Environment and Conservation (EPA)	Manager Sydney Industry
Department of Environment and Conservation (NPWS)	Manager, Conservation Planning Unit, Conservation Programs and Planning Division
NSW Roads and Traffic Authority (RTA)	Head Office
Department of Infrastructure, Planning and Natural Resources (DIPNR)	Director-General /Manager Mining and Extractive Industries Major Assessment Branch
Maroota Resource Centre	Marianne Sheumack

6.2 *SEMP REVIEW*

The SEMP is to be reviewed as required in response to:

- changes to site activities or processes, including environmental controls, water ponds, rehabilitation, etc;
- changes in environmental requirements, by changes to legislation, policy or best practice guidelines; or
- request from Council or other regulatory authorities.

7 *ENVIRONMENTAL REQUIREMENTS*

7.1 *CONSENTS AND LICENCES*

Table 7.1 lists relevant legislation, consents and licences required for the site works, as well as relevant standards and guidelines. This list will be updated as required as part of the annual EMR.

Consents and licences relevant to site activities are:

- Development approval with conditions of consent, issued by the Land and Environment Court (10206 of 2003; DA No. 250-09-01) issued 24 May, 2004;
- Development approval with conditions of consent and general terms of approval from DIPNR, EPA and RTA, issued by the Land and Environment Court (10273 of 2000; DA No. 796/00/HE) issued 7 July, 2000;
- Environment Protection Authority (EPA) licence in accordance with the *Protection of the Environment Operations Act 1997* to extract sand and operate the processing plant;
- 3A Permit in accordance with the *Rivers and Foreshores Improvement Act 1948* to carry out stream and riparian zone restoration within 40 metres of the top bank of the creek on Lot 196; and
- Part 5 Water Licence in accordance with the *Water Act 1912* to extract water from the supply bore on Lot 196.

These consents and licences are included in *Annexures C and D* of this SEMP.

Table 7.1 LEGISLATION, LICENCES AND GUIDELINES		
Legislation/Guideline	Relevancy to Project	Site Requirements
<i>Environmental Planning & Assessment Act 1979</i>	Development consents (DA 796/00/HE & DA 250-09-01) provided for operation of site	Consents lapse 22 March 2010 (10yr consent) and 24 May 2022 (18yr consent). All site works to comply with consent conditions issued with consents (<i>Annex C</i>). Continuation of extraction is subject to annual review (Annual EMR).
<i>National Parks and Wildlife Act 1974</i>	Regulates disturbance of relics and Aboriginal places	NPWS to be immediately advised of any disturbance to relics or sites. Work to stop if artefacts uncovered.
<i>Threatened Species Conservation Act 1995</i>	Special conditions on development to protect threatened species <i>Kunzea rupestris</i> , <i>Tetratheca glandulosa</i> , <i>Darwinia fascicularis subsp. oligantha</i> , and the shale-sandstone transition forest.	Controls required as per EP 14 Flora and Fauna Management.
<i>Local Government Act 1993</i> (Building Code of Australia)	Building approval	Any proposed temporary or permanent structures to be approved by Council.
<i>Protection of the Environment and Operations Act 1997</i>	Site water discharge, noise limits, hours of operation, odour, dust, soil erosion and sediment control structures, monitoring and reporting and community liaison.	EPA requires compliance with documented water quality, noise, odour and dust limits and monitoring requirements. Any waste generated on the site not to be disposed on the premises. Comply with documented hours of operation. Stormwater management scheme to be implemented, capacity of main storage dam to be monitored for design storm events - water in dam to be treated if required 5 days after storms to comply with water quality limits prior to discharge. Community environmental liaison committee to be established, with complaints telephone line and complaints recording system. Annual return to EPA to be submitted with statement of compliance and monitoring and complaints summary.

LEGISLATION, LICENCES AND GUIDELINES (Contd)		
Legislation/Guideline	Relevancy to Project	Site Requirements
<i>Water Act 1912 (Part V)</i>	Water supply bores	Bores to be constructed, operated and monitored in accordance with the Conditions of consent (DIPNR General Terms of Approval Water Act Part V Licence).
<i>Rivers and Foreshores Improvement Act 1948</i>	Stream and riparian zone restoration on Lot 196.	DIPNR may order work on the stream to cease if the work is seen to be damaging Stream Restoration and Vegetation Management Plan for the length of the creek on Lot 196, a Soil and Water Management Plan and detailed drawings to be approved by DIPNR. Work as Executed plans to be submitted to DIPNR on request. Operation must not cause damage or increase erosion of stream banks or bed, and must not detrimentally affect vegetation and habitat, the flow of water and water quality in the stream. No exotic species (other than sterile cover crops) to be planted in or within 40 m from top bank of the creek - local native species are to be used to establish a riparian zone.
Department of Mineral Resources and Factories (Health & Safety Hearing Conservation) Regulation 1979	Exposure of employees to noise and dust levels.	Ensure employees are not subjected to noise or dust levels greater than those specified under the relevant legislation. OH&S noise monitoring to be completed annually and when new equipment brought onto site.
<i>Waste Avoidance and Resource Recovery Act 2001</i>	Control of waste products generated by the development.	Waste products to be disposed at controlled waste facilities. Recycling to be maximised. Transfer of certain wastes to be carried out by licensed operator.
<i>Rural Fires Act 1997</i>	Control of burning and fire management on site.	Any burning on site requires notice to be given to Council, burning during bushfire danger period requires permit from Council.
<i>Environmentally Hazardous Chemicals Act 1985</i>	Storage and distribution of some chemicals may require a licence.	List of all chemicals used to be provided to Site supervisor to determine if licence required.

LEGISLATION, LICENCES AND GUIDELINES (<i>Contd</i>)		
Legislation/Guideline	Relevancy to Project	Site Requirements
Guidelines and Standards		
DCP 16 - Extractive Industries	Batter design and rehabilitation.	Batter design to be in accordance with DCP 500 and certified by qualified engineer Compliance with established rehabilitation methods
Baulkham Hills Shire Council Design Guidelines: <i>Subdivisions/Developments</i> 1997 <i>Works Specifications: Subdivision /Developments</i> 1997	Road and drainage construction works.	Submission to Council of detailed engineering plans in accordance with the guidelines and cash bond or bank guarantee prior to Council issuing a Construction Certificate. Submission to Council of Work as Executed Plans in accordance with guidelines.
<i>Managing Urban Stormwater - Soils and Construction</i> (NSW Government, 2004)	Provides stormwater, sediment and erosion management techniques during construction and operation.	Management techniques to be implemented during construction and operation to manage stormwater.
EPA Environmental Noise Control Manual 1994	Provides criteria for construction noise	Construction noise criteria to be met during any construction works
ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters 1992	Provides criteria for water quality monitoring.	Use criteria to set targets for water quality monitoring on site.

Environmental monitoring, together with a monthly inspection to monitor general site conditions and environmental performance will ensure environmental plans are being followed.

Each plan details its monitoring requirements, including those required by the conditions of consent and licences. *Table 8.1* provides a summary of monitoring required by the consent and licences, and information for the annual EMR report to DIPNR and Council.

Monitoring results and completed monthly checklists will be retained on site and included in the annual report to DIPNR and Council. The checklist proforma is provided in Environmental Plan 4 (Form EP4.1).

All reporting requirements relating to environmental management are set out in Environmental Plan 4.

To ensure all persons working on the site are aware of their environmental obligations and required procedures, each person will be inducted in the relevant procedures before commencing work. Re-training will also be undertaken if there are any changes to procedures, or if any non-conformance to procedures is noted by site inspection, monitoring or by a regulatory authority or public complaint.

Training and induction is detailed in Environmental Plan 1.

Table 8.1 SUMMARY OF ENVIRONMENTAL MONITORING

Environmental Parameter	Criteria	Target	Schedule	Responsibility
Water Quality				
- Main storage weir (S18)pH, TSS, turbidity (NTU)	EPA Conditions L3 and M2.1	100% concentration limit <50 mg/L TSS pH 4.5 – 6.5	• 4 grab samples per month during discharge	Environmental Officer (sampling)
- Groundwater bores (Lots 1 & 2) Water Quality	Condition 4.8 of Consent No. 250-09-01		• Every 6 months	Independent laboratory (analysis)
Weir Flow and Groundwater levels	Weir: EPA Condition M6 Groundwater: (2.28/4.8 of consent 796/00/HE /250-09-01) & AEMR Maroota Groundwater Study Technical Status report DLWC 2001	Flow meter (L) to be installed 3 months from date of reviewed licence issue. Monitor groundwater fluctuations	Weir: Daily during discharge Groundwater: Monthly & after periods of extreme wet weather.	Environmental Officer
Climate				
• Rainfall • Wind speed & direction • Temperature • Sigma theta	Conditions 4.2 of Consents & EPA Condition M2.3	Monitor conditions	Continuous, 24hr/15min/ 1hr averaging periods.	Environmental Officer
Noise	EPA (Condition L6) and Consent condition 4.5	LA _{eq} (15 minutes) level not to exceed 44 dB(A) Mon. to Sat. (7am to 6pm) & not exceed 37 dB(A) (6am to 7am) Mon. to Sat. No works on Sundays & Public Holidays.	Every six months	Environmental officer to engage accredited acoustic consultant

Table 8.1 SUMMARY OF ENVIRONMENTAL MONITORING

Environmental Parameter	Criteria	Target	Schedule	Responsibility
	Condition 4.6 of consent 250-09-01	Road traffic noise at Maroota PS	Within six months of commencement of operation (to be approved by DG)	Independent person(s) to be engaged
	Condition 4.3 of 796/00/HE	Employees must not be subjected to noise levels greater than those specified in relevant legislation.	Annual OH&S monitoring & when new equipment is introduced.	Environmental Officer to engage accredited acoustic consultant.
Erosion and Sedimentation	Condition 4.10 of consent 796/00/HE & SEMP	No change to water quality downstream	Monthly visual inspections of erosion/ sediment controls. DLWC/EPA may be involved in inspections.	Environmental Officer
Extraction Depth	Condition 3.5 of consent 796/00/HE	No extraction below 15.24 m from original ground level lots 96 & 196.	Monthly visual survey	Site supervisor
Dust and Air Quality				
• Static dust	Consent Condition 3.2 of 250-09-01 & EPA (Condition M1, M2 & R4)	Dust deposition (total) must not exceed 4 g/m ² /month	Continuous (collected monthly)	Collection- Environmental officer, independent lab analysis
• PM10		PM10 <37 µg/m ³ as a 24h average and <30 µg/m ³ as an annual average.	Continuous	Environmental Officer (or delegated hardware/ software specialists).
Flora and Fauna / Rehabilitation				
• Buffer zones, <i>Kunzea rupestris</i> , <i>Tetratheca glandulosa</i> , <i>Darwinia fascicularis</i> subsp. <i>oligantha</i> , and the shale-sandstone transition forest, conservation	Consent conditions 2.17, 2.24, 3.3, 3.13 of 796/00/HE, 4.9 of 250-09-01 & SEMP, DCP 16	Monitor effects on threatened species and success of revegetation. No disturbance to required buffer zones, conservation	Monthly visual inspection. Annual survey of threatened species and monitoring of conservation area. Start prior to operations & continue 2yrs post approval.	Environmental Officer or qualified bush regenerator. Qualified plant ecologist to undertake annual survey of threatened species.

Table 8.1 SUMMARY OF ENVIRONMENTAL MONITORING

Environmental Parameter	Criteria	Target	Schedule	Responsibility
area and rehabilitation areas.		zones & rehabilitation areas. Buffer markers intact.		
Waste Management	SEMP	No fines for illegal disposal of wastes. No contamination of site or adjacent areas. Maximise recycling of waste materials.	Monthly check of waste management system Weekly inspection of recycling system	Environmental Officer or delegate

REFERENCES

Baulkham Hills Shire Council (2003) **Fire Safety Tips**.
http://www.baulkhamhills.nsw.gov.au/fire_safety/tips.aspx

Department of Land and Water Conservation (2003) **Hawkesbury Lower Nepean Catchment Blueprint**

Department of Land and Water Conservation (DLWC) (2001) **Maroota Groundwater Study Technical Status Report**

Department of Land and Water Conservation (DLWC) (2000) **Rehabilitation and Revegetation Strategy**

Department of Land and Water Conservation (DLWC) (1999) **Urban Erosion and Sedimentation Handbook**

Dixon Sand (Penrith) Pty Ltd (2004a) **Flora and Fauna Management Plan**

Dixon Sand (Penrith) Pty Ltd (2004b) **Rehabilitation and Landscape Plan**

Environment Protection Authority of NSW (EPA) (2001) **Approved Methods for the Sampling and Analysis of Air Pollutants in NSW**

Environment Protection Authority of NSW (EPA) (2001) **Bunding and Spill Management**. Technical Bulletin

Environment Protection Authority of NSW (EPA) (1999) **Assessment, Classification and Management of Liquid and Non-Liquid Wastes**

Environment Protection Authority of NSW (EPA) (1997) **Managing Urban Stormwater: Council Handbook**

Environmental Resources Management Australia Pty Limited (ERM) (2001) **Maroota Quarry Extension Environmental Impact Statement**. Prepared for Dixon Sand (Penrith) Pty Ltd

NSW Government (2004) **Managing Urban Stormwater - Soils and Construction**

Rural Fire Service of NSW (RFS) (2003) **Guidelines for Low Intensity Bush Fire Hazard Reduction Burning (for Private Landholders)**

Southern Environmental (1999) **Extraction, Rehabilitation and Processing of Construction Sand, Lots 196 and 29, DP 752025 North Maroota - Environmental Impact Statement**

Annex A

Environmental Plans

Title	EP 1 - INDUCTION AND TRAINING
Consent/Licence Ref.	Condition 6.2 (ix) of Consent 796/00/HE and condition 2.1 of Consent 250-09-01.
Objectives	To ensure all persons working on the site are aware of their environmental obligations, site environmental issues and control measures, as well as roles and responsibilities with regard to the environment on site.
Procedures	1. Environmental induction for all employees and contractors before starting work. Induction to cover following issues: (i) requirements of the SEMP; (ii) specific environmental issues on the site and control measures; (iii) roles and responsibilities for environmental management; and (iv) environmental incident procedures. 2. Retraining sessions within one month of changes to relevant sections of the SEMP. 3. Retraining sessions within one month to persons identified by <i>Complaints Register</i> or <i>Site Condition Checklist</i> as not conforming to procedures. 4. All truck drivers entering the site for the first time to be provided with the 'Site Induction for Drivers' form (attached).
Monitoring	Status of inductions to be checked monthly using site condition checklist.
Reporting	Record of all inductions and retraining, including name and date provided, to be retained on site.
Responsible Person	• Environmental officer responsible for ensuring all persons working on the site are properly inducted and retraining provided as required.
Information/References	<i>Site Induction for Drivers</i> form (EP1.1) <i>Maroota Traffic Management Policy</i> (EP1.2) <i>Site Traffic Management Plan: Maroota</i> (EP1.3)

DIXON SAND (PENRITH) PTY LTD

SITE INDUCTION FOR DRIVERS

We are pleased to receive our recent approval to expand operations at our Maroota Quarry and continue our supply of good quality sand to our customers. A lot of work has gone into gaining this approval and as before, certain practices must be adhered to when visiting this site. It is in the interests of both the customers and Dixon Sand, that these requirements are met to allow the quarry to maintain a good and safe working environment.

RESPONSIBILITIES

- I have read and understood Dixon Sands Site Traffic Management Plan (and attached Map).

Specifically:

- I am fully aware of my responsibilities as laid out in Dixon Sands Site Traffic Management Plan.
 - I agree to follow all site rules at Dixon Sands Maroota Quarry.
 - I am fully aware of my responsibilities to notify Dixons of any hazards as addressed in point 19 of the Traffic Management Plan.
- In addition;
 - I have read and understood Dixon Sands Health and Safety Policy.
 - I have read and understood Dixon Sands Alcohol and Drug Policy.
- I understand that this document may be used to provide information to the Department of Mineral Resources (DMR) and the Department of Environment and Conservation (DEC).

DECLARATION: I have read the above summary of responsibilities and have received a copy of all mentioned documents.

Print Name: _____ **Signature:** _____

Company _____ **Truck Reg. No.:** _____

Witnessed by: _____

Noel Kenny
Production Manager.

Maroota Local Traffic Management Policy

As extractive operators and customers in the Maroota area we all benefit from the use of the local roads and in particular Old Northern Road, which provides access to all quarries.

As a customer in the Maroota area you are aware of the existing local speed limitations and in particular the speed restrictions at Maroota Public School, along Old Northern Road.

As company policy all trucks entering and leaving quarry sites will be required to:

1. Comply with speed limits as observed. SPEED LIMITS AT MAROOTA PUBLIC SCHOOL are 40 kph BETWEEN THE HOURS OF 8.00 to 9.30 am and 2.30 to 4.00 pm OTHERWISE 70 KPH
2. Cover all loads leaving the quarry sites
3. not use engine/exhaust brakes in the vicinity of quarry sites.

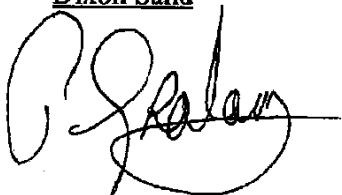
As company policy all trucks entering the Maroota quarries will be required to obey the above site regulations.

Any offending trucks found repeatedly not observing these restrictions will be refused access to all sites.

The Maroota Sand Resource is of growing importance to the Sydney Sand Market. We all need to work together and self regulate our industry to ensure our joint commercial future. We therefore require your assistance in enforcing these policies.



Dixon Sand



PF Formation



Maroota Quarry (F Vella)

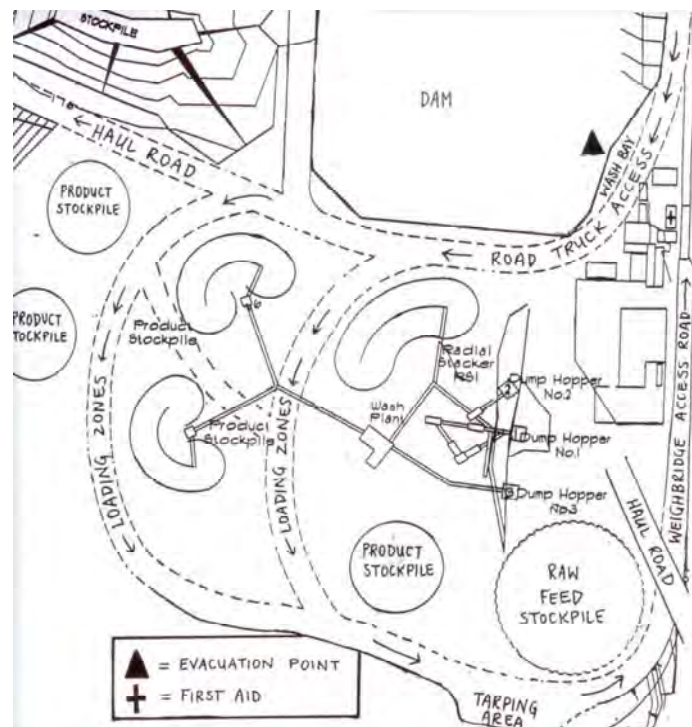


Hodgson Contracting
(Sun-a-Rise Site)

SITE TRAFFIC MANAGEMENT PLAN: MAROOTA

1. No trucks are to arrive at Dixons' prior to 5:45am as a courtesy to our neighbours. Repeat offenders will be refused access to quarry.
2. Dixon Sand request that truck drivers minimise their arrival to the quarry during peak hours, holiday periods, and before and after school hours (i.e. 8.30am – 9.00am and 3.00pm – 3.30pm).
3. Trucks are required to obey the 40km/hr speed limit in front of Maroota Public School on School days, during School hours.
4. Trucks are not permitted to use exhaust brakes *at any time* in the Maroota area, especially around Maroota Public School during morning time.
5. All earthmoving equipment (including the water-cart and Quarry Vehicles with flashing lights) have right of way at all times. No exceptions.
6. All trucks are to obey directional signs at all times.
7. All trucks are to observe and obey the 20km/hr speed limit on site at all times. This speed limit will be enforced.
8. Drivers are only permitted to exit trucks at Weighbridge, and designated Wash bay and Tarping areas. Drivers must wear approved hi-vis clothing. Drivers are not permitted to exit their trucks in pit area.
9. All trucks entering Dixon's Maroota must have a fully operational C/B radio so as to communicate with loader drivers (using AM 8 or UHF 5). If CB is broken, go to weighbridge and inform operator.
10. All trucks entering Dixon's Maroota must have an approved tarp to cover load before leaving site.
11. All drivers to follow loader driver instructions at all times.
12. No trucks are to proceed past wash bay without contacting loader driver.
13. Wash bay area is provided to wash body. Not to wash truck.
14. Wash bay area: - Only area on site designated for trucks to park and raise their bodies. - No double-parking permitted. - Only 1 truck at a time permitted in the wash bay.

15. No trucks permitted to leave site prior to 6 am, or after 6pm.
 16. Trucks must not obstruct designated haul roads after 7am.
 17. All trucks to be loaded must park where instructed.
 18. All access through Dixon's Maroota is 1 way.
 19. All vehicles are to enter and leave the site in a forward direction.
 20. Drivers must notify Dixon's management of any hazards identified. Hazard identification sheets are available in Weighbridge.
 21. It is the responsibility of all drivers entering Dixon's Maroota to be aware of all rules and regulations.
 22. All drivers must be inducted and sign relevant documents.
 23. Seat belts to be worn at all times whilst driving (if fitted).
 24. Any drivers found to be repeating offenders of these regulations will be banned from site.
- NOTE: copy of OH&S Policy to all customers also.



Title	EP 2 - ENVIRONMENTAL INCIDENT MANAGEMENT
Consent/Licence Ref.	EPA General Terms of Approval – Attachment A of Conditions of Consent No. 796/00/HE; Condition 7.1 of Consent No. 250-09-01; EPA conditions M2.4, M2.5, M2.6 R2 and R3.
Objectives	To ensure all environmental incidents are promptly and effectively managed to minimise environmental impact.
Definitions	An environmental incident is an event that has the potential to harm the environment. Examples are fuel spillage, failure of erosion or sedimentation controls or excessive noise or dust.
General Procedures	1. Stop action causing incident (eg: switch off equipment). 2. Stop all work in the immediate vicinity of the incident until advised to continue work by the site supervisor – inform nearby workers if required. 3. Notify environmental officer. 4. Block flow paths - cover with sand or install temporary barriers or controls as necessary. 5. For fuel/oil spill, remove contaminated material and dispose to licensed hazardous waste management facility. 6. Environmental officer to contact EPA's Pollution Line on 131 555 as soon as possible for any incidents causing or threatening harm to the environment. For other contact details refer <i>Incident Contact Table</i>. 7. Environmental officer to make sure incident area cleaned up, problem rectified and prevention measures put in place. 8. Fire extinguishers to be carried by all machinery used. Water cart is to be able to access all lots. 9. Adhere to PM10 exceedance procedures.
Monitoring	<i>Site Condition Checklist</i> to be completed monthly.
Reporting	1. Immediately for PM10 emission exceedance, otherwise, within 7 days of an incident causing or threatening harm to the environment a written report to be provided to the EPA. 2. Annual EMR to record details of all incidents – noted on <i>Site Condition Checklist</i>.
Responsible Person	1. All site employees are responsible for their own actions in preventing incidents occurring, containing spills, etc. 2. General Manager is responsible for enquires into incidents, notification and written report to EPA and declaring an area safe after an incident.

Information/ References	FOR MEDICAL EMERGENCIES AND SAFETY INCIDENTS REFER TO SAFETY MANAGEMENT PLAN Air Quality Management EP13, Pm10 Action Plan Refer <i>Incident Contact Table</i> (EP2.1) for telephone numbers of relevant authorities.
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INCIDENT CONTACT TABLE

As per Dixon Sand Mines Safety Management Plan (MSMP), all incidences must be reported directly to the General Manager immediately. Refer to the MSMP for more detailed procedures.

INCIDENT TYPE	CONTACT	TELEPHONE
All incidents	General Manager	4566 8348 0414 330 490
Environmental incidences	Environmental Officer	4566 8348 0410 668 343
Fire	Fire Fighting Service	000
Hazardous materials spill	Fire Fighting Service	000
Pollution event	EPA Pollution Line	131 555
Accident/Unlawful action	Police (Wisemans Ferry)	4566 4302 4577 4111 (AH)
Injured animal	Wildlife Information and Rescue Service (WIRES - Blue Mountains)	4754 2946
Archaeological artefact identified	National Parks and Wildlife Service (Sydney Zone)	9585 6444

Title	EP 3 – COMPLAINTS MANAGEMENT
Consent/Licence Ref.	EPA General Terms of Approval – Attachment A of Conditions of Consent No. 796/00/HE; Conditions 5.1 and 5.2 of consent No. 250-09-01; EPA POEO Licence conditions M4 and M5.
Objectives	To ensure any site problems brought to the attention of Dixon Sand by the local community and/or relevant authorities are documented and acted upon to avoid re-occurrence.
Procedures	1. Complaints telephone number signposted at front gate. Telephone number, along with postal, and email address for complaints advertised on website, and in 3 local newspapers / newsletters. These contact points for complaints to be regularly provided to the community throughout the life of the development. 2. All complaints/concerns raised by local community/relevant authorities to be recorded on <i>Complaints Register</i> by Environmental Officer. <i>Complaints register</i> to be retained on site. 3. All complaints to be brought to the attention of the Environmental Officer immediately. 4. Environmental officer to identify and initiate appropriate action in response to complaint and follow-up contact with complainant. 5. Any complaints received to be reviewed at CCC meeting.
Monitoring	1. All complaints to be recorded on <i>Complaints Register</i>. 2. <i>Complaints Register</i> to be checked monthly using <i>Site condition checklist</i>.
Reporting	1. Completed <i>Complaints Register</i> to be included in annual EMR. 2. Summary of complaints to the EPA as part of Annual Return for Licence.
Responsible Person	1. All persons who receive telephone complaints are responsible for completing the <i>Complaints Register</i> and notifying the environmental officer within 24 hours. 2. Environmental officer responsible for initiating follow-up action and contact with complainant.
Information/References	<i>Complaints Register</i> (EP3.1) <i>Section 4.15.3 Socio-Economics – Mitigation Measures</i> of EIS (ERM, 2001).

DIXON SAND (PENRITH) PTY LIMITED COMPLAINTS REGISTER FORM	
All complaints or comments received from the public to be recorded on a copy of this form. The Environmental Officer must be advised of the complaint immediately.	
Corrective actions are to be identified and followed-up within one week of expiry of the stated timeframe.	
Call Received: (Time/date)	
Method of complaint:	
Nature of complaint:	
Weather conditions at time relating to complaint (wind/rain?):	
Name/address/ contact no. of caller: (If complainant will not provide details, provide a note to that effect)	
Call taken by:	
Section to be completed by Site Supervisor:	
Recommended Action: (If no action is to be taken, provide reason why)	
Implementation required by (date):	
Complainant to be contacted on (date if required):	
Action completed: Signed/ date (Site Supervisor)	

Title	EP 4 – ENVIRONMENTAL REVIEW AND REPORTING
Consent/Licence Ref.	Conditions 6.1, 6.2, 6.3, 6.4, 6.5, 6.6 of Consent No. 796/00/HE; Condition 7.2 of Consent No. 250-09-01. EPA POEO Licence Condition 6.
Objectives	To review and report on environmental controls and their effectiveness to assess site environmental performance and any required improvements.
Procedures	1. Monthly inspection using <i>Site Condition Checklist</i> by environmental officer or delegate to check environmental procedures and controls and completion of various environmental requirements. 2. Monthly monitoring results required by relevant procedures to be reviewed by environmental officer to determine effectiveness of controls. (Refer to summary of environmental monitoring in SEMP). 3. Annual EMR to be prepared by independent, qualified person(s) detailing consent compliance, environmental performance and management by updating current SEMP and providing a revised strategy for the coming year.
Monitoring	1. Monthly <i>Site Condition Checklist</i> to be completed. 2. Various monitoring activities required as per summary of environmental monitoring (refer SEMP).
Reporting	1. Annual EMR to be submitted to DIPNR and Council. EP 4.2 <i>Annual EMR Checklist</i> to be used to make sure all relevant information is supplied in report. 2. Annual Return to be submitted to the EPA to include annual monitoring, summary of complaints, compliance with license conditions and calculation of license fees. 3. Environmental Audit of entire quarry before commencement of strips 2, 3, 4, 5 and 6, at the end of the approval period of consent 250-09-01, and at completion of flora and fauna monitoring program and submitted to Director-General, EPA, NPWS, RTA and Council.
Responsible Person	• Environmental officer to ensure all reports are provided to DIPNR, Council and EPA. • Independent person(s) approved by Director-General to undertake Environmental Audit.
Information/References	EP 4.1 <i>Monthly Site Condition Checklist</i> EP 4.2 <i>Annual EMR Checklist</i>

DIXON SAND MAROOTA MONTHLY SITE CONDITION CHECKLIST <i>This checklist is to be completed monthly by the Environmental Officer. Completed checklists are to be retained and included in the annual EMR to Council.</i>		
Date of inspection: _____		
Inspection by: _____		
Measured monthly rainfall (mm) _____		
	OK (✓) or Not Acceptable (✗)	Comments/ Action
SEDIMENT CONTROLS		
Sediment fences installed and maintained		
Sediment level of basin and drains checked (>70% volume of basins available)		
Site checked for erosion		
Stockpiles located and maintained correctly		
Tree clearance restricted to required area		
WATER QUALITY AND QUANTITY		
During discharge from wier (S18): Water quality monitoring undertaken weekly at discharge point (max. 4/mth)		
Weir (S18): Daily volume of water discharged recorded.		
6 monthly monitoring of groundwater quality at four bores on Lots 1&2		
Monthly depth measurement of all groundwater bores and comparison with rainfall		
Monthly inspection of drainage & sediment controls including water storages, pumps, pipes and dams walls		
Voluntary monthly water quality monitoring of spring in unnamed creek (S19)		
Any Fuel or oil spills reported and maintained		
Fuels/chemicals stored in bunded areas		
AIR QUALITY		
Continuous static dust (collected for analysis monthly)		
On site dust suppression		
Loads covered entering and leaving site		
No burning of vegetation		

EP 4.1 Checklist (Cont)		
	OK (✓) or Not Acceptable (×)	Comments/ Action
Wind speed, direction and rainfall recorded		
NOISE		
Operation only during hours of operation		
No complaints received from school, residences or local community members.		
6 monthly monitoring at Maroota PS		
FLORA & FAUNA/ REHABILITATION		
Sightings of threatened species reported		
No disturbance of buffer/conservation areas		
All buffer/conservation area fencing/marking intact		
Rehabilitation undertaken to schedule		
Success of rehabilitation of buffers, conservation areas & rehabilitation areas		
Rehabilitation near school during holidays		
ARCHAEOLOGY		
Stop work if sites located – NPWS notified		
WASTE AND SITE CONDITION		
No rubbish visible or buried on site		
Recyclables removed by licensed Contractors		
Putrescible waste covered and regularly removed		
ROADS AND TRANSPORT		
Weekly inspection of Old Northern Rd/Crown Rd intersection and sand/clay removed as necessary.		
Crown Road, Old Northern Road near site, intersection & haul roads in good state of repair.		
Truck movements have not exceeded 60/day, or 15 between 6-7am.		
Weighbridge/log book records forwarded to Council monthly		
EXTRACTION PROGRAM		
Extraction depths from monthly checked control points (see EP7.1) in accordance with extraction program.		
REPORTING		

Complaints register maintained		
Environmental incidents reported to EPA		

Signed: _____ Environmental Officer

The SEMP is to be reviewed annually and changes made as required to the Environmental Plans (EPs). The annual review is also to include a review of relevant legislation and policy. The revised SEMP is to be submitted to Council in the form of an Annual EMR.

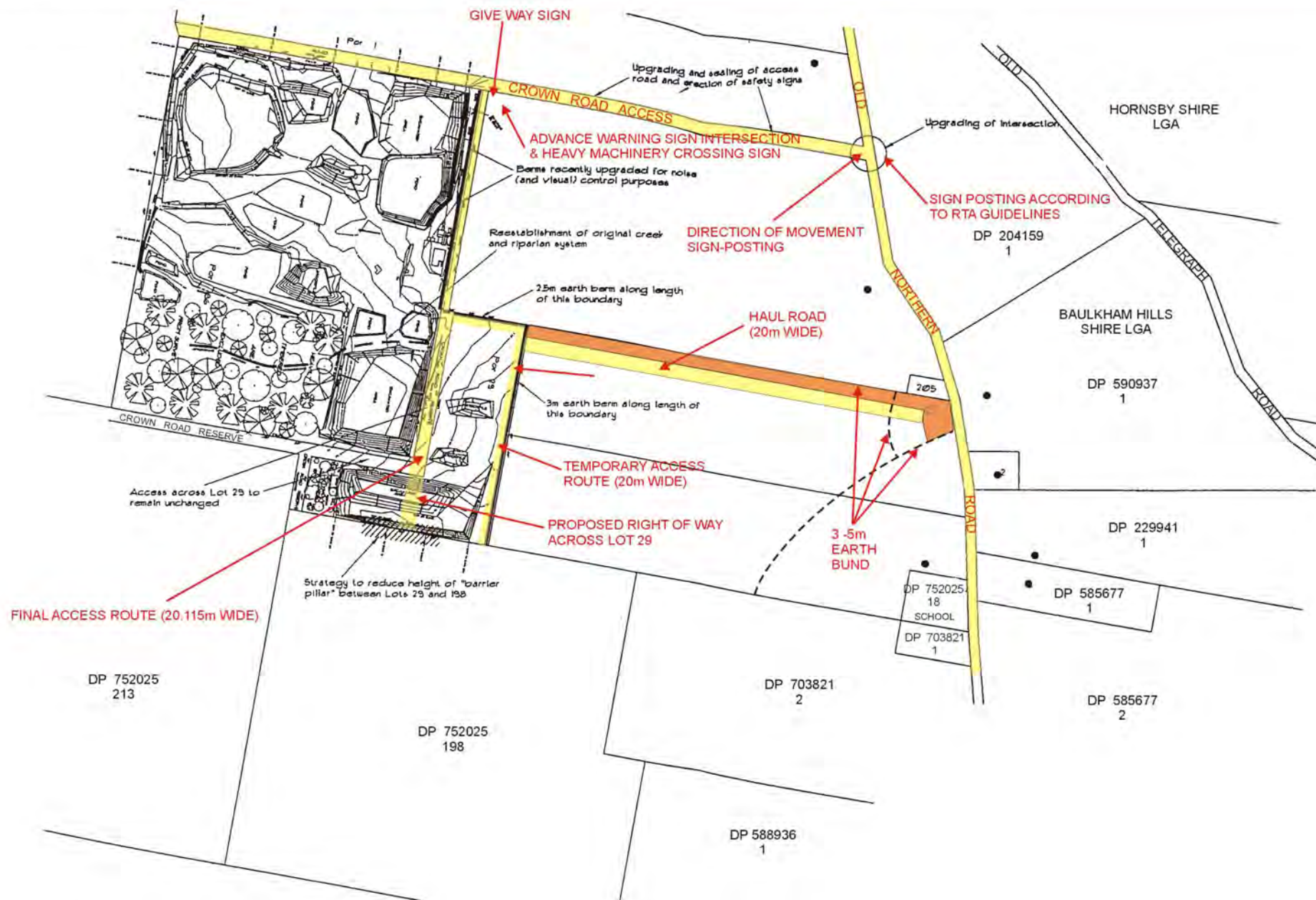
The following provides a checklist of information to be included in each section of the Annual EMR.

Environmental Issue	Report Requirements
Air quality	Summary of dust sources, sensitive receptors and containment/mitigation measures. Compliance with static dust and PM10 criteria. Air and dust quality results. Climate data (wind speed and direction, temperature and rainfall). Any comments/recommendations from EPA, DLWC or other authority. Any changes to EPs. Any changes to EPA licence. Summary of dust related complaints and actions taken (include <i>Complaints Register Forms</i>)
Noise	Summary of noise sources and containment/mitigation measures. Results of six monthly compliance monitoring. Results of annual OH&S monitoring and compliance with guidelines. Any changes to EPs. Any changes to EPA licence. Summary of noise related complaints and actions taken (include <i>Complaints Register Forms</i>) Review of new technologies/practices to reduce noise emissions, applicable to site operations. Any comments/recommendations from EPA, DLWC or other authority
Water Management	Summary of water quality monitoring results for S18 weir discharge. Summary of daily discharge measurements at S18 weir when discharged. Summary of 6 monthly groundwater quality results at the 4 monitoring bores on Lots 1&2. Summary of all groundwater bore level results and comparison with rainfall data. Summary of water quality monitoring at spring in unnamed creek (S19). Compliance with criteria and licenses and permits. Summary of monthly inspections of erosion and sediment controls (include monthly site condition checklists). Any changes to EPs. Any changes to EPA licence, DLWC licences or new licences/permits obtained.

Environmental Issue	Report Requirements
Rehabilitation	Details of backfilling works (source of material, grades and stability of batters). Summary of monthly inspections of rehabilitation areas (include checklists). Work as executed plans when a precinct completed to demonstrate that levels are in accordance with Rehabilitation Plan. Results of annual survey by plant ecologist of threatened species, ecological communities on the site and all conservation areas. Compliance with rehabilitation schedule.
Social Impact	Minutes, outcomes and recommendations of the biannual Community Consultative Committee meetings. Summary of complaints and follow-up actions (include complaints register forms). Summary of any public open days and monthly local newspaper articles. Summary of any other initiatives such as involvement in a Streamwatch program at Maroota School.
Roads and Traffic	Summary of vehicle movement records. Summary of liaison with MPS regarding effectiveness of traffic management. Summary of traffic related complaints (include relevant complaints register forms). Summary of inspections of road surfaces for damage (Crown Road, Old Northern Road/Crown Road intersection and haul roads) by Environmental Officer. Compliance with consent conditions relating to traffic management. Summary road works undertaken, include work as executed plans.
Waste Management	Summary of waste management including type, composition and quantity of material recycled and removed and destination of materials removed.
ESD	Summary of overall environmental performance for the year. Statement of compliance with licences, permits and conditions of consent. Survey plan, illustrating status of extraction and rehabilitation. Any recommendations to adjust operational procedures to improve overall environmental performance. Statement of how Dixon Sand addresses ISO 14001-14004 relating to Environmental Management Systems (ie mechanisms necessary to implement and achieve company's environmental policy, objectives and targets and means to monitor and evaluate environmental performance).

Title	EP 5 - TRAFFIC AND TRANSPORT MANAGEMENT
Consent/Licence Ref.	Conditions 2.2, 2.3, 2.11, 2.16, 2.17, 2.18, 2.20, 2.22, 2.23, 3.7, 3.8, 4.9 of Consent No. 796/00/HE; conditions 3.30, 3.31, 3.32, 3.33, 3.34, 3.35A, 3.35B, 3.35C, 3.5 of consent No. 250-09-01.
Objectives	To minimise the impact of trucks on the local road network, local residents and the Maroota Public School, and to comply with approved access and vehicle movements.
Procedures	Truck movements 1. Truck movements to and from the site not to exceed 120 per day (60 loaded trucks per day). 2. Between 6:00am and 7:00am only 15 loaded trucks allowed to enter or leave the site, and none prior to 5:45am. 3. All new truck drivers to be provided with <i>Site Induction for Drivers</i> form at weighbridge. Drivers provided with Site Traffic Management Plan and <i>Maroota Local Traffic Management Policy</i>. 4. All loads must be fully tarped prior to final weighing, before leaving site. 5. 20 km/hr speed limit on internal haul roads. 6. All vehicles are to enter and leave the site in a forward direction
	Road Improvements and Maintenance 1. Old Northern Rd/Crown Road intersection to be inspected weekly by the Environmental Officer for accumulated sand/clay and maintained as necessary by removing the material.
Monitoring	Vehicle Movements 1. All loads to be inspected at weighbridge to make sure they are covered. 2. Weighbridge dockets to be retained for a record of the time of daily vehicle movements and volume of material entering and leaving the site. 3. Maroota School to be contacted by Environmental Officer annually to discuss effectiveness of traffic management. 4. EP3.1 Complaints register to be used to record traffic management complaints.

Title	EP 5 - TRAFFIC AND TRANSPORT MANAGEMENT
	Road Improvements and Maintenance
Monitoring <i>Cont.</i>	5. Weekly inspections by Environmental Officer of Old Northern Road/Crown Road intersection for accumulated sand/clay. 6. Monthly inspections of road surfaces (Crown Road, Old Northern Road/Crown Road intersection and haul roads) by Environmental Officer for damage.
Reporting	1. Vehicle movement records (including certified weighbridge dockets and log book or equivalent computer records) to be submitted to Council monthly, and summarised in the Annual EMR. 2. Work as executed plans for road and drainage works external to the site to be submitted to Council. 3. Compliance and effectiveness of traffic management to be submitted to Council in Annual EMR.
Responsible Person	1. Environmental Officer responsible for weekly inspections of Old Northern Road intersection for sand/clay accumulation, monthly inspections of road pavements for damage condition and consulting annually with Maroota School regarding effectiveness of traffic management. 2. Truck drivers responsible to comply with permitted hours of operation and site induction form requirements.
Information/References	EIS Sections 6.8, 7.5, 10.3, 11.5 and Appendix C6 (Southern Environmental 1999); EIS sections 2.4.4, 2.4.5, 2.4.6 (<i>Extraction, Processing and Haulage</i>), 4.11.2, 4.11.3, 4.11.5 (<i>Traffic and Access</i>) (ERM, 2001). <i>EP1.1 Site Induction for Drivers/Site Traffic Management Plan</i> <i>EP1.2 Maroota Traffic Management Policy</i> EP5.1 Roads and Access Arrangements



Source: Southern Environmental 1999

Title	EP 6 - HOURS OF OPERATION
Consent/Licence Ref.	Condition 3.12 of Consent 796/00/HE; Conditions 3.31, 3.41 and 3.42 of Consent 250-09-01. EPA General Terms of Approval Condition L5.4-5.8; EPA POEO Licence Condition L7.
Objectives	To ensure all site operations and truck movements comply with the approved hours of operation.
Procedures	5.45 am Monday to Saturday Site gates may open to allow entry of vehicles to site. 6.00am – 7.00 am Monday to Saturday (not incl. Public Holidays) 30 truck movements (15 loaded vehicles) may enter or leave site. 7.00 am – 6.00 pm Monday to Saturday (not incl. Public Holidays) Extraction, transportation and processing or running of machinery for maintenance purposes permitted. 7.00 am – 6.00 pm Monday to Saturday (during Public Holidays only) Construction of earth bunds around Maroota PS setback perimeter. Sundays and Public Holidays No extraction, transportation or processing to occur.
Monitoring	Certified (under company seal) weighbridge dockets and log book or computer records to be kept on site recording arrival and departure times of vehicles between 6.00 am and 7.00 am.
Reporting	Weighbridge dockets and records to be submitted to Council monthly and summarised in Annual EMR.
Responsible Person	1. Weighbridge operator responsible for accurate vehicle movement record keeping. 2. Truck operators and site employees responsible for operating within permitted hours. 3. Head office responsible for reporting to Council each month.
Information/References	EP5 - Roads and Traffic Management EP 12 – Noise and Vibration Management

Title	EP 7 - PERMISSIBLE EXTRACTION PROGRAM
Consent/Licence Ref.	Conditions 3.10 and 6.6(k) of Consent 796/00/HE; Conditions 3.9, 3.12, 3.25 and Annexure C of consent 250-09-01.
Objectives	To ensure that: - the maximum annual volume of extracted material complies with the approved extraction volume of up to 60 loads per day over 10 and 18 years for Lots 29 and 196, and 1 and 2 respectively; - the combined production of quarry products within all lots to not exceed 495,000 tonnes per annum, while processing of extracted sandstone not to exceed 1,750 tonnes per day; - the extraction sequence complies with the approved programs (detailed in procedures); and - extraction complies with approved depth.
Procedures	Volume of Extraction Extraction on Lots 29 and 196 to be undertaken at the estimated annual stripping rates shown in <i>Table 7.1</i>. Extraction Sequence Extraction undertaken in sequence shown in <i>Tables 7.2 and 7.3</i> (extraction precincts/strips are shown on EP8.1). Depth of Extraction - Extraction on Lots 1, 2, 29 and 196 not to occur within 2 metres of highest recorded wet weather groundwater level. - Extraction depth not to exceed 15.24 metres from original ground surface of Lots 29 and 196.
Monitoring	Volumes - Weighbridge dockets to monitor monthly number and volume of loads leaving the quarry. Extraction Sequence - Work as Executed plans showing completed extraction precincts to be prepared for lots 29 and 196 when necessary.

Title	EP 7 - PERMISSIBLE EXTRACTION PROGRAM (Cont.)
	Depth of Extraction 3. Monthly visual survey of extraction depths from survey control points located near extraction precincts on Lots 29 and 196, 1 and 2 (see EP7.1). 4. Surveying of depth of extraction at the completion of each precinct on lots 29 and 196 by a qualified surveyor to ensure compliance. This is to be organised by the Environmental Officer. 5. Monthly monitoring of groundwater levels in the 5 monitoring bores across the site and comparison with monthly average rainfall by the Environmental Officer.
Reporting	1. Statement of Compliance submitted to Council annually with EMR, including a survey plan showing status of extraction and rehabilitation. 2. Work as Executed plans to be submitted to Council annually if an extraction precinct has been completed on lots 29 and 196 to demonstrate compliance with approved work and levels. 3. Monthly groundwater levels and relationship with rainfall reported in Annual EMR. 4. Annual production data to be provided in standard form to DIPNR.
Responsible Person	Environmental Officer ensures: • extraction and rehabilitation is undertaken sequentially as indicated in EP15.1 - Rehabilitation Schedule; • Work as Executed plans are submitted to Council with Annual EMR; • a surveyor is contracted to measure depths of extraction at completion of precinct extraction within Lots 96 and 196; and • monitor groundwater levels and reporting as detailed above.

Information/ References	EIS Chapter 6 and Appendix C3 (Southern Environmental 1999); EIS <i>Chapter 2Description of Proposed Development</i> (ERM, 2001). EP7.1 – Survey Control Points & Monitoring Well Locations EP8.1 – Extraction Precincts/Strips and Buffer Areas EP9.3 – Water Management System – Strip 2 <i>Figure 2 – Stage 2 Annexure C of Consent 250-09-01</i>
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Table 7.1 **INDICATIVE STRIPPING REQUIREMENTS LOTS 29 & 196**

Year	Total Yearly Stripping	Concrete Sand (tonnes)	Mortar Sand (tonnes)
1	157,500	70,000	70,000
2	234,000	90,000	120,000
3	270,000	120,000	130,000
4	328,500	160,000	140,000
5	328,500	160,000	160,000
6	300,000	180,000	80,000
7	216,000	180,000	

Notes: The above rates are based on the following:

- 1. total resource of concrete sand is 960,000 tonnes and of mortar sand is 680,000 tonnes;*
- 2. a 15% loss in washing for concrete sands;*
- 3. a 5% interburden/overburden loss for concrete and mortar sands; and*
- 4. 0% topsoil allowance, given most of the site has been previously stripped of topsoil.*

Table 7.2 **EXTRACTION & REHABILITATION SEQUENCE LOTS 29 & 196**

Action	Year 1	Year 2	Year 3	Years 4 to 10
White Sand				
Precinct 4 – excavate northern end and develop as sediment pond for processing area.				
Precinct 10 – complete extraction and develop as water storage.				
Precinct 11 – extract and rehabilitate				
Yellow Sand				
Precinct 5 – extract and develop as tailings pond.				
Precinct 3 – commence rehabilitation				
Precinct 9 – extract at completion of Precinct 5				
Precinct 8 – extract in western end to link with Precinct 9.				

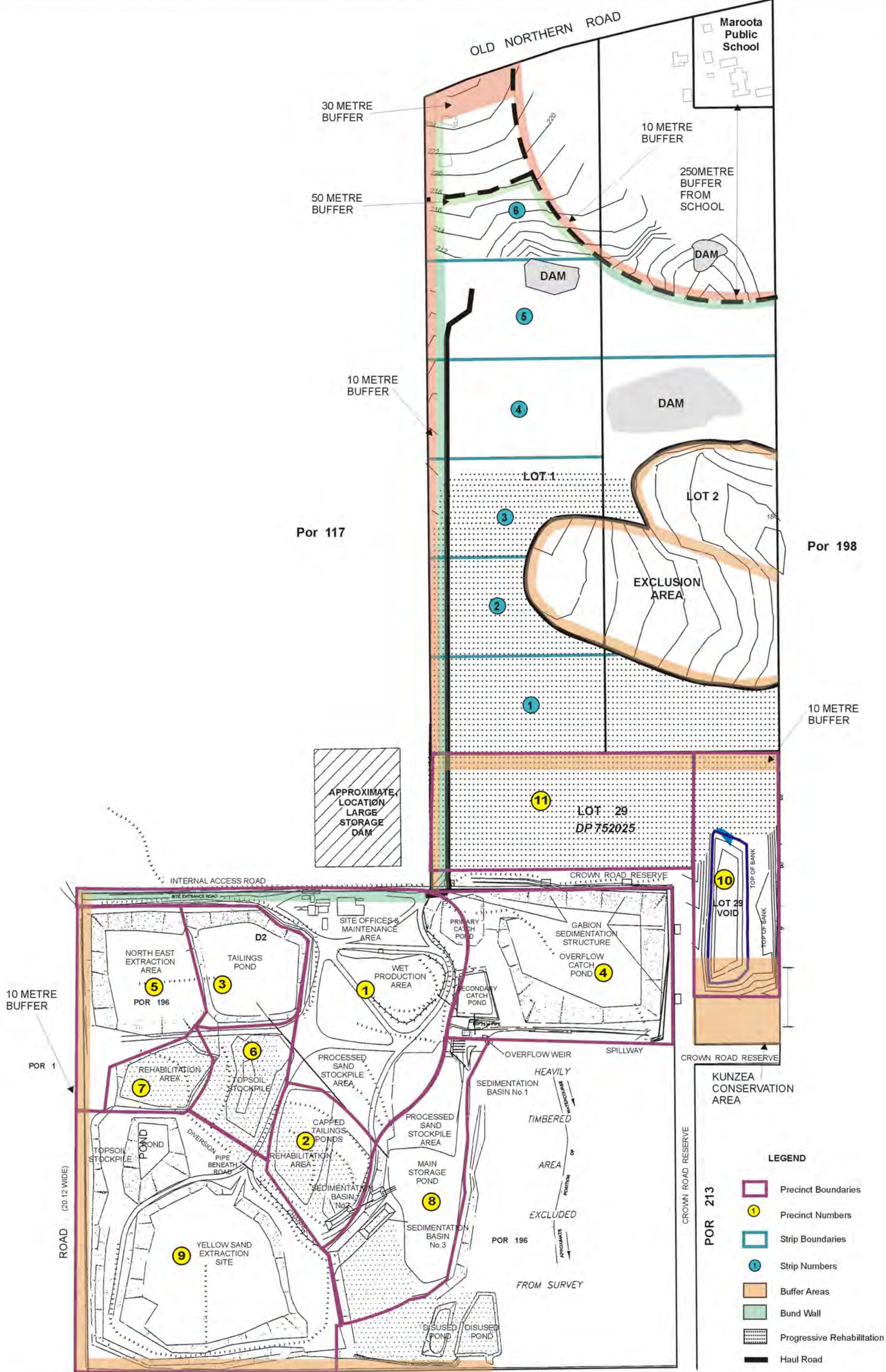
Notes: The above extraction sequence is based on the most optimistic scenario of 60 loads per day which would see the operation completed in four years. At a more gradual build-up from 40 to 60 loads per day, extraction will extend up to ten years.

Table 7.3 **EXTRACTION & REHABILITATION SEQUENCE LOTS 1 & 2**

Action	Years 1-3	Years 3-6	Years 10-11	Years 11-15	Years 15-17	Years 17-18
Strip 1 – extraction period						
Strip 2 – extraction period						
Strip 3 – extraction period						
Strip 1 – commence rehab						
Strip 4 – extraction period						
Strip 2 – commence rehab						
Strip 5 – extraction period						
Strip 3 – commence rehab						
Strip 6 – extraction period						
Strip 4 – commence rehab						
Strips 5/6 – rehabilitate						

Title	EP 8 - BUFFER ZONES AND PROTECTION OF ADJOINING LANDS
Consent/Licence Ref.	Condition 3.3 of Consent 796/00/HE; condition 3.1, 3.49, 6.3 and 7.2 of Consent 250-09-01.
Objectives	To minimise impact of the operation on nearby landuses and sensitive environmental areas such as the <i>Kunzea rupestris</i> plants on Lot 29, and the species composition within the Shale/Sandstone transition forest on Lots 1&2
Procedures	1. Buffer zones to be clearly delineated with pegs and safety wire, including: (i) 10 metre buffer to the northern boundary of Lot 29 (see EP8.1); (ii) 50 metre buffer to <i>Kunzea rupestris</i> on Lot 29 (see EP8.1); (iii) 250 metre buffer from boundary of Maroota P.S. (see EP8.1); (iv) 10 metre buffer from boundary of Lot 117 DP 752025 (see EP8.1); (v) 50 metre buffer from existing house on Lot 1 DP 547255 (see EP8.1); (vi) buffer at the edge of the shallow groundwater area (see EP8.1); 2. Buffer zones to be suitably bunded and fenced to ensure excavation, truck movements, dumping, dust, and weed infestation do not affect flora and fauna in: (vii) 50 metre buffer around <i>Tetratheca glandulosa</i> populations and shale-sandstone transitional forest (see EP8.1); and (viii) a reduced 20 metre buffer on northern point of conservation area (see EP8.1). 3. Rehabilitated 50 metre buffer to <i>Kunzea rupestris</i> on Lot 29 to be maintained. (see EP8.1). 4. 30 metre buffer from Old Northern Road to be planted on commencement of strip 1 extraction on Lots 1 & 2. 5. Implement measures to ensure public safety and restrict unsupervised access of school children to the quarry eg safety fencing.
Monitoring	Monthly inspection of buffer zones to monitor success of rehabilitation and inspection of buffer markers to ensure no disturbance of buffer/conservation zones (see EP4.1 - monthly site condition check list).

Title	EP 8 – BUFFER ZONES AND PROTECTION OF ADJOINING LANDS
Reporting	1. Success of rehabilitation of buffer zones to be reported in Annual EMR. 2. Director-General approved survey plan of buffer zones and setback boundaries for Lots 1 and 2 to be adhered to.
Responsible Person	Environmental Officer or bush regenerator responsible for monthly inspection to monitor rehabilitation success of buffer zones and ensure no disturbance.
Information/References	EIS Section 7.8 and Appendix C7 (Southern Environmental 1999); EIS <i>Section 2.4 Extraction, Processing and Haulage</i> and <i>5.1.1 Summary of Mitigation Measures</i> (ERM, 2001). EP8.1 – Extraction Precincts/Strips and Buffer Areas.



Source: Southern Environmental 1999



0 60m
Approximate Only

Figure EP8.1 Extraction Precincts/Strips & Buffer Areas

Dixon Sand - Maroota, NSW

Title	EP 9 - WATER MANAGEMENT
Consent/Licence Ref.	Conditions 2.3, 2.5, 2.7, 2.14, 2.28, 3.5(b), 3.6, 4.1, 4.11, 6.3 of Consent 796/00/HE; Conditions 3.17, 3.18, 3.19, 3.20, 3.21, 3.22, 3.23, 3.24, 3.25, 3.26, 3.27, 3.28, 4.7, 4.8, 6.3, 7.2 and Annexure C of consent 250-09-01. EPA General Term of Approval P1.3, L1, L3, M1, M2.1, M3, M4, M6, R1; EPA POEO Licence Conditions P1.2, L1, L3, M1, M2, M3, M6, R1. Water Licence Part 5 General Terms of Approval (Lots 29 & 196).
Objectives	To ensure discharge of stormwater from the site is clear of sediment (<50 mg/l TSS) and pH is between 4.5 and 6.5, a base flow is provided to the downstream creek, downstream ecosystems are protected, on-site re-use of water is maximised and groundwaters are not breached or contaminated. To ensure compliance with the <i>Rivers and Foreshores Improvements Act 1948</i> and the <i>Protection of the Environment and Operations Act 1997</i> and to support the first order objectives, targets and key issues outlined in the <i>Hawkesbury Lower Nepean Catchment Blueprint</i> (NSW Department of Land and Water Conservation, 2003).
Procedures	Surface Water 1. Install and maintain water management structures (diversion banks, sediment basins, catch ponds, tailings ponds and main storage pond) as per; EIS Appendix C3 (1999), EIS Section 2.5 <i>Surface Water Management</i> (ERM, 2001), EP9.1 to EP9.3, <i>Managing Urban Stormwater: Soil and Conservation</i> (NSW Government, 2004), and <i>Managing Urban Stormwater: Council Handbook</i> (EPA, 1997) to contain and treat all rainfall and runoff resulting from a 90 percentile, 5 day rainfall event. 2. Construction of clean water diversion drain around strip 1 and implementation of temporary sediment controls in drainage lines for stage 1 works to be completed prior to extraction on Lots 1 & 2. Refer EIS Table 2.2 <i>Stage 2 Water Management Design</i> (ERM, 2001) for design specifications. 3. Construction of clean water diversion drains and sediment controls for each successive strip (as shown in EP9.1 and EP9.3) shall be constructed prior to commencement of extraction from the respective strip. Refer EIS Table 2.2 <i>Stage 2 Water Management Design</i> (ERM, 2001) for design specifications. 4. Excavate drainage channel and construct small silt traps within excavated quarry floor as shown in EP9.1 and EP9.3. Size, dimension and grade of channel to comply with EIS Table 2.2 <i>Stage 2 Water Management Design</i> (ERM, 2001).

Title	EP 9 - WATER MANAGEMENT
	5. The voids within Lot 29 to act as a sedimentation pond for stormwater runoff from the Lot 1 & 2 excavation areas (refer to EP9.3). The volume of the initial void shall not be reduced beyond 2,500m³ during excavation of this lot - refer EIS <i>Section 2.5 Surface Water Management</i> (ERM, 2001). Construct overflow pipe beneath Crown Road for overflows from Lot 29 sediment ponds to overflow dam, as shown in EP9.1 6. No discharge from the main storage pond on Lot 196 permitted if TDS > 50mg/L and pH <4.5 and >6.5. 7. Ensure low flow pipe at weir within Lot 196 maintains base flow in creek. 8. Within 5 days after each storm, water in main storage dam within Lot 196 must be treated to comply with EPA licence conditions and discharged to freeboard level 9. Erosion and sediment control works to be implemented in accordance with EP10. 10. Minimise the area of disturbance by only clearing areas immediately prior to extraction and undertaking progressive rehabilitation (see EP15). 11. Maintenance and equipment refuelling shall only be carried out in the designated workshop or refuelling areas on Lot 196. 12. Chemicals and fuels to be stored in 110% capacity bunded areas of Lot 196 and fuel and oil spill equipment to be retained on site. 13. Prior to commencement of strips 4 and 5 on Lot 1 & 2, existing farm dams to be de-commissioned using the following methodology: • test water quality of dam storage to determine its suitability for discharge; • place erosion & sedimentation controls downstream of dam (refer EP10); • dewater dams to site water management system; and • excavate dam wall, remove deposited silt, and dispose of via procedures for desiltation of site sedimentation ponds (refer EP10). 14. During rehabilitation of strip 6 on Lot 1, constructed channel and silt traps on Lots 1 and 29 to be levelled to approved final landform on EP 15.2, topsoiled and revegetated.

Title	EP 9 - WATER MANAGEMENT
	15. Rehabilitation of strips 4 & 5 on Lots 1&2 to include the reinstatement of the ephemeral watercourse through Lot 2. Stabilisation of channel bed and banks using vegetation planting, rock gabions, and rock boulders placed and anchored if necessary, to reduce channel flow velocity, provide stilling ponds, and protect channel from erosion. Refer final landform plan EP15.2.
	16. Sedimentation ponds on Lots 29 & 196 to be filled to level of approved final landform shown on EP 15.2, topsoiled and revegetated following extraction. Groundwater 17. Extraction not to occur within 2 metres groundwater table (wet weather, high level) based on groundwater monitoring and survey information of the working area of the quarry. 18. In the event of groundwaters being breached, operations in the vicinity of the affected area to are to cease and Council & the Director-General are to be consulted with respect to the basis upon which extraction may recommence. 19. Maintain four groundwater monitoring bores on Lots 1 and 2 and one on Lot 196.
Monitoring	1. During Discharge: water monitoring at main storage dam weir (EP9.2) to occur daily for pH, turbidity (NTU) and TSS (mg/l). 2. During discharge: daily measurement of volume of water discharged at weir in litres. 3. Monthly groundwater level monitoring of the monitoring bores on site to be undertaken and following any periods of extreme wet weather. 4. Groundwater quality monitoring within each of the four bores on Lots 1&2 shall be undertaken every six months. 5. Quantity of groundwater extraction from supply bores (pumping and non-pumping) water levels to be recorded in January and June/July. 6. Voluntary monthly monitoring of quality in spring in unnamed creek (S19) 7. Consultation with NSW Fisheries to be carried out prior to commencement of operations in strip 4 of Lots 1 and 2.

Title	EP 9 - WATER MANAGEMENT
Reporting	1. All groundwater water quality, level and extraction data to be reported to DIPNR in the Annual EMR. 2. All water quality/quantity results to be reported to Council in Annual EMR. 3. Annual water quality monitoring report to be completed (records must include times of sampling, locations and name of person collecting sample) as part of Annual Return to EPA. (Annual Return comprises a Statement of Compliance and a monitoring and complaints summary.)
	4. An entire site Environmental Audit Report to be supplied to Director-General, EPA, NPWS, RTA and Council within a month of its completion
Responsible Person	Environmental Officer or person(s) authorised by environmental officer.
Information/References	EIS Section 6.9 and '<i>Integrated Surface Water Management Plan</i>' in Appendix C3, Figures 3 and 4 (Southern Environmental 1999) EIS Section 2.5 <i>Surface Water Management</i> and 5.1 <i>Summary of Mitigation Measures, Environmental Impact Statement - Maroota Quarry Extension</i>, (ERM, 2001) EP9.1 – Water Management System and Monitoring Locations- Strip 5, EP9.2 – Water Management Plan (Schematic) EP9.3 - Water Management System - Strip 2, EP15.2 – Final Landform Plan Lots 1 & 2. <i>Managing Urban Stormwater: Soil and Conservation</i> (NSW Government 2004) <i>Hawkesbury Lower Nepean Catchment Blueprint</i> (NSW Department of Land and Water Conservation, 2003) <i>Managing Urban Stormwater: Council Handbook</i> (EPA, 1997) <i>Maroota Groundwater Study Technical Status Report</i> (DLWC, 2001)

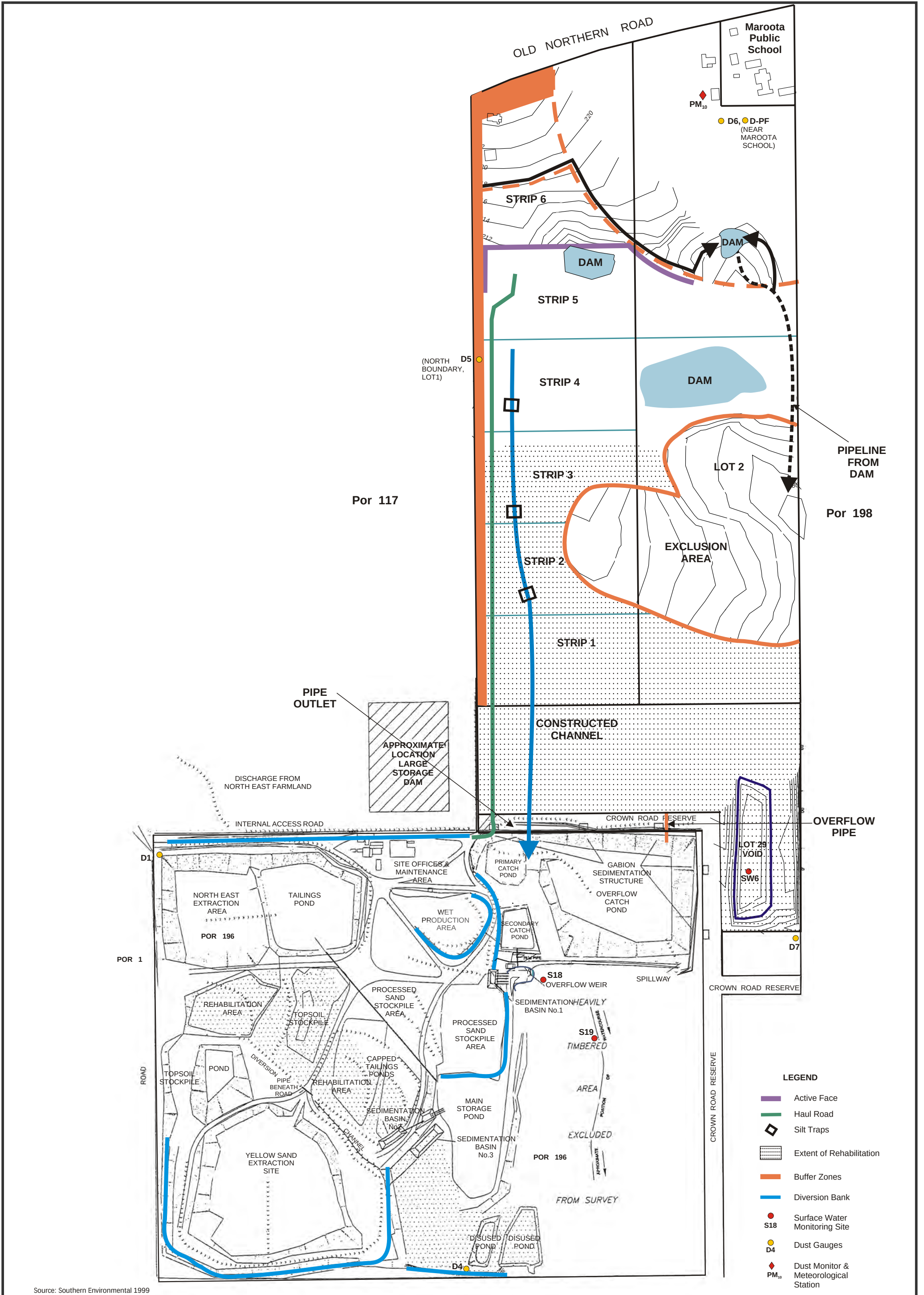


Figure EP9.1 Water Management System & Monitoring Locations - Strip 5

Dixon Sand - Maroota, NSW



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Approximate Only

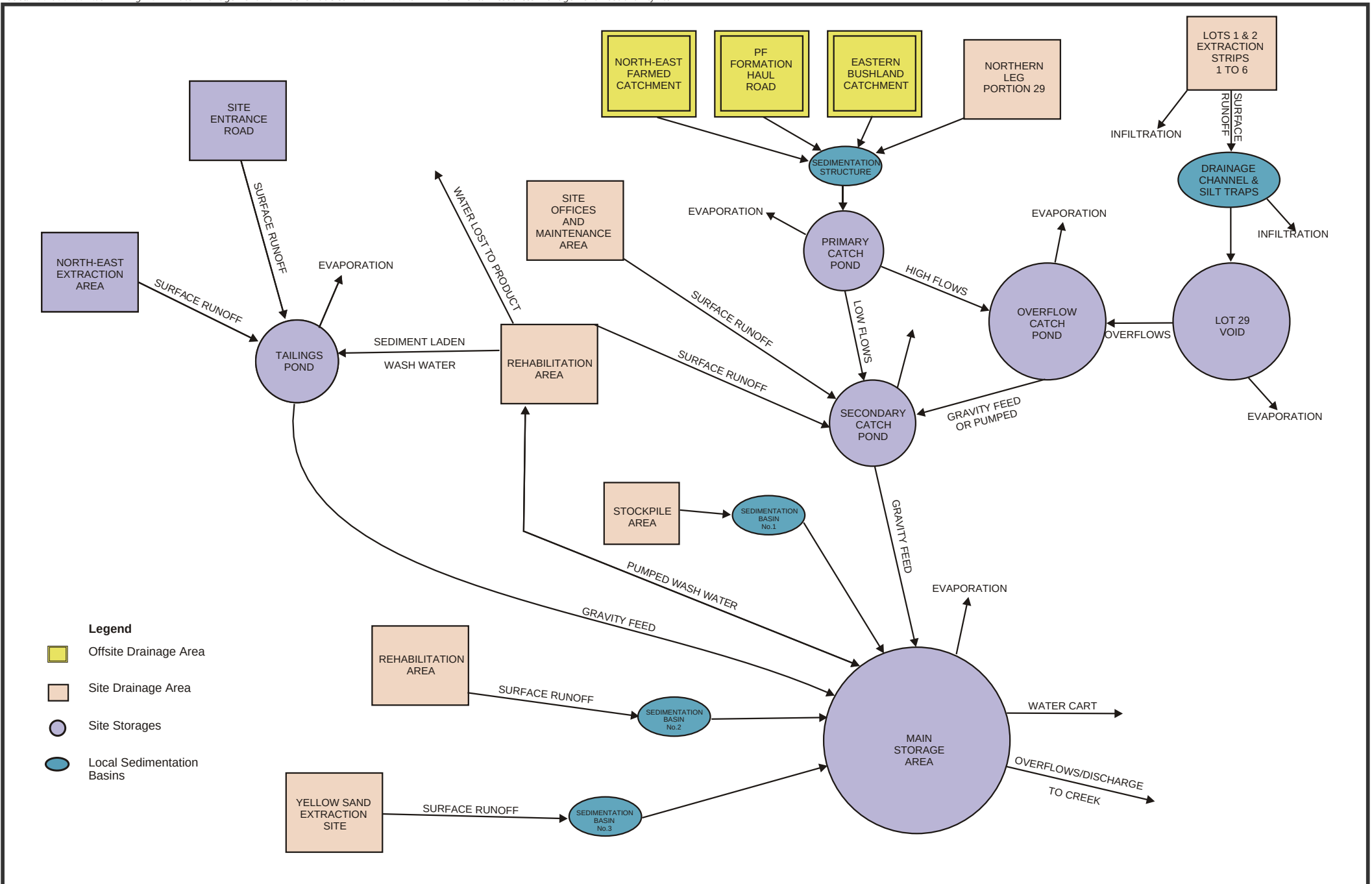
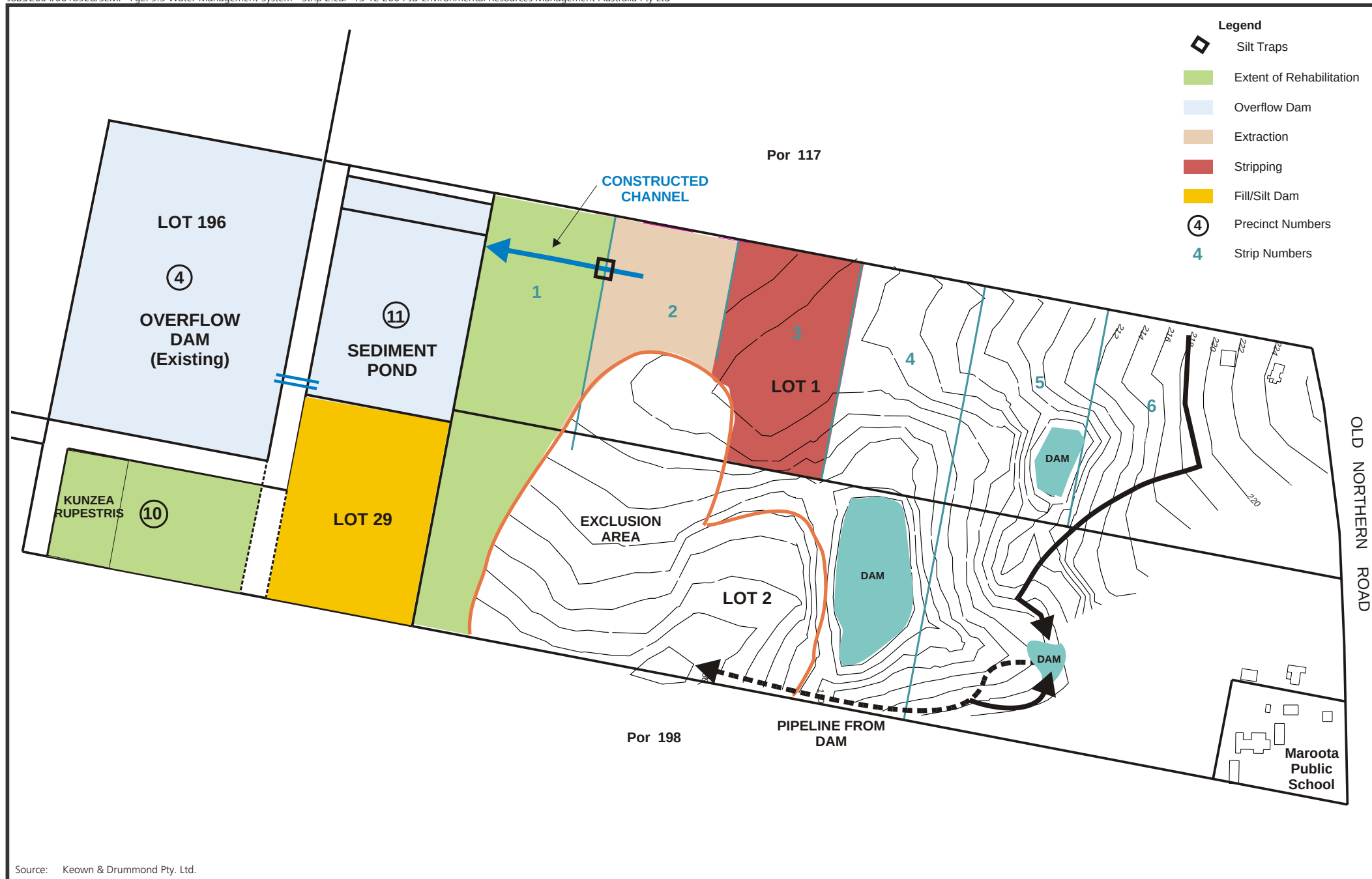


Figure EP9.2 Water Management Plan - Schematic



Source: Keown & Drummond Pty. Ltd.



0 80m
Approximate Only

Figure EP9.3 Water Management System - Strip 2

Dixon Sand - Maroota, NSW

Title	EP 10 - EROSION AND SEDIMENT CONTROL
Consent/Licence Ref.	Conditions 2.4, 2.14, 2.15, 2.23, 3.3, 4.10 of consent 796/00/HE; and 3.9, 3.10, 3.11, 3.12, 6.3 and 7.2 of consent 250-09-01. EPA general Terms of Approval L1, L3, O4, M1, M2, M4, R1; EPA POEO Licence Conditions L1, L3, O3, M2, M6, R1.
Objectives	To minimise and manage erosion and sedimentation on the site and ensure that sediment laden runoff is not discharged from the site. To conform with the <i>Urban Erosion and Sedimentation Handbook</i> (DLWC), <i>Pollution Control Manual for Urban Stormwater</i> (EPA) and <i>Managing Urban Stormwater: Soils and Construction</i> (NSW Government, 2004).
Procedures	1. Construct all internal all-weather surfaced access tracks with crossfall, table drains and lead outs with appropriate sediment traps, headwalls and scour protection as per <i>Section 2.5.2 Proposed Surface Water Management</i> of EIS (ERM, 2001). 2. Divert dirty runoff and dam water to sediment basins, sediment traps and catch ponds as a primary means of sediment trapping before water is discharged to main storage pond (see EP9). 3. Sediment ponds to have markers in place indicating sediment storage capacity (if known), or 30% of design capacity of the basin. 4. Sediment collected in sediment pond to be removed when design capacity of pond is reduced by 30%. Sediment/silt removed may be applied on site within rehabilitation areas as a layer no greater than 100mm thick beneath topsoil (immediately prior to spreading of topsoil), or alternatively, removed off site to landfill/waste recycling facility or on site sediment dump. 5. Only clear areas immediately prior to extraction and progressively rehabilitate to minimise area of disturbance (see EP15). 6. Inspect drainage and sediment controls monthly and conduct maintenance as required to ensure effectiveness. Where erosion is observed to be occurring, implement rehabilitation/stabilisation measures as per <i>Managing Urban Stormwater: Soils and Construction</i> (NSW Government, 2004). 7. Topsoil stockpiles to have maximum depth of 3 metres and are to be sown with vegetation if to be stored for more than 12 months.

Title	EP 10 - EROSION AND SEDIMENT CONTROL
	8. Implement and maintain silt fence downstream of dam sites and at intersection of the boundary and ephemeral watercourse prior to decommissioning. Fence to be maintained along boundary until rehabilitation of watercourse occurs.
	9. Silt traps within quarry floor drainage channel to be designed in accordance with <i>Managing Urban Stormwater: Soil and Conservation</i> (NSW Government, 2004) and consist of a gravel filled wire mesh or geotextile 'sausage', or similar, laid perpendicular to the direction of flow. Straw bales should not be used unless they may be securely anchored to the quarry floor.
Monitoring	1. Monthly inspection of all drainage and sediment controls on site, including water storages, pumps pipes and dams walls. 2. During discharge: weekly monitoring of water quality (pH, NTU, TSS) at the discharge point S18 (see EP 9) by the environmental officer or delegate.
Reporting	Refer EP9
Responsible Person	Environmental officer or person(s) authorised by environmental officer.
Information/References	EIS Section 6.9 and '<i>Integrated Surface Water Management Plan</i>' in Appendix C3, Figures 3 and 4 (Southern Environmental 1999). EIS Section 2.5 <i>Surface Water Management</i> and 5.1 <i>Summary of Mitigation Measures, Environmental Impact Statement - Maroota Quarry Extension</i>, (ERM, 2001). <i>Managing Urban Stormwater: Soils and Construction</i> (NSW Government, 2004). <i>Managing Urban Stormwater: Council Handbook</i> (EPA, 1997).

Title	EP 11 - HERITAGE MANAGEMENT
Consent/Licence Ref.	Condition 3.11 of consent 796/00/HE and 3.52, 6.3 and 7.2 of consent 250-09-01.
Objectives	To protect and manage any heritage items and archaeological material found on site.
Procedures	If any unidentified heritage or archaeological sites are found during operation: 1. work likely to affect the site is to cease; 2. the NPWS (Sydney zone) are to be contacted: NPWS Tel (02) 9585 6444 Fax (02) 9585 6555 3. necessary permits or consents to be obtained prior to recommencement of work.
Monitoring	To be documented in Annual EMR in the event that material is found.
Reporting	If archaeological material is found this would be reported in the Annual EMR and reported to NPWS (Sydney zone).
Responsible Person	Environmental officer responsible for reporting any find to the NPWS and/or NSW Heritage Office and restricting access to the area.
Information/References	<i>Section 5.1.2 Mitigation Measures</i> of EIS (ERM, 2001).

Title	EP 12 - NOISE AND VIBRATION MANAGEMENT
Consent/Licence Ref.	Conditions 2.22(vi), 3.8, 3.12, 4.4, 4.12, 6.2 of consent 796/00/HE and 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 3.43, 3.44, 3.45, 3.46, 3.47, 3.48, 4.5, 4.6, 5.2, 6.3 and 7.2 of consent 250-09-01. EPA General Terms of Approval L5, M1; EPA POEO Licence Conditions L6, M1, M4, R1.
Objectives	To ensure that construction and operation noise complies with EPA regulations whereby: (i) noise must not exceed $L_{Aeq}(15 \text{ minute})$ 44dB(A) (7am-6pm) Mon-Sat; and (ii) noise must not exceed a $L_{Aeq}(15 \text{ minute})$ 37dB(A) (6am-7am) Mon-Sat and no works on Sundays and Public Holidays; and (iii) noise must not exceed $L_{Aeq}(1 \text{ hour})$ 45dB(A) at most affected classroom of Maroota PS. To minimise impact of noise on surrounding residents and the Maroota Public School. To ensure employees are not subject to noise levels above those specified in the OH&S legislation.
Sources	Noise sources include wet/dry central processing plant and associated loader; dozer, excavator, water truck, haul truck, and articulated dump truck.
Procedures	1. Construct bunds on the eastern, southeastern and northern sides of Lots 1 & 2 to at least 5 metres above existing ground level (EGL). 2. Bulldozer not to be used concurrently with any other plant on strips 4, 5, and 6 of Lots 1 & 2 at depths between EGL and 6m below EGL. 3. Only use bulldozer for clearing, stripping and bund construction on Lots 1 & 2 during calm wind conditions. 4. Between 0-6 metres depth below EGL, dozer-dump truck combination to be replaced by excavator-dump truck combination to strip overburden on Strips 2-6 inclusive. 5. Construction and rehabilitation of eastern highwall of quarry within 250 metres of Maroota Public School in school holiday periods only. 6. Noise emissions of new equipment to be considered prior to purchase.

Title	EP 12 – NOISE AND VIBRATION MANAGEMENT
	7. Refer to EP6 for hours of operation to be complied with. 8. All road surfaces, vehicles and equipment to be regularly maintained to reduce noise. 9. EP1.1 <i>Site Induction for Drivers</i> to note required truck speeds and limited use of exhaust brakes in residential areas. 10. Residual noise management measures are to be implemented if noise exceeds EPA noise criterion. Measures may include: (a) quarrying at ground level to cease during southwest to northwest winds; (b) addition of controls or treatments on individual sources; (c) provision of alternative measures to compensate neighbours; and (d) actively investigating long-term strategies to eliminate noise levels.
Monitoring	1. Operational noise compliance monitoring required annually on Lots 196 & 29 (as per 1.). 2. Operational noise compliance monitoring on Lots 1 & 2 required 6-monthly at sensitive residential locations and Maroota PS during worst case operation and adverse weather conditions. 3. Undertake noise monitoring in adverse weather conditions after noise mitigation earth bunds on strips 4, 5 and 6 of Lots 1 & 2 are completed. 4. Road traffic noise monitoring required within 6 months of commencement of operations on Lots 1 and 2, at Maroota PS. 5. Annual OH&S noise monitoring and when new equipment is introduced. 6. Ongoing community liaison (see EP17) and noise complaints monitoring using EP3.1 to be completed.
Reporting	1. Operational compliance results to be submitted to EPA within 28 days of monitoring. 2. Monitoring results after bund construction on Lots 1 & 2 to be submitted to EPA and Director-General within 3 months of their construction. 3. Annual noise monitoring report (including Statement of Compliance and a monitoring and complaints summary) as part of Annual Return to EPA.

Title	EP 12 - NOISE AND VIBRATION MANAGEMENT
	4. Noise monitoring results to be submitted in the Annual EMR.
Responsible Person	Environmental officer to organise monitoring and reporting as required. Truck drivers responsible for required actions to reduce noise.
Information/References	EIS Section 7.4 and Appendix C4, (Southern Environmental 1999); EIS Section 4.7 <i>Noise</i> and 5.1 <i>Summary of Mitigation Measures</i> (ERM, 2001). EP8.1 Extraction Precincts/Strips & Buffer Areas (location of required noise attenuation walls)

Title	EP 13 - AIR QUALITY MANAGEMENT
Consent/Licence Ref.	Conditions 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 6.2 of Consent 796/00/HE and 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 4.3, 4.4, 6.3 and 7.2 of consent 250-09-01. EPA General Terms of Approval O2, M1, R1; EPA POEO Licence Conditions P1, O3, M1, M2, R3.
Objectives	To minimise dust generation and air pollution to prevent impact on surrounding residences and the Maroota Public School and comply with the following EPA ambient goals: (i) dust deposition – 4 g/m² /month (annual average); (ii) PM10 – 50 µg/ m³ (average for rolling 24 hour period) or 30 µg/ m³ (annual average). To ensure employees are not subject to dust levels above those specified in the OH&S legislation.
Procedures	1. Minimise the area of disturbance by only clearing areas immediately prior to extraction and progressive rehabilitation (see EP15). 2. Maintain dust suppression devices to all processing equipment. 3. Maintain the Council approved manual sprinkler system including fine sprays on the conveyors of the dry processing plant, overhead sprinklers and a conical jet stockpile sprinkler. 4. Topsoil stockpiles to be planted with a cover crop of non-invasive cereal or legumes (refer to Appendix 2 of Rehabilitation and Revegetation Strategy (DLWC, 2000) for appropriate species depending on season and duration of cover required). 5. Use water cart to suppress dust on unsealed roads, truck loading areas and stockpiles during dry conditions on days of operation. 6. 20 km/hr speed limit on internal, unsealed access tracks to minimise dust generation. 7. All loaded vehicles entering and leaving the site to be covered prior to final weighing. 8. Surface haul roads in selected hard, non-friable material. 9. Construction and rehabilitation of eastern highwall of quarry within 250 metres of Maroota Public School in school holiday periods only. 10. Regular maintenance of mobile and fixed equipment to minimise exhaust emissions.

Title	EP 13 - AIR QUALITY MANAGEMENT
Monitoring	1. Dust deposition levels to be monitored continuously at the five gauges on and around the entire site (see EP9.1 - Water Management System & Monitoring Locations). 2. PM10 Action Plan Continuous monitoring by a device near Maroota PS connected to an alarm system within the operations area of Lots 1 & 2 (see EP9.1) triggered by a maximum PM10 level of 37.0µg/m³ as a rolling 24 hour average: If this trigger level is reached during a prevailing north-westerly wind: 1) Alarm received by Management (via text message). 2) General manager and Production manager authorised to issue directive to relevant personnel to cease operations as per EPA licence condition M2.4. 3) Management to evaluate conditions and employ the use of dust suppression measures immediately. 4) Environmental officer to notify EPA Manager Sydney Industry immediately. 5) Environmental Officer to closely monitor and communicate PM10 levels to management. 6) Operations on Lots 1 and 2 may only re-commence upon approval from General Manager and Production Manager when the rolling 24hr average PM10 is less than 37ug/m³ for 4 consecutive 15 minute periods as informed by Environmental Officer. 7) If the dust level does not return to below the allowable limit within 1 hour of ceasing all operations on Lots 1 & 2, then all dust generating activity on Lot 29 must also stop; and operations must stay restricted to precincts 1,2,3,4,5,6,8 and 9 of Lot 196. The PM10 action plan must be adhered to at all times. 3. Climate – wind speed, direction, temperature and rainfall to be measured daily at on-site meteorological station, location is indicated on EP9.1.

Title	EP 13 - AIR QUALITY MANAGEMENT
Reporting	1. EPA to be contacted immediately if allowable PM10 level exceeded. 2. Report identified dust exceedences and any complaints received in Annual EMR. 3. Annual air and dust quality monitoring report to the EPA (in Annual EMR). 4. Air quality results and meteorological data to be reported in Annual EMR.
Responsible Person	1. Drivers responsible for adherence to speed limits, covering loads, regular vehicle maintenance. 2. Site supervisor responsible for ensuring processing plant operator(s) maintain dust suppression equipment on the plant. 3. Environmental Officer or person(s) authorised by environmental officer responsible for dust and air quality monitoring and reporting, implementation of dust suppression controls.
Information/ References	EIS Section 7.6 (Southern Environmental 1999); <i>Sections 4.8 Air Quality</i> and 5.1 <i>Summary of Mitigation Measures</i> of EIS (ERM, 2001). <i>Approved Methods for the Sampling and Analysis of Air Pollutants in NSW</i> (EPA, 2001) EP9.1 Water Management System & Monitoring Locations – Strip 5.

Title	EP 14 - FLORA AND FAUNA MANAGEMENT
Consent/Licence Ref.	Conditions 2.15, 2.17, 2.24, 3.13, 5.1 and 5.3 of consent 796/00/HE and conditions 3.0, 3.49, 3.50, 3.51, 4.9, 4.10, 6.3 and 7.2 of consent 250-09-01. Refer to <i>Flora and Fauna Management Plan</i> Dixon Sand (Penrith) Pty Ltd (2004a) for detailed procedures.
Objectives	To minimise impact on flora and fauna and protect threatened species on the site and in adjacent bushland.
Procedures	1. Maintain fence delineating the 50m buffer around <i>T. glandulosa</i> and shale-transitional forest and the buffer of 20m on the northern point of the conservation area. 2. Carry out pre-clearance inspections, flora/fauna translocation and micro-habitat salvage prior to felling hollow-bearing trees as per <i>Annex B</i>. 3. Minimise disturbance of natural vegetation by maintaining, rehabilitating and replenishing existing buffer zones (see EP8). 4. Progressively rehabilitate extraction areas under direction of a qualified person (see EP15). 5. No stockpiling of material or moving of plant equipment under trees. 6. Protect adjoining bushland by maintaining buffers (EP8), stabilising and revegetating existing batters and erosion and sediment control measures (EP 10). 7. Grazing stock, if present, to be excluded from conservation areas. 8. Maintain nursery on site for propagation of native seed collected from adjoining bushland for use in native bush regeneration on site. 9. Remove weeds and/or prevent from spreading, local Council to be notified of any noxious weeds (list to be obtained from Council and retained on site). 10. Maintain a low flow in the natural watercourse to protect riparian vegetation and aquatic flora and fauna downstream of the site. 11. If any unidentified heritage or archaeological sites are found during rehabilitation works, refer to procedures in EP11.

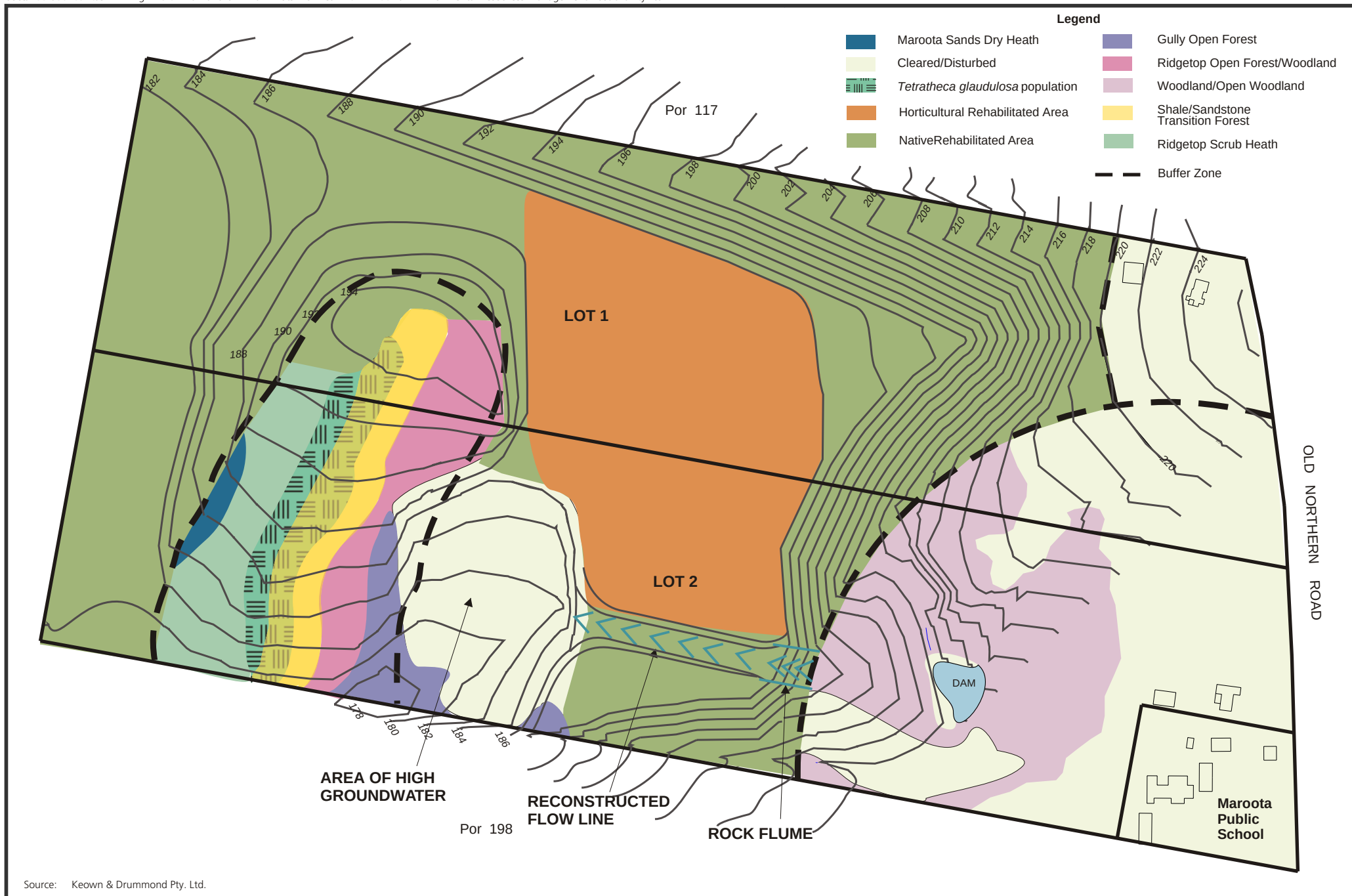
Title	EP 14 - FLORA AND FAUNA MANAGEMENT
Monitoring	1. Annual survey of revegetation works and effects on <i>Kunzea rupestris</i>, <i>T. glandulosa</i>, Shale-Sandstone Transitional Forest, and <i>D. fascicularis subsp. oligantha</i> by a qualified ecologist to assess health of the communities and any threats or degradation. 2. Monthly assessment of buffer markers and fences to ensure no disturbance of buffer/conservation zones (see EP 4.1 EMP Check list). 3. Visual assessment of buffer/conservation areas to ensure no degradation as a result of the operation. 4. Monitoring program to begin prior to commencement of operations on Lots 1 & 2 and continue for at least 2 years beyond the period of approval.
Reporting	1. Results of annual survey of threatened species and communities submitted to DIPNR and Council in Annual EMR. 2. Report on status of each rehabilitation area, works implemented, updated diagrams and photos to be submitted to DIPNR and Council in Annual EMR.
Responsible Person	• Bush regeneration and habitat reconstruction techniques and pre-clearance surveys to be carried out under the direction of a qualified plant ecologist. • Environmental officer or bush regenerator responsible for monthly assessment of buffer zones. • Qualified ecologist (environmental officer) responsible for annual threatened species/communities survey. • Machine operators obligated to minimise harm to vegetation.
Information/References	<i>Annex B</i> Flora and Fauna Management Plan (Dixon Sand (Penrith) Pty Ltd, 2004a) Section 7.8, 11.8 and Appendix C7 of EIS (Southern Environmental 1999); sections 4.9 <i>Flora and Fauna</i> and 5.1 <i>Summary of Mitigation Measures</i> of EIS (ERM, 2001). EP8.1 Extraction Precinct/Strips & Buffer Areas EP11 Heritage Management

Title	EP 15 - REHABILITATION AND FINAL LANDSCAPE
Consent/Licence Ref.	Conditions of 2.24, 2.25, 3.3, 3.4, 5.1, 5.2, 5.3, 6.4, 6.6 of consent 796/00/HE and conditions 3.11, 3.12, 3.13, 3.16, 3.41, 3.51, 4.9, 6.3, 7.2 and Annexure C of consent 250-09-01. Refer to <i>Rehabilitation and Revegetation Strategy</i> (DLWC, 2000), and <i>Rehabilitation and Landscape Plan</i> (Dixon Sand (Penrith) Pty Ltd, 2004b) for detailed procedures.
Objectives	To ensure rehabilitation works are implemented progressively to enhance the scenic and environmental quality of the site, increase habitat for threatened species, and utilises areas suitable for agricultural pursuits.
Procedures	1. Progressively rehabilitate extraction precincts on Lots 29 and 196 within 3 months of completion of extraction in accordance with the schedule outlined in the Rehabilitation Strategy (DLWC, 2000) (see Rehabilitation Schedule-EP15.1). 2. Progressively rehabilitate buffer areas on lots 1 and 2 (refer to DLWC, 2000 for detail). Retain mature vegetation in designated buffer zones and plant 30m buffer to Old Northern Road upon commencement of strip 1 extraction. 3. Rehabilitation works to be supervised by Environmental Officer. 4. Carry out rehabilitation and habitat construction works in the conservation area and its buffer zones on lots 1 and 2 upon commencement of strip 1 extraction. 5. Undertake rehabilitation and final landform works within 250m of Maroota PS in school holiday periods only. 6. Soils used in rehabilitation to be tested to determine fertiliser requirements etc prior to rehabilitation in each precinct on lots 29 and 196. 7. Initial cover cropping of lots 29 and 196 with cereals. Once crop has browned off it is to be slashed to create mulch layer, then second seed application with required fertilisers and soil ameliorants (recommended seed mix refer to DLWC, 2000). 8. Minimise extraction-related activities to not more than 2 strips (plus one undergoing rehabilitation) on lots 1 and 2 at any one time. 9. Transfer topsoil and brush material from adjacent strips prior to excavation.

Title	EP 15 - REHABILITATION AND FINAL LANDSCAPE
	10. Establish native vegetation areas using brush matting and/or tube stock propagated from local seed and other vegetation (orchards) in accordance with the Rehabilitation Strategy (DLWC, 2000) and Plan (Dixon Sand (Penrith) Pty Ltd, 2004b).
	11. Remove felled trees, logs and rocks from strips and stockpile or lay during rehabilitation to provide fauna habitat. 12. Revegetate final batters and slopes as soon as land forming is completed. 13. Stockpiles to be kept to less than 3m high, left for less than 12months and revegetated with non-invasive, sterile species. 14. Retain erosion and sediment controls as per EP10 until works complete. 15. Remove problem weeds or prevented from spreading; notify local council if noxious weeds found. 16. Carry out required rabbit control methods as required per annual inspection during winter months. 17. Rehabilitate Lots 1 & 2 with native plants to Class 4 agricultural land (utilising cover crops when necessary). 18. Restore the creek line through Lot 2 and precinct 4 of Lots 29 and 196 once extraction is completed in consultation with DLWC (see DLWC, 2000; Dixon Sand (Penrith) Pty Ltd, 2004b). 19. Establish a riparian zone 20 metres wide along the entire length of the reconstructed ephemeral waterway & revegetate with local native species.
Monitoring	1. Monthly inspections of rehabilitation areas by environmental officer and bush regenerator to assess establishment of vegetation and success of rehabilitation (see site condition checklist, EP4.1). 2. Annual assessment of vegetated and weed infested areas for evidence of rabbits. 3. Where applicable, prepare work as executed plans to demonstrate that completed precinct levels on lots 29 and 196 are in accordance with Rehabilitation Strategy.

Title	EP 15 – REHABILITATION AND FINAL LANDSCAPE
	4. Following commencement of stream restoration, bi-annual field sampling of performance criteria for stream restoration works on strips 4 and 5 of Lots 1 and 2, and Lots 29 and 196. 5. Certification from qualified geotechnical engineer confirming rehabilitated land is compacted to a level suitable for its end use. 6. Noise and air monitoring to continue as per EP12 and EP13 until all earthworks complete.
Reporting	Report on status of each rehabilitation area, works implemented, updated diagrams and photos, work as executed plans where necessary and engineer certification to be submitted to Council in Annual EMR as Annual Rehabilitation Management Plan.
Responsible Person	• Environmental officer responsible for ensuring rehabilitation is undertaken in accordance with rehabilitation schedule and strategy (DLWC, 2000). • Qualified bush regenerator responsible for supervising rehabilitation works. • Environmental officer and bush regenerator responsible for monthly inspections of rehabilitation areas and reporting. • Environmental officer responsible for ensuring work as executed plans and engineer certification submitted to Council following the completion of a precinct. • Environmental officer to engage suitable pest control contractors for the control of rabbits if required.
Information/References	Section 7.8, 11.8 and Appendix C7 of EIS (Southern Environmental 1999); sections 2.8 <i>Rehabilitation and Final Land Use</i>, 4.9 <i>Flora and Fauna</i>, 4.12 <i>Visual</i> and 5.1 <i>Summary of Mitigation Measures</i> of EIS (ERM, 2001). Rehabilitation and Revegetation Strategy for Dixon Sand North Maroota Operations (DLWC, 2000), and Rehabilitation and Landscape Plan (Dixon Sand (Penrith) Pty Ltd, 2004b). EP15.1 – Rehabilitation Schedule; EP15.2 – Final Landform Contours – Lots 29, 196, 1 & 2; EP15.3 Final Landform Plan – Lots 1 & 2; EP15.4 – Section A-‘A’ Final Landform Level, Lots 29, 196 (Concept Only); EP15.5 – Section B-‘B’ Final Landform Level, Portion Lots 29, 196 & 2 (Concept Only); EP15.6 – Section C-‘C’ Final Landform Level, Lots 1 & 2 (Concept Only).

Colour code		Lots 29 & 196 Rehabilitation Works				Lots 1 & 2 Rehabilitation Works							
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Completed yes/no
2004							Review rehab of Lot 196		Review rehab of Lot 29	Reinstate 10m buffer along eastern boundary of Lot 29.			
2005				Start final rehab Crown Reserve		Start reveg. & habitat construction works in exclusion area.	Review rehab of Lot 196 Plant 30m buffer from Old Northern Rd.	Start final rehab of Precinct 11	Plant buffers along northern & south-eastern edges of quarry.	Review rehab of Lot 29			
2006						Treat weeds in buffer zone edges.	Review rehab of Lot 196	Start rehab Precincts 5 and 9		Review rehab of Lot 29			
2007							Review rehab of Lot 196			Review rehab of Lot 29			
2008		Initial landform rehab. of Strip 1.		Transfer topsoil/brush & plant Strip 1.		Treat weeds in buffer zone edges.	Start total rehab of Precincts 1 and 2			Start final rehab of Precincts 9 and 5			
							Review rehab of Lot 196			Review rehab of Lot 29			
2009			Obtain 3A permit		Initial landform rehab of Strip 2.		Start rehab of Precinct 4 (must have part 3A permit before commencing rehab works)		Start final rehab of Precinct 4				
							Transfer topsoil/brush & plant Strip 2.						
2010						Treat weeds in buffer zone edges.	Review rehab of Lot 196			Review rehab of Lot 29	Initial landform rehab of Strip 3.		
2011		Transfer topsoil/brush & plant Strip 3.											
2015		Initial landform rehab of Strip 4.		Transfer topsoil/brush & plant Strip 4.		Treat weeds in buffer zone edges.	Review rehab of Lot 196			Review rehab of Lots 1 & 2.	Review rehab of Lot 29		
2019		Initial landform rehab of Strip 5.		Transfer subsoil & plant cover crops Strip 5.		Treat weeds in buffer zone edges.		Re-establish creek line through Strips 4 & 5.		Review rehab of Lots 1 & 2.			
2020					Treat weeds in buffer zone edges.	Initial landform rehab of Strip 6.	Review rehab of Lot 196	Transfer subsoil & plant cover crops Strip 6			Review rehab of Lot 29		
2021-2023		Review rehab of Lots 1 & 2			Maintain buffer edges.								



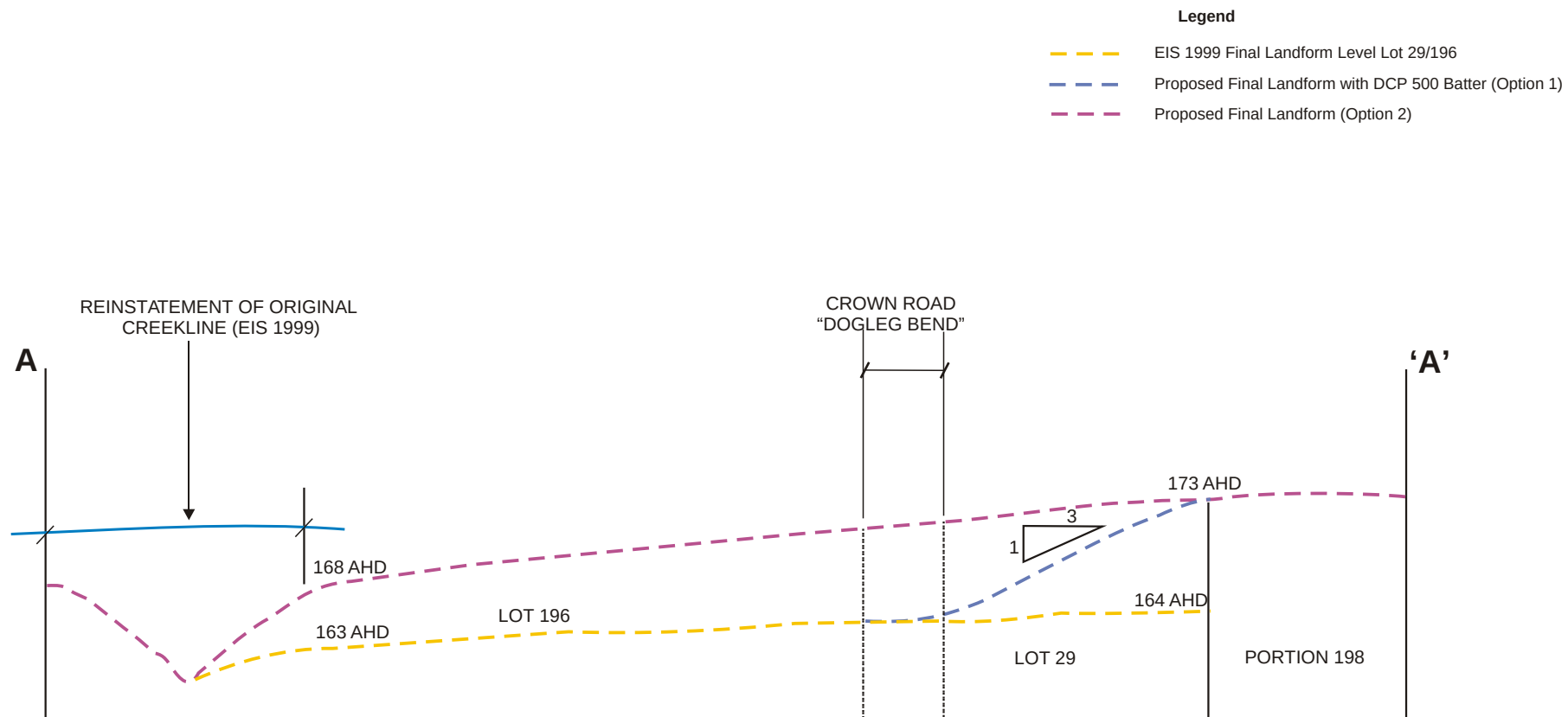
Source: Keown & Drummond Pty. Ltd.

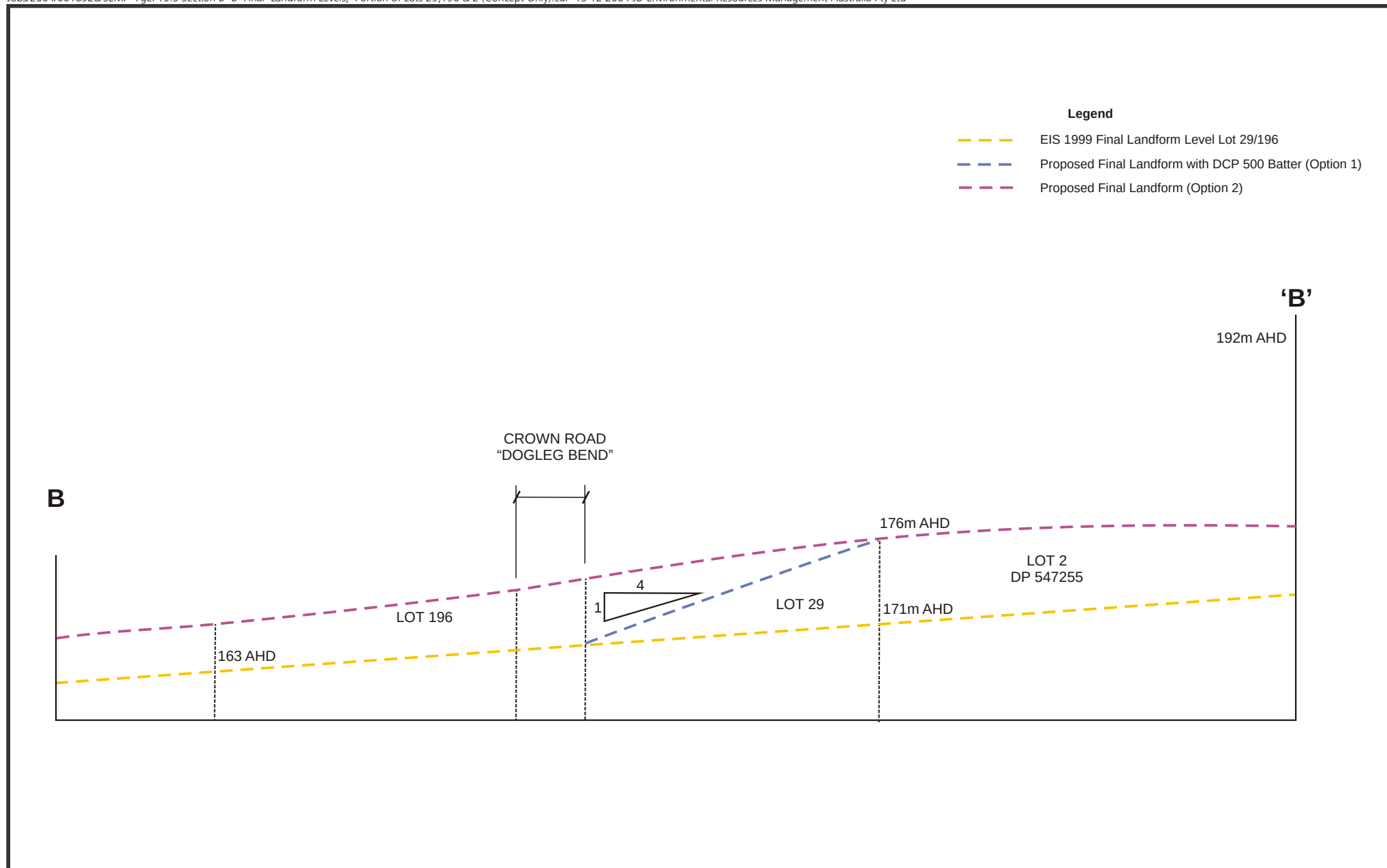


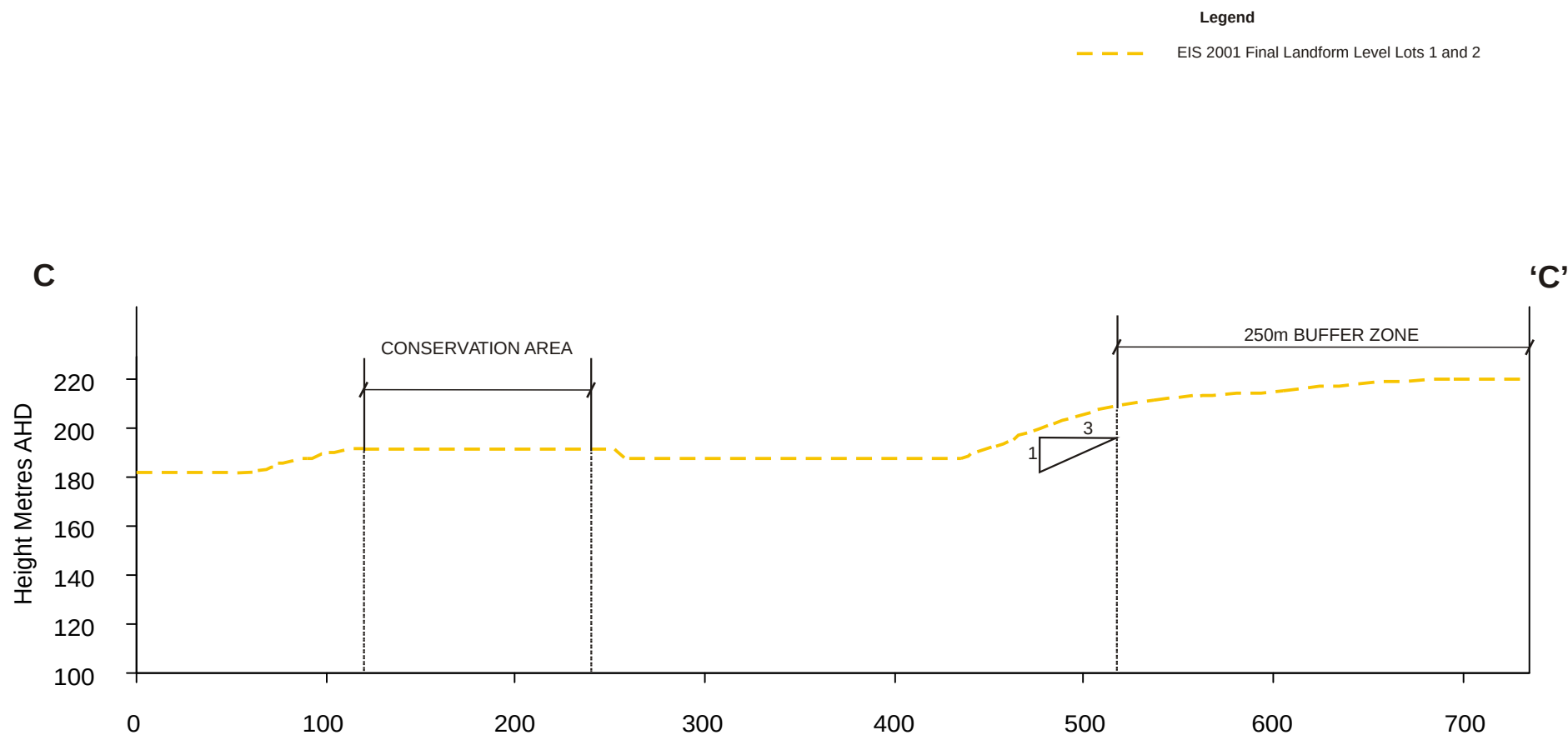
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Approximate Only

Figure EP15.3 Final Landform Plan - Lots 1 & 2

Dixon Sand - Maroota, NSW







Title	EP 16 - BUSHFIRE RISK MANAGEMENT
Consent/Licence Ref.	Conditions 3.15, 6.3 and 7.2 of consent 250-09-01 (Lots 1 and 2).
Objectives	To ensure that Dixon Sand effectively minimise the risk of damage to life, property and the environment in the event of a bush fire.
Procedures	1. Assess the on-site bush fire fuel load every 6 months to maintain fuel loads to less than 8 tonnes/ha on lots 1 and 2. 2. Undertake hand and mechanical clearing methods to reduce fuel load of site (except conservation areas) eg manual raking of fine fuels; grass moving; slashing; ploughing or grading; removal or pruning of trees and shrubs; hazard reduction burning. 3. Obtain a Fire Permit or Bush Fire Hazard Reduction Certificate if hazard reduction burning is required. 4. Do not conduct a burn when a Total Fire Ban or No Burn Day is declared for the area, or in adverse weather conditions. 5. Advise adjoining property owners, RFS Fire Control Centre and the NSW Fire Brigade prior to conducting a controlled burn. 6. Educate employees and visitors of emergency evacuation procedures, the location of a marshalling areas and the use of fire-fighting equipment. 7. Treat machinery to prevent the spread of weeds following hazard reduction burning. 8. Undertake a fire drill every 6 months.
Monitoring	1. Annually review emergency evacuation procedures and carry out workplace safety audit. 2. Regularly consult with adjoining property owners to coordinate maintenance of equipment, vegetation, fences etc. and discuss effectiveness of hazard reduction procedures.
Reporting	Report effectiveness of bush fire hazard reduction techniques in Annual EMR.

Title	EP 16 - BUSHFIRE RISK MANAGEMENT
Responsible Person	Environmental officer responsible for the training of employees, education of visitors, organisation of fire drills, and maintenance of fuel loads across the site. Environmental officer and/or qualified firefighters to undertake hazard reduction burning works where required.
Information/References	<i>Guidelines for Low Intensity Bush Fire Hazard Reduction Burning (for Private Landholders)</i> (RFS, 2003). Fire Safety Tips (Baulkham Hills Shire Council, 2003).

Title	EP 17 - COMMUNITY RELATIONS
Consent/Licence Ref.	Conditions of 6.5, 6.6, and 6.7 of consent 796/00/HE and conditions 3.15, 3.35B, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 6.3 and 7.2 of consent 250-09-01. EPA General Terms of Approval G1 and Appendix B; EPA POEO Licence Conditions M4, M5.
Objectives	To ensure that Dixon Sand effectively manage, minimise and monitor social impacts and improve communications with the local community, and key stakeholders including: • Baulkham Hills Shire Council (BHSC); • DIPNR, DEC, DIPNR, Department of Education, NPWS, Hawkesbury Nepean Catchment Authority. • Maroota Public School • farmers and local extractive industries; • employees, lenders, suppliers and customers of Dixon's; • local environmental groups; • local residents and Aboriginal groups; and • land owner of Lot 2 (M/M/F Taouk).
Procedures	1. Two review meetings to be held per year with a Community Consultative Committee (CCC) comprising: (i) 1 independent chairperson nominated by the DG in consultation with Council and Dixon's; (ii) 2 representatives from Dixon's, including environmental officer; (iii) 1 representative from Council; (iv) 1 representative from Maroota PS; and (v) 2 representatives from local community, approved by DG/Council. Discuss SEMP, monitoring results, audit reports, compliance reports, AEMR or complaints. 2. Telephone complaints line to be open during operating hours. Telephone number to be advertised on the site gate and in a local newspaper. 3. Web site to be constructed to provide 24hr information on operation and complaints avenues.

Title	EP 17 - COMMUNITY RELATIONS
	4. Annual community open days and site inspections as part of CCC meetings will be held on site to explain operations and receive feedback. Open days will be advertised on the web-site and in appropriate local newsletters. 5. Regular articles as relevant in the local community newspapers and newsletters including environmental monitoring results and local sand mining issues. 6. Liaise with Maroota PS annually to discuss effectiveness of traffic management procedures. 7. Annual EMRs are to be made available for inspection by the public. Copies shall be made available on-site at Dixons, BHSC and the Maroota Resource Centre. 8. Assist with Streamwatch program initiated by Maroota School. 9. Co-operate with local Landcare and bush regeneration groups and provide revegetation information. 10. Assist the Glenorie ECAC Crofton Weed Project.
Monitoring	1. Maintain complaints register (see complaints register form EP3.1). 2. Regularly consult with adjoining property owners to coordinate maintenance of fences, weed control etc. 3. Conduct biannual attitudinal survey for teachers, parents and students of MPS for first 2 years and then at lesser intervals as reviewed by the CCC. 4. Carry out annual survey by letterbox drop to gauge social impact on wider community.
Reporting	1. Publish summary of minutes from CCC meetings in local newspaper. 2. Provide minutes of CCC to Council and DG within 14 days. 3. Outcomes/recommendations of liaison and CCC to be recorded and provided to Council as part of Annual EMR. 4. Summary of complaints to be submitted to EPA as part of Annual Return. 5. Any social survey results to be reviewed at CCC meetings.

Title	EP 17 - COMMUNITY RELATIONS
Responsible Person	• Environmental officer responsible for convening liaison meetings, recording and distributing minutes, organising open days, newspaper articles, assisting with community activities, maintaining complaints register and reporting. • Environmental officer and their delegates responsible for operating complaints register.
Information/References	EP3.1 (Complaints Register). <i>Section 5.1 Summary of Mitigation Measures</i> of EIS (ERM, 2001).

Title	EP 18 - WASTE MANAGEMENT
Consent/Licence Ref.	Condition 5.2 consent 796/00/HE, and conditions 3.29, 3.53, 3.54, 3.55, 6.3 and 7.2 of consent 250-09-01. EPA POEO Licence Condition L5.
Objectives	To minimise waste generated, maximise reuse and recycling and ensure wastes are managed effectively to minimise impact on the environment.
Procedures	1. Maintain separate receptacles for paper, aluminium, glass, plastic and general domestic waste on Lots 29 and 196. 2. Recyclables (paper, aluminium, glass and plastic) to be collected by Council and other types (oil, steel and paper) by contractors. 3. Pick-up of non-recyclable domestic waste from office, amenity and workshops by Council. 4. No building wastes or putrescible material to be disposed on site. 5. No waste generated outside site to be stored, treated, processed, or disposed on site except as permitted by a licence. 6. Maintain on-site sewage treatment and disposal in an 'enviro-cycle' type plant. 7. Waste oil and grease to be collected and stored on Lot 196 in bund 110% size of the volume of largest tank and removed by a licensed waste oil recycling contractor. No refuelling of equipment to be undertaken on Lots 1 & 2. 8. Encouragement of employees to adopt waste-reducing practices. 9. Processing plant tailings (fine clays and silts) to be disposed to tailings dams on Lots 29 & 196, to be capped and rehabilitated when at capacity.
Monitoring	Monthly inspection of on-site sorting and storage of recyclables via Site Condition Checklist.
Reporting	Annual waste management reported in Annual EMR to Council including type, composition and quantity of material recycled and removed and destination of materials removed.
Responsible Person	All staff are responsible for correct management and disposal of waste.

Title	EP 18 - WASTE MANAGEMENT
	Environmental officer to educate new staff of waste minimisation procedures of site.
Information/ References	Section 6.6, 6.7, 7.7 of EIS (Southern Environmental 1999); <i>Sections 2.9.6 Alternative Waste and Water Management</i> and <i>4.14 Waste Management</i> of EIS (ERM, 2001). <i>Bunding and Spill Management</i> (EPA Technical Bulletin). <i>Assessment, Classification and Management of Liquid and Non-Liquid Wastes</i> (EPA, 1999).

Annex B

Detailed Ecology and Rehabilitation Management Plans

Flora and Fauna Management Plan

1.0 Introduction

The following management plan details measures and guidelines for pre-clearance, clearing, vegetation management, revegetation, wildlife corridor links, and the monitoring program required under condition 4.9 of Consent 250-09-01.

The plan has been designed to minimise impacts on flora and fauna within the site and to protect threatened species, populations and communities in the adjacent bushland during the life of the operation.

This plan has been developed in accordance with NPWS recommendations, and Baulkham Hills Shire Council *Development Control Plan 500 – Extractive Industries* (Baulkham Hills Shire Council, 1997).

2.0 Pre-clearance measures

2.1 Habitat trees

Pre-clearance inspections shall be carried out by an ecologist or suitably qualified person to identify and mark trees containing hollows and/or stags to be felled, and those to be retained (ie within a buffer zone).

The method of removing habitat trees will involve disturbing the tree (by pushing against it with a bulldozer) at least 12 hours before it is to be felled in order to allow inhabiting fauna to disperse. An ecologist or suitably qualified person will be present during habitat tree clearance in order to collect any displaced fauna.

Any animals collected will be re-released either at the point of capture, or in suitable habitat (on-site or nearby adjoining) as soon as possible, preferably at night. In order to avoid possible heat stress on a hot and sunny day, the animal may need to be kept captive in a breathable Hessian or cotton bag, placed in a safe, quiet, dark and warm room, until conditions are suitable for its release.

All efforts shall be made to prevent trauma to any animal collected by protecting it from predators and minimising human contact with it. Captured animals should be checked for injuries, and WIRES will be contacted to attend to any injured animal (Hawkesbury branch phone number: 02 4577 2669). The breeding status of captured animals should also be considered.

2.2 Micro-habitats

Pre-clearance inspections will also be carried out to identify and, where practical, salvage micro-habitats (including dead trees, stags, stumps and hollow branches) for relocation to areas lacking such material (eg buffer zones, boundary areas) and for use in the recreation of habitat areas (eg between any cleared and remnant bushland or in rehabilitation areas).

The method for the salvage of micro-habitats will involve removal of habitat features via hand or excavator prior to ripping and excavation, the removal of hollows from dead trees if required, and the placement of habitats in cleared areas of buffer zones or rehabilitated strips/stages by hand, excavator or dozer.

As rehabilitation progresses over time, the felled trees and micro-habitat material that gradually become available will be strategically placed, wherever possible, in these areas in order to improve habitat availability, and provide runways of ground cover for the dispersion of animals.

3.0 Clearing time frames

A comprehensive time frame for clearing and revegetation activities is outlined in section 4.1.2 of the Rehabilitation and Landscape Plan (Kenny, 2004b) included in the SEMP. The clearing schedules will be subject to any sensitive periods of animal hibernation or breeding.

Breeding and hibernation periods for Mammals recorded in the area are varied. Most locally occurring bats typically hibernate in winter and breed in spring, while some other mammals breed throughout winter, spring and autumn. Frogs recorded in the area are spring breeding species, and locally occurring bird species generally have breeding times ranging from early spring to early summer, with possibly a few exceptions in winter (eg. Honeyeaters) (NPWS, 2004).

Thus, clearing is to be carried out in mid-summer where possible to best avoid incidents as seasonal habitat requirements will be at their lowest during this time.

4.0 Vegetation and revegetation management measures

Vegetation management and revegetation measures described in this SEMP aim to restore the ecological integrity of the site by ensuring the preservation of flora and habitat outside the extraction area, and providing scope for effective vegetation re-establishment post-extraction.

Sections 3.0 and 5.0 of the Rehabilitation and Landscape Plan (Kenny, 2004b) describe in detail the methods for creating, landscaping, and managing site vegetation for the purposes of maximising the floral and faunal diversity of locally occurring species.

4.1 Buffer zones

Buffer zones shall be clearly defined (using high visibility wire), maintained and replenished to minimise impact on natural vegetation. All effort will be made to retain areas of mature vegetation in designated buffer zones which may become a valuable supply for seeds, brush, seedlings (for transplanting) and cuttings.

Material will not be stockpiled under trees, while Machine operators are to be briefed on responsibilities regarding their obligation to minimise harm to vegetation.

4.2 Establishing and maintaining vegetation

Part 3.1 of the Rehabilitation and Landscape plan outlines the key methodology to re-instate vegetation on site, which involves the transfer of topsoil and brush material obtained directly from adjacent strips prior to their excavation. This will ensure the use of local endemic species for revegetation. The species selection may be initially determined by this material, and later added to by brushmatting and direct planting. All efforts shall be made to reinstate elements of vegetation communities that originally existed on the site.

Regenerative material shall be extensively collected from the area to be extracted prior to clearance and shall be used for propagation, brushmatting, and possibly

experimental translocation depending on weather conditions (refer to Vallee *et al* 2004).

The approach to on-site threatened vegetation management is discussed in detail in Section 4.2 of the Rehabilitation and Landscape Plan.

5.0 Wildlife corridor links

Figure 14 contained in the Environmental Impact Statement for P.F. Formations Extractive Industry and Processing Plant (Donges *et al*, 1989) shows the conservation area contained in lot 198 of the site. The figure depicts a tract of vegetation to be reinstated extending from the northeast corner of the conservation area on Lots 1 and 2, towards the north east corner of lot 198 itself.

The southwest corner of Dixon Sands' lot 2 directly adjoins this corner of lot 198. Conserved and rehabilitated areas of lot 2 (and subsequently lot 1) will join with this corridor upon completion of rehabilitation works by both parties. These areas of vegetation will also eventually become integrated with revegetation works to be carried out on lot 29 (of Dixon Sand Pty Ltd), providing further links between adjoining habitat areas.

Upon final completion of rehabilitation and revegetation works on the site, the integrated vegetation shall provide for improved wildlife corridor links to the adjoining habitat areas and the expanse of crown bushland to the west.

6.0 Monitoring program

The aim of the Flora and Fauna monitoring program is to monitor and identify any effects of the operation on preserved flora and fauna species. Measures for monitoring and reporting on the success of general revegetation areas, conserved and threatened vegetation areas, and the stream restoration areas are outlined in section 5.0 of the Rehabilitation and Landscape Plan.

As required under condition 4.10 of consent 250-09-01, the monitoring program shall begin before commencement of operations on the quarry extension site and continue for at least two years beyond the period of approval.

The Flora and Fauna Monitoring Program will include the following;

- an annual survey of the threatened plant species (*Tetratheca Glandulosa*, *Darwinia fascicularis subsp. oligantha*, *Kunzea Rupestris*) and Shale-Sandstone Transitional Forest on the site to assess the health of the communities and any threats of degradation. This assessment is to be done by a qualified ecologist;
- a monthly assessment of buffer markers to ensure there has been no disturbance of buffer/conservation zones;
- regular visual assessment of buffer/conservation areas to ensure no degradation as a result of the operation; and
- the success of revegetation works (as addressed in section 5.0 of Rehabilitation and Landscape plan).

Results of these surveys will be produced in the form of an annual report, to be submitted to council as part of the Annual Environmental Management Report (as required by condition 7.2 of consent 250-09-01).

REFERENCES

- Baulkham Hills Shire Council (1997) *Development Control Plan 500 – Extractive Industries*
- Donges, C.C., and associates (1989) Environmental Impact Statement for P.F. Formations Extractive Industry and Processing Plant.
- Kenny, C (2004a) Rehabilitation and Landscape Plan, written for Dixon Sand Pty Ltd.
- NSW National Parks and Wildlife Service (2004) National Parks and Wildlife Service Wildlife Atlas
<http://wildlifeatlas.nationalparks.nsw.gov.au/wildlifeatlas/watlas.jsp>
- Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M., and Rossetto, M. (2004) *Guidelines for the translocation of threatened plants in Australia*. Second Edition. Australian Network for Plant Conservation, Canberra.

REHABILITATION AND LANDSCAPE PLAN

1.0 Summary

This rehabilitation and landscape plan has been prepared for Dixon Sand (Penrith) Pty Ltd to provide recommendations for both the existing quarry site (lots 196 and 29), and the quarry extension (lots 1 and 2) at North Maroota. The strategy has been prepared in accordance with *Development Control Plan No. 500 – Extractive Industries* (Baulkham Hills Shire Council, 1997), and in response to the requirements of other government agencies.

The objectives of the strategy are to:

- *form a final landform similar to the surrounding landscape;*
- *ensure rehabilitation works are implemented progressively;*
- *enhance the scenic and environmental quality of the site;*
- *maintain existing flow paths wherever possible and reinstate the ephemeral watercourse through Lot 2;*
- *protect and enhance habitat for threatened species and communities; and*
- *continue agricultural land uses on Lots 1 & 2.*

Lots 1 and 2 comprises six extraction strips that will be rehabilitated progressively. Other areas of the extension site have been grouped into management units for rehabilitation and revegetation purposes. Each area has been addressed with a specific strategy relative to anticipated limitations and environmental conditions. Ultimately, limitations to the successful establishment of vegetation will relate to the depth of available soil material, and the permeability of the sandstone sub-strata.

Native endemic plants will be used to rehabilitate Lots 1 and 2 to Class 4 agricultural land. Recommendations for species selection have been noted throughout this plan, with reference to various studies carried out in the Maroota area, which provide comprehensive species lists for local vegetation types.

The revegetation strategy outlines recommendations for the transfer of topsoil and brush, the use of cover crops, and other types of revegetation techniques (with reference to DLWC 2000, and current successful methods on lots 196 and 29). Weed and feral animal control methods are also outlined in this methodology.

This plan also provides specific recommendations for the conservation, revegetation and monitoring of threatened vegetation on site. The final restoration, revegetation, maintenance and monitoring of the natural creek line on Lot 2 is also outlined, along with recommendations relating to set backs, buffer zones, and environmental bunds.

2.0 Introduction

This document details the landscaping to be undertaken on site, and has been written based on techniques sited in the *Rehabilitation and Revegetation Strategy* prepared by Soil Service, Department of Land and Water Conservation (DLWC 2000), and those currently being undertaken for lots 196 and 29.

2.1 Requirements of Public Authorities

This report has been written to address the requirements of Baulkham Hills Shire Council *DCP 16 – Extractive Industries*, the NSW Department of Infrastructure, Planning and Natural Resources, and other government authorities.

2.2 Existing environment – site and surrounds

Lots 1 and 2 are made up of areas of remnant vegetation, and Class 3 and 4 agricultural lands. Lots 29 and 196 are currently under extraction and in the process of being rehabilitated. Surrounding the site are other extractive industries, native vegetation, and orchards. Maroota Public School is also in close proximity.

The geology of the site and surrounding area comprises Hawkesbury sandstone overlain by a Tertiary deposit of fluvial sediments. The limitations that such sandy, erodible soil types may impose on the revegetation of the site may be sufficiently mitigated through the full utilisation of available topsoil and brush, and cover crops where necessary.

2.3 Rehabilitation Strategy Outline

The final landscape plan for Lots 1 and 2 (ERM 2001) indicates that the site is to form a final landform similar to the surrounding landscape (although three to 20 metres lower), which will maintain existing flow paths wherever possible and reinstate the ephemeral watercourse through Lot 2. Thus, as recommended by DLWC (2000), all revegetation operations should be undertaken with consideration of the Site Drainage Control Plan, the Site Erosion Control Program and areas of favourable soil conditions (i.e. moist and deep).

The parts of Lots 1 and 2 that are not available for quarrying will remain at their current levels. The western edge of the quarry extension will blend into the floor of the quarried area on lot 29, and the northern and eastern edges will be back-filled and battered to the top of the existing landform to an average grade of 3:1 (horizontally to vertically).

3.0 Revegetation Methodology

As explained below, the revegetation methods for Lots 1 and 2 will vary according to each conservation area and strip. Specific recommendations for revegetation methods can generally be taken from DLWC (2000). However, given the planned transfer and immediate availability of topsoil and brush on lots 1 and 2, recommendations relating to soil testing and conditioning (DLWC 2000, sections 3.1 and 3.2) may not be relevant to this plan. Use of cover crops (DLWC 2000, section 3.3) may also be minimised for this same reason. The following are recommendations for procedures that are most likely to be effective on lots 1 and 2, based generally on findings from works on lots 196 and 29.

3.1 Direct Transfer of Topsoil and Brush

The key method of rehabilitation on lots 1 and 2 will involve the transfer of topsoil and brush material obtained directly from adjacent strips prior to their excavation. This material may be utilised as a seed source, mulch, erosion control, and possibly habitat for fauna. Cleared logs and felled trees will also be utilised wherever possible for ground fauna habitat and soil stabilisation. The species selection may be initially determined by this material, and later added to by brushmatting and direct planting using local material (collected according to recommendations by DLWC 2000, sections 3.4, 3.5).

As recommended by DLWC (2000, section 3.4), the floristic composition of the communities that existed on site prior to excavation may be used as a guide for the selection of species, and as a long-term goal for the final species composition of the rehabilitated areas. All revegetation landscaping works will aim to promote the maximum diversity of species endemic on the site.

3.2 Established revegetation methodologies - Lots 196 & 29

On-site propagation of local provenance seed is currently the chief method employed for revegetation on Lots 29 and 196. Given the current drought conditions across the area, it is likely that large scale direct seeding may not be a viable option in the near future. On-site trials have shown that correctly treated and propagated seed produces greater numbers of seedlings than direct seeding. From previous experience, tubestock 6 to 9 months old at the time of planting is most successful for rehabilitation.

Complimentary brush-matting and manual weeding (to assist natural regeneration, especially on vegetated boundaries of the site) has also proven to be particularly successful when combined with direct planting. Where the use of cover crops has not been viable on Lots 29 and 196, the gradual addition of organic matter to these areas has been achieved through the use of mulch provided by dried brush or dead weeds.

The spreading of soil substrate has also proven successful in areas where weed control would be otherwise unattainable. Contour ripping of this material further reduces erosion and provides valuable areas of moisture retention for plants. Initially, low levels of organic matter and nutrient in the soil has proven to slow early colonisation by weeds, and given nursery fertilised tubestock an advantage following planting.

From previous trials, the broad vegetation groups listed in *Table 3.1* are recommended for use when employing certain revegetation techniques.

Table 3.1 Rehabilitation Species

Rehabilitation technique	Broad vegetation Group
Brush Matting	<i>Allocasuarina</i> , <i>Banksia</i> *, <i>Hakea</i> , <i>Leptospermum</i> *, <i>Acacia</i> *, <i>Eucalypt</i> , <i>Angophora</i> .
Topsoil	<i>Grevillea</i> , <i>Pultanaea</i> , <i>Hibbertia</i> , <i>Bossiaea</i> , & grasses & herbs
Transplanting	<i>Lomandra</i> , <i>Dillwynia</i> , <i>Pultanaea</i> , <i>Angophora</i>
Broad sowing	<i>Acacia</i> *, <i>Isoopogon</i> , <i>Banksia</i> *, <i>Hakea</i> *, & grasses
Tubestock	<i>Persoonia</i> , <i>Eucalypt</i> , & other small shrubs that do not germinate from the topsoil.

*May require heat treatment (taken from ERM 2001).

3.3 Rehabilitation of Lots 1 and 2

Species selection for revegetation on lots 1 and 2 has been derived from a variety of flora inventories found in the following reports:

- Appendix 3 of *Rehabilitation and Revegetation Strategy, Recommendations and Methodologies*, DLWC (March, 2000);
- Section 4.2.3, and Appendix 1 of *Ecology of the Maroota Sandmass and Environs*, Ecohort Consultants (2000), and;
- Section 3 of *Proposed Sand Extraction, Old Northern Rd, Maroota, Flora and Fauna Constraints*, Gunninah (1998).

These reports will be utilised to assist in maximising the floristic diversity of the revegetation program.

The necessary regenerative material for propagating plants will be obtained from areas designated for clearance, i.e. the approved extraction areas.

3.4 Cover crops

Where a lack of transferable topsoil and / or brush material is present, the use of cover crops may be required for the stabilisation and mulching of an area prior to further regeneration. Section 3.3 of DLWC (2000) provides methodologies and a listing of non-invasive, sterile species for this use. These cover crops may also be used to assist in stabilising any temporary stockpiles or bund walls.

3.5 Weed control

Early intervention and prevention is undoubtedly the most cost-effective way in which to approach weed control on-site (ANRM *et al* 1999). An ongoing weed control program should aim to identify problem weeds, and formulate a recommended time frame for the control of each, based on its life cycle. Consistent attention will be paid to any weed infestations in order to maximise opportunities for timely control methods. Problem weeds will be removed or at least prevented from spreading and council should be notified of any noxious weeds.

The use of *Round-up* may be suitable for areas requiring large scale weed control, however within areas of natural regeneration (eg on site boundaries), hand pulling may be safer and more effective.

3.6 Feral Animal Control

Control of feral animals on site may be carried out on a need by need basis. Evidence indicates the presence of rabbits on site, and includes dung piles, scratches / digging in soil, and burrows. Pest control contractors may be required to provide the necessary rabbit control services, which involve the application of a pesticide on the area.

An annual assessment of vegetated areas for evidence of rabbits will determine the need for control methods that year. Ideally, any controls should be implemented during the winter months when the population is at its lowest.

4.0 Progressive Strategy

The rehabilitation strategy has been scheduled to address the likely anticipated limitations in each area. The aim of the rehabilitation strategy is to (at the earliest possible opportunity) cultivate a sustainable vegetative cover in accordance with the rehabilitation and final land use objectives of the site. The following recommendations outline the various approaches to the staged, progressive rehabilitation of Lots 1 and 2. These areas of Lots 1 and 2 can be grouped as follows:

- Extraction strips (1 to 6);
- Threatened vegetation;
- Setbacks, Buffer zones and Environmental bunds; and
- Natural creek line re-establishment.

There will be generally three stages of operation for the quarry extension:

1) Early stage (years 0 – 6):

- extraction of Strips 1 – 3 and commencement of revegetation.
- commencement of conservation buffer zone revegetation.
- setback, buffer zone and bund establishment and maintenance.

2) Latter stage (years 7 – 17):

- extraction of Strips 4 – 6 and commencement of revegetation.
- maintenance of previous strip revegetation, setbacks, buffer zones and bunds.

3) Final stage (years 15 – 18)

- creek restoration and revegetation
- final replenishment and maintenance works on all revegetated areas.

4.1 Extraction Strips

4.1.1 Methodology Outline

Extraction works should strive to minimise operation to not more than two strips at any one time. Each strip will be progressively cleared, extracted, and then rehabilitated. It is recommended that wherever possible, direct return of cleared vegetation and topsoil from one strip to another should be carried out. To minimise degradation and decomposition of the topsoil when stockpiling is unavoidable, piles should be:

- less than 3 meters high, and left for no longer than 12 months;
- placed in areas where they will not be disturbed; and
- revegetated with cover crops.

If the topsoil is likely to contain significant numbers of undesirable weed species, use of the subsoil as an alternative substrate for revegetation may be considered. Alternatively, the technique of double stripping the soil (i.e. removing the top 50-100mm) may assist in reducing the amount undesirable species in the receiving revegetation area. The unwanted top layer of weed-infested soil may then be stockpiled or buried, and the next layer utilised as topsoil for rehabilitation purposes.

At any one time, three consecutive strips may be active, wherein Strip X is cleared prior to extraction, Strip Y is in the final stages of extraction, and Strip Z is awaiting / in the process of being rehabilitated. This process can be summarised as follows:

1. Fell any large trees on strip X (in accordance with methods outlined in Flora and Fauna management Plan contained in this SEMP), and temporarily stockpile on strip Z.
2. Following seed / regenerative material collection, clear remaining vegetation, and strip (or double strip if necessary) topsoil on strip X with dozer and stockpile separately on strip X.
3. Strip overburden from strip X and truck to backfill the vertical cuts on strip Z.
4. Truck useable stockpiled topsoil from strip X and spread over the awaiting strip Z.
5. Cover topsoiled area of strip Z with brush and large felled trees from strip X.
6. Plant and maintain tubestock on strip Z. Replace dead plants as necessary.
7. Regularly weed strip Z.

4.1.2 Detailed Schedule of Works- Strips 1 to 6 (Early stage – Latter stage)

STRIP 1

Strip details: Approximately 50 per cent of topsoil on strip 1 may be suitable for rehabilitation purposes. The Maroota Sands dry, and Ridgetop scrub heath vegetation on lot 2 will be a valuable supply of brush material. The remaining area is cleared and weed infested.

Approximate extraction period: It is envisaged that extraction works will operate on strip 1 for 3 years. Because strip 1 has no adjacent area to transfer material to, it is recommended that the southwest corner of Lot 196 be considered as a possible area of use for this material.

Revegetation: Upon completion of extraction and landform rehabilitation works, strip 1 should receive topsoil and brush material from strip 3. The use of subsoil (stabilised by cover crops) may be appropriate if there is an insufficient supply of topsoil.

STRIP 2

Strip details: Strip 2 resides only on lot 1; its pre-extraction state is fully cleared, and very weedy. Thus, double stripping and utilising only the under layer of topsoil may be necessary for this area.

Approximate extraction period: Extraction works are envisaged to operate on this strip for a 12 to 19 month period. Topsoil may be stored in stockpiles for later use on strip 1 or others.

Revegetation: Upon completion of extraction and landform rehabilitation works, strip 2 should receive a sufficient amount of topsoil and brush material from strip 4.

STRIP 3

Strip details: Mostly resides on Lot 1. Pre-extraction, this strip is more than 50% cleared. The remaining area is vegetated by Ridgetop open forest / Woodland which will provide good transfer material for revegetation on strip 1.

Approximate extraction period: Extraction works are envisaged to operate on this strip for a 12 to 19 month period.

Revegetation: Upon completion of extraction and landform rehabilitation works, strip 3 should receive topsoil and brush material from strip 5.

STRIP 4

Strip details: This strip spans both lots 1 and 2. Pre-extraction, the strip is approximately 40% cleared, and 60% vegetated. The ridgetop open forest / woodland on site will provide good material for transfer to strip 2 and possibly supplement strip 1.

Approximate extraction period: Extraction works are envisaged to operate on this strip for 4 to 4.5 years.

Revegetation: Upon completion of extraction and landform rehabilitation works, strip 4 should receive topsoil and brush material from strip 6.

STRIP 5

Strip details: Strip 5 spans lots 1 & 2. Pre-extraction, it is fully vegetated by woodland / open woodland species. This brush and topsoil material may ultimately be used for revegetation on strip 3 and possibly be considered for stockpiling for later use on strip 4. Any excess material may also be utilised to improve on rehabilitation works on strip 2.

Approximate extraction period: Extraction works are envisaged to operate on this strip for 4 years.

Revegetation for strips 5 & 6: Due to the proposed use of material from strip 1 on lot 196, and the general limited availability of brush from other areas, strip 5 and 6 may suffer a lack of material to receive for revegetation purposes. Alternative revegetation methods such as the use of subsoil (proven effective on lot 196) and cover crops may need to be employed for these 2 strips.

STRIP 6

Strip details: Strip 6 lies on lot 1 and is approximately 70 per cent cleared and 30 per cent vegetated by Woodland / Open woodland species. This area will provide good material for transfer to strip 4, however the remaining topsoil will not be useable for revegetation purposes because of its potential to spread weed.

Approximate extraction period: Extraction works are envisaged to operate on this strip for a 12 to 19 month period.

Revegetation: (see above).

Follow-up direct planting of endemic plant species will also aid the revegetation of these strips. It should be noted that the final location of strip boundaries may vary slightly when subject to site management and landform constraints.

4.2 Threatened Vegetation (Early stage – Final Stage)

4.2.1 Viability of translocation programs

The Recently revised edition of *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee *et al* 2004) emphasise that translocation is a high-risk exercise that requires a commitment to careful management, preparation and monitoring.

Driscoll & Bell (2004) provide a summary, which indicates that the success of translocation projects for threatened plants in Australia has had varying levels of success. Survival rates have typically varied from 0 to 88%, with many less than 60%.

The following is a discussion, which considers the use of translocation as an ameliorative or compensatory measure for threatened species on Lots 1 and 2. The recommendation by Vallee *et al* (2004) that states “management options requiring the least intervention and less risk should be considered first” has been taken into account.

Shale/Sandstone transition forest.

The existing remnant Shale/Sandstone transition forest on Lots 1 and 2 has been designated as a conservation area. Transition forest reconstruction outside of the buffer zone has been considered practically and economically inappropriate for the site, as much of Lot 1 is intended to be returned to agricultural land following the cessation of operations. Within the buffer zone, the Shale/Sandstone transition community will be promoted.

Tetratheca Glandulosa

The conservation of a species requires the supporting habitat and continuation of natural ecological processes (Vallee *et al* 2004). The conservation area on Lots 1 and 2 has been defined by the presence of *T. glandulosa* and the Shale/Sandstone Transition Forest. The supporting habitat (or part thereof) for *T. glandulosa* is therefore highly likely to be the Shale/Sandstone transition forest. Subsequently, all recorded *T. glandulosa* plants on lots 1 and 2 occur within the designated conservation area and do not require translocation.

There has been some experimental work undertaken recently on the closely related *Tetratheca juncea* plant in the Wyong Shire (Driscoll & Bell 2004). This work was necessitated by the fact that many *T. juncea* plants were designated for removal before extraction, and land with secure tenure was available nearby. A translocation program for *T. glandulosa* on Lots 1 and 2 is however not required.

Kunzea rupestris

K. rupestris occurs within the conservation area of Lots 1 and 2, and consists of a small, fragmented group of plants. In this situation, a small-scale translocation program would not be likely to provide significant long-term benefits to the species because of the minimum genetic diversity available from such a small number of plants (Vallee *et al* 2004). A lack of available, suitable recipient locales also reduces the feasibility of a translocation program (Vallee *et al* 2004).

The protective measures currently in place for this species on-site will therefore continue and threatening processes such as weed invasion will be regularly controlled.

Darwinia fascicularis ssp oligantha

In 1999, the *D. fascicularis ssp. oligantha* population was recorded as being made up of approximately 500 individuals on Lots 1 and 2 (NSW Scientific committee, 2000). Subsequent surveys (ERM, 2000) have indicated that the population and sub-populations on-site exceed several thousand plants. Only 8% of the approximate 6,356 *Darwinia fascicularis ssp. oligantha* plants on site will be cleared and the remainder will be conserved *in situ*.

The records suggest that the distribution of the sub-species may not be fully understood to-date. Vallee *et al* (2004) advocate that in such circumstances, further investigations are essential before considering the viability of a translocation program. As a precautionary measure, it is recommended that plant and / or

regenerative material from the species be collected prior to clearing operations, and stored in an *ex situ* collection. In light of any further surveys or new scientific developments that may arise in the future, the material could be utilised experimentally on behalf of a translocation program.

If future assessments determine that a translocation program could be viable, it would need to be implemented, managed, monitored, and evaluated following the procedures outlined in the guidelines by Vallee *et al* (2004). Adequate time and funding would also need to be made available to minimise risk of failure.

4.2.2 Best Use of Resources

Evidently, resources are likely to be most effective if directed towards protection and maintenance of the outlined *in situ* conservation areas and their buffer zones. It is recommended that revegetation and habitat construction works occur upon commencement of strip 1 extraction in order to maximise the opportunity for increased habitat across the site.

Weed-infested buffer zone edges should be treated regularly to aid natural assisted revegetation. In cleared areas, the use of a subsoil substrate, or topsoil, may be considered for the purpose of regaining control over impenetrable weed cover. Brush and brush-matting material obtained from adjacent vegetation, may be required to build up the organic and seed content of this soil.

Felled trees and hollowed logs that gradually become available throughout the period of extraction may also be laid on cleared areas of the buffers and conservation area to improve on habitat availability.

4.3 Setbacks, Buffer zones and Environmental Bunds (Early stage – Latter stage)

All effort should be made to retain any mature vegetation that exists in the designated buffer zones. These areas may be used as supply zones for seeds, brush, seedlings (for transplanting) and cuttings for extraction strips if required.

Setbacks, buffer zones and environmental bunds should be rehabilitated as soon as possible in order to minimise erosion and improve visual amenity of the site. As extraction proceeds and areas become available for final rehabilitation, revegetation of batters and slopes should proceed as soon as land forming has been completed. Specific land forming and erosion control recommendations for peripheral areas can be found in section 4.6 of DLWC (2000).

The 30m buffer west of Old Northern Road is to be planted with trees and shrubs upon commencement of strip 1 extraction, to maximise growing time, to screen extraction as it proceeds towards the road. Tree and shrub species will be selected from the rehabilitation list for planting within this buffer.

4.4 Details of Stream Restoration Works (Final stage)

The proposed re-establishment of the natural creek line through lot 2 will transect the southern portions of strips 4 and 5.

4.4.1 Bed and bank stabilisation

The need for bank stabilisation may be minimal due to the likely hard sandstone nature of the quarry floor. If required, the use of strategically placed logs and pinned brushmatting are methods which may assist in bank stabilisation. The planting of

tubestock into sandstone rock is not likely to be practically viable, however the proposed riffle and pool design of the stream may provide some areas of level softness, in which sedges and other riparian species may be trialed.

4.4.2 Establishment and maintenance of vegetation

Cut brushmatting material for the revegetation of this creek line may be collected from the gully open forest vegetation residing in the southwest corner of the shallow ground water area, or from the buffer zone surrounding the school.

Any moist, soft areas of soil are to be planted with sedges, while revegetation works should strive for the establishment of canopy species. Seeds will be propagated in the on-site nursery and planted during periods of favourable growing conditions. To improve moisture retention, sandy soil should be dug into a shallow dish shape around plants so that water collects and drains down to the roots. The use of water rain crystals (or other such surfactant) when planting may be considered to aid moisture where dryness is a serious threat to plant survival.

Maintenance of riparian vegetation will involve a regular manual weeding regime, and the ongoing replacement of plants found dead. The use of herbicides in the riparian zone should be avoided at all costs, however, if no alternative is apparent, an environmentally sympathetic herbicide such as *bi-active Round-Up* may be required. Fertilisers should also not be applied *in situ*.

5.0 Monitoring and Reporting

Performance reports on the rehabilitation and revegetation strategy will be submitted to council as part of the annual EMR.

5.1 General Revegetation Areas

Field notes are to be recorded at least monthly to detail any variation from the recommended strategies, along with the status, success, species selection, and any other relevant issues of the area. The taking of photos and drawing of diagrams will also assist in this documentation.

5.2 Conservation and Revegetation of Threatened Vegetation

This conservation zone will be monitored regularly, and its peripheral areas maintained and replenished with tubestock planting to prevent the penetration of weeds into the area.

The current annual assessment of threats, degradation or health issues for *Kunzea rupestris* shall be extended to include the Shale/sandstone transition forest, *Tetratheca Glandulosa*, and *Darwinia fascicularis susp. oligantha*. This assessment must be undertaken by a qualified ecologist.

5.3 Stream Restoration

For the purpose of effectively monitoring the success of stream restoration through strips 4 and 5, performance criteria will be derived from riparian assessment studies previously carried out in south-eastern Australia (Jansen & Robertson 2001, Jansen *et al* 2004).

In order to gain an indication of the functional aspects of the physical, community and landscape features of the establishing riparian zone, five indicative criteria will be recorded bi-annually:

1. Habitat continuity and extent (HABITAT);
2. Vegetation cover and structural complexity (COVER);
3. Standing dead trees, fallen logs, and leaf litter (DEBRIS);
4. Dominance of natives vs. exotics (NATIVES); and
5. Indicative features (FEATURES).

The stream banks' potential for recovery may be indicated through sampling the adjacent undisturbed riparian / gully forest to obtain a control for the area. A copy of the field record sheets provided in Jansen *et al* 2004 is attached.

REFERENCES

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- Vallee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M., and Rossetto, M. (2004) *Guidelines for the translocation of threatened plants in Australia*. Second Edition. Australian Network for Plant Conservation, Canberra.

Annex C

Development Consent

Annex D

Licences

Annex E

Monitoring Sheet

Sample scoring sheet for the Rapid Appraisal of Riparian Condition

Site: _____ GPS beginning: _____

Date: _____ Observer: _____ GPS end: _____

Longitudinal continuity of riparian canopy vegetation (> 5 m wide)

Map	Score

0 = < 50% vegetated bank, 1 = 50–64% vegetated bank, 2 = 65–79% vegetated bank, 3 = 80–94% vegetated bank, 4 = ≥ 95% vegetated bank, with 1/2 point taken off for each significant discontinuity (≥ 50 m long)

Width of riparian vegetation

Transect	Channel Width (CW)	Vegetation Width	Score
1			
2			
3			
4			

Channel < 10 m wide: 0 = < 5 m vegetated, 1 = 5–9 m vegetated, 2 = 10–29 m vegetated, 3 = 30–39 m vegetated, 4 = ≥ 40 m vegetated
Channel ≥ 10 m wide: 0 = < 0.5 CW, 1 = 0.5–0.9 CW, 2 = 0.9–2.9 CW, 3 = 2.9–3.9 CW, 4 = ≥ 4 CW

Vegetation cover: Canopy > 5 m, Understorey 1–5 m, Ground cover < 1 m

Transect	Canopy	Native canopy	Understorey	Native understorey	Ground cover	Native ground cover	# layers
1							
2							
3							
4							

Cover and native cover: 0 = none, 1 = 1–30%, 2 = 31–60%, 3 = > 60%

Debris

Transect	Leaf litter	Native leaf litter	Standing dead trees	Fallen logs
1				
2				
3				
4				

Leaf litter cover and native leaf litter cover: 0 = none, 1 = 1–30%, 2 = 31–60%, 3 = > 60%

Standing dead trees (> 20 cm dbh): 0 = absent, 1 = present

Fallen logs (> 10 cm diameter): 0 = none, 1 = small quantities, 2 = abundant but some removed, 3 = abundant with no signs of removal

Indicative features

Transect	Canopy species regeneration	Grazing damage to regeneration	Shrub/sub-canopy regeneration	Reeds
1				
2				
3				
4				

Regeneration < 1 m tall: 0 = none, 1 = scattered, and 2 = abundant

Damage: 0 = all damaged, 1 = some damaged, 2 = no damage

Reeds: 0 = absent, 1 = present

ERM consulting services worldwide www.erm.com



Environmental Resources Management Australia

53 Bonville Ave

Thornton NSW 2322

Telephone (02) 4964 2150

Facsimile (02) 4964 2152

Attachment 9

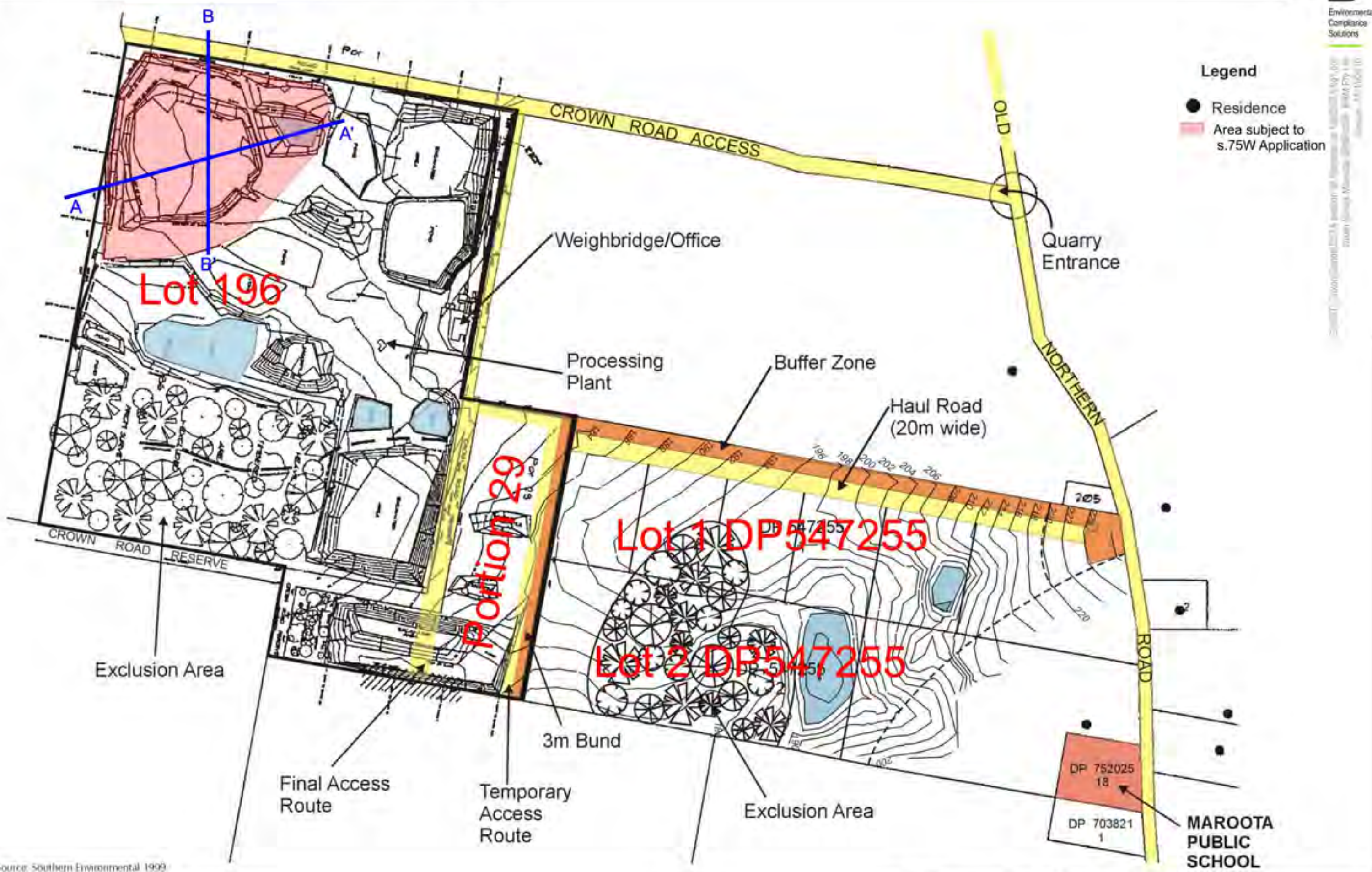
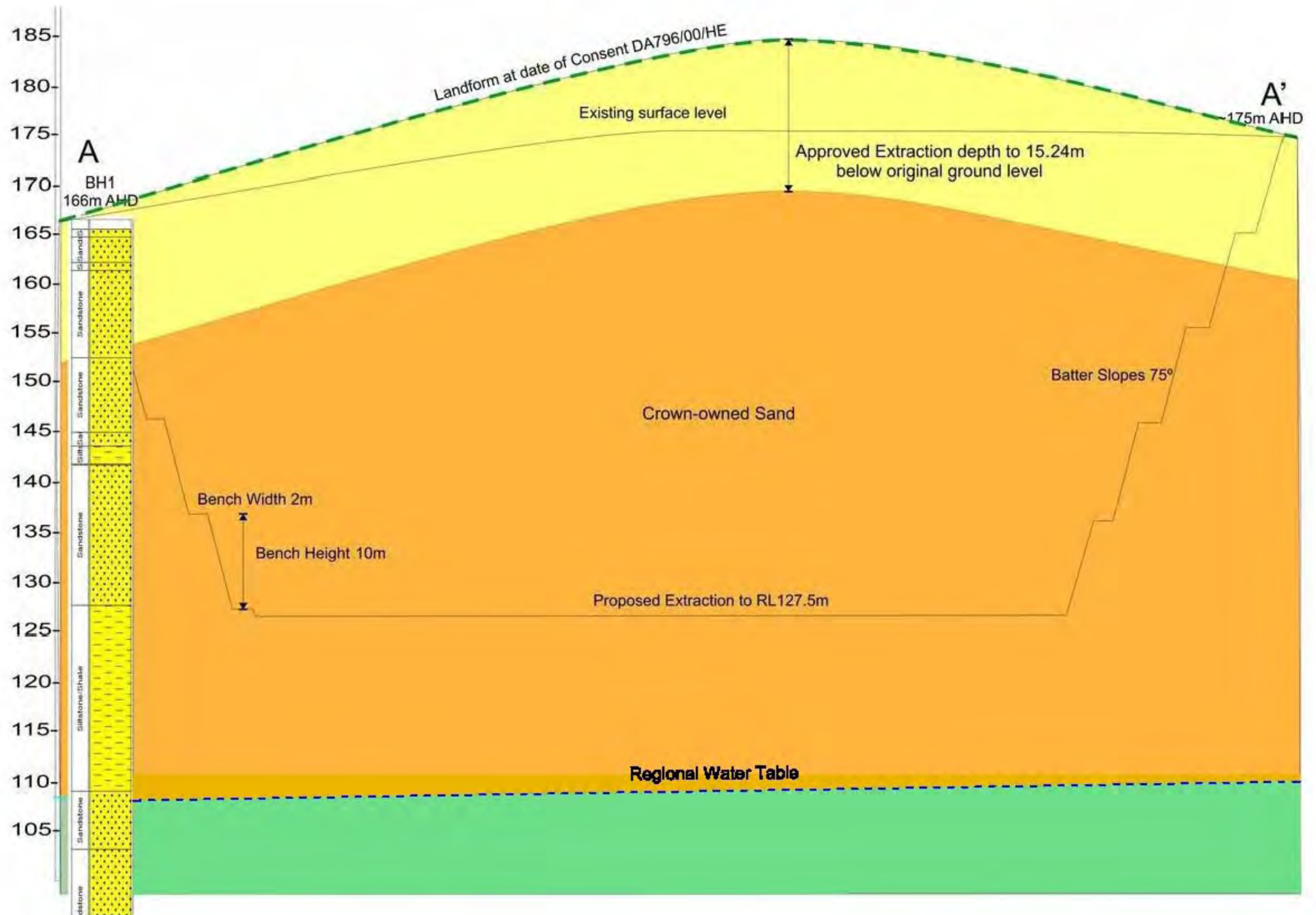
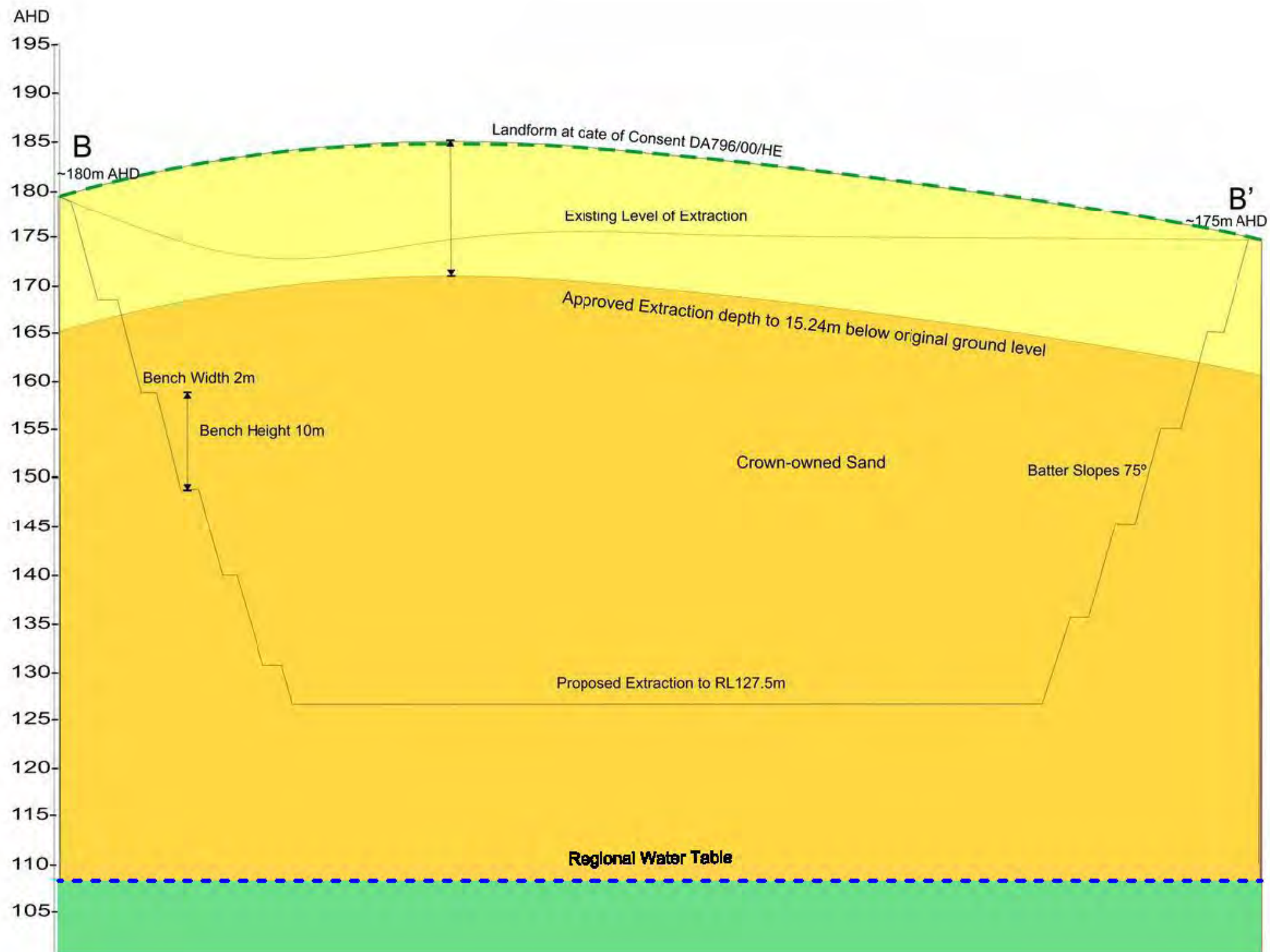


Figure 1 Site Plan

Dixon Sand - Maroota, NSW





Attachment 10



L.J. Kane & Co.

LPI On-Line

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 29/752025

SEARCH DATE	TIME	EDITION NO	DATE
-----	----	-----	----
23/1/2007	2:24 PM	4	24/4/2001

LAND

LOT 29 IN DEPOSITED PLAN 752025
LOCAL GOVERNMENT AREA: BAULKHAM HILLS
PARISH OF CORNELIA COUNTY OF CUMBERLAND
(FORMERLY KNOWN AS PORTION 29)
TITLE DIAGRAM: CROWN PLAN 6254.2030

FIRST SCHEDULE

DINA GOUSKOS (TA 6247394)

SECOND SCHEDULE (5 NOTIFICATIONS)

1. LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2. EXCEPTING LAND BELOW A DEPTH FROM THE SURFACE OF 15.24 METRES
- * 3. U841822 CAVEAT BY DIXON SAND (PENRITH) PTY LIMITED
- * 026115 CAVEATOR CONSENTED
- * 7558510 CAVEATOR CONSENTED
4. DP1018359 RIGHT OF CARRIAGEWAY 20 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN DP1018359
5. 7558510 MORTGAGE TO WESTPAC BANKING CORPORATION

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

GC 60723

PRINTED ON 23/1/2007

**L.J. Kane & Co.****LPI On-Line**

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Information provided through Tri-Search an approved LPI/NSW Information Broker

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 196/752025

SEARCH DATE	TIME	EDITION NO	DATE
-----	-----	-----	-----
23/1/2007	2:24 PM	4	24/3/1995

LAND

LOT 196 IN DEPOSITED PLAN 752025
LOCAL GOVERNMENT AREA: BAULKHAM HILLS
PARISH OF CORNELIA COUNTY OF CUMBERLAND
(FORMERLY KNOWN AS PORTION 196)
TITLE DIAGRAM: CROWN PLAN 3251.2030

FIRST SCHEDULE

MANALDO PTY LIMITED

SECOND SCHEDULE (4 NOTIFICATIONS)

1. LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2. EXCEPTING LAND BELOW A DEPTH FROM THE SURFACE OF 15.24 METRES ✓
- * 3. U841823 CAVEAT BY DIXON SAND (PENRITH) PTY LIMITED
- * O22479 CAVEATOR CONSENTED
4. O22479 MORTGAGE TO WESTPAC BANKING CORPORATION

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

GC 60723

PRINTED ON 23/1/2007

Attachment 11

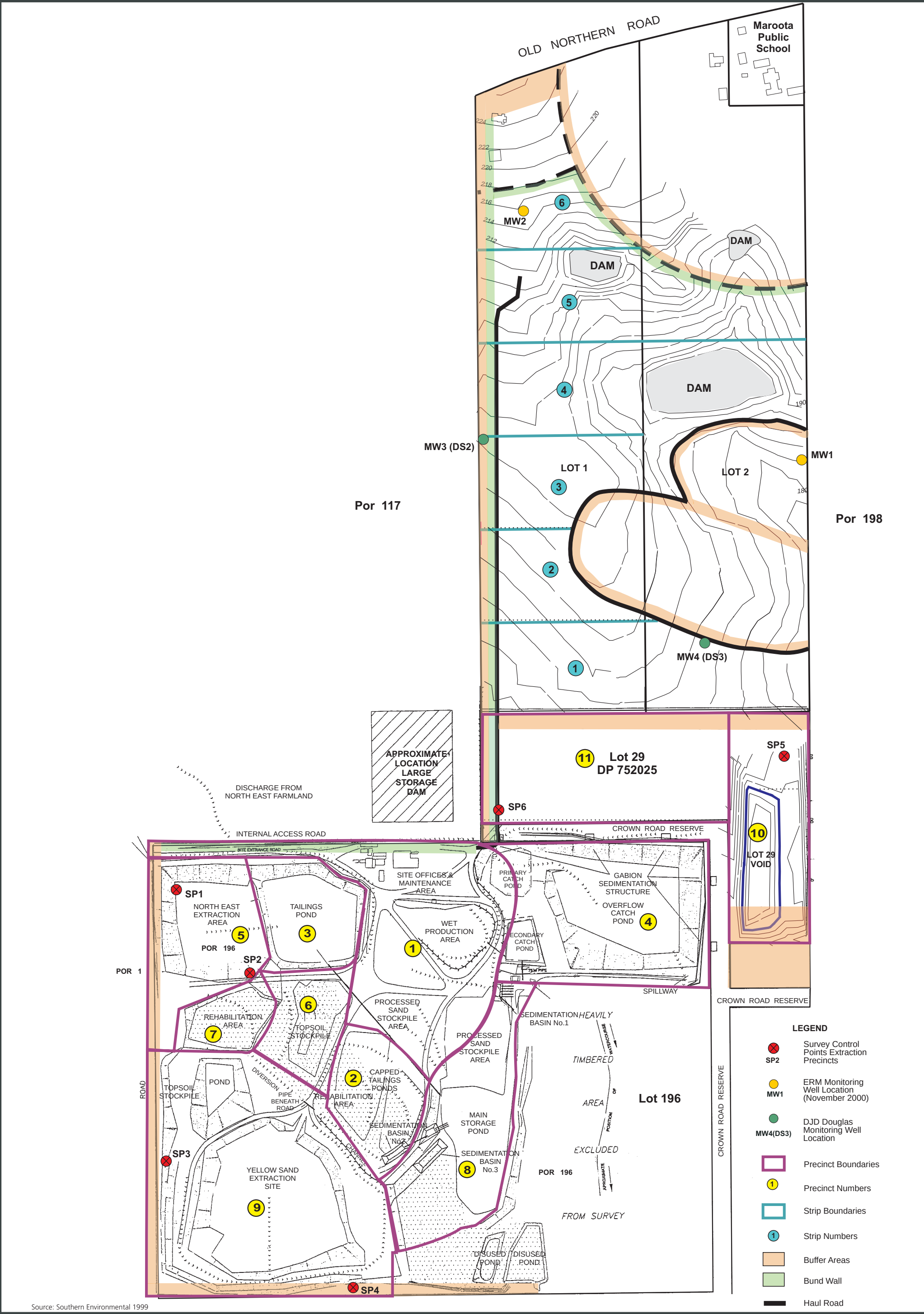


Figure 3 Extraction Precincts, Survey Control Points & Monitoring Well Locations

Dixon Sand - Maroota, NSW

Attachment 12

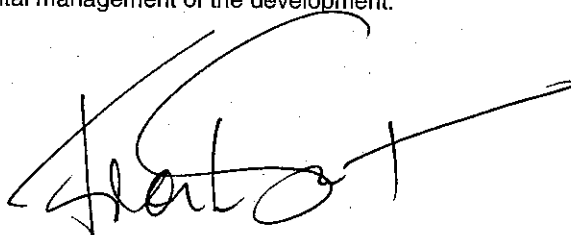
Development Consent

Section 80 of the Environmental Planning and Assessment Act 1979

I, the Minister for Planning, approve the Development Application referred to in schedule 1, subject to the conditions in schedules 2 to 5.

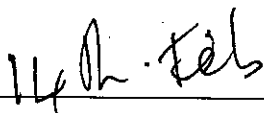
These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the development.



Frank Sartor MP
Minister for Planning

Sydney,



2006

File No: 9039217

SCHEDULE 1

Development Application:	DA 165-7-2005.
Applicant:	Dixon Sand (Penrith) Pty Limited.
Consent Authority:	Minister for Planning.
Land:	Lot 170 DP 664767; Lots A and B DP 407341; Lots 176 and 177 DP 752039; Haerses Road; and the intersection of Wiseman's Ferry Road and Haerses Road.
Proposed Development:	Sand quarry
State Significant Development:	The proposal is classified as State significant development under section 76(A)(7) of the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) as it is an extractive industry that meets the criteria for State significance under the <i>State Environmental Planning Policy (State Significant Development) 2005</i> .
Integrated Development:	The proposal is classified as integrated development under section 91 of the EP&A Act as it requires additional approvals under the: • <i>Protection of the Environment Operations Act 1997</i>; and • <i>Roads Act 1993</i>.
Designated Development:	The proposal is classified as designated development under Section 77A of the EP&A Act as it is an extractive industry that meets the criteria of Schedule 3 of the <i>Environmental Planning and Assessment Regulation 2000</i> (EP&A Regulation).

Note:

- To find out when this consent becomes effective, see section 83 of the EP&A Act;
- To find out when this consent is liable to lapse, see section 95 of the EP&A Act; and
- To find out about appeal rights, see section 97 of the EP&A Act.

TABLE OF CONTENTS

DEFINITIONS	4
ADMINISTRATIVE CONDITIONS	5
SPECIFIC ENVIRONMENTAL CONDITIONS	7
General Extraction Provisions	7
Noise	7
Air Quality	9
Surface and Ground Water	10
Rehabilitation and Landscape Management	11
Traffic and Transport	12
Waste Minimisation	13
Bushfire Management	13
Production Data	13
ADDITIONAL PROCEDURES	14
Notification of Landowners	14
Independent Review	14
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING	15
Environmental Management Strategy	15
Environmental Monitoring Program	15
Annual Reporting	15
Independent Environmental Audit	15
Community Consultative Committee	16
Access to Information	16
APPENDIX 1: EXTRACTION SEQUENCE	17
APPENDIX 2: LOCATION OF ACOUSTIC BUNDS	21
APPENDIX 3: FINAL LANDFORM	22
APPENDIX 4: SCREENING MEASURES	23
APPENDIX 5: INDEPENDENT DISPUTE RESOLUTION PROCESS	24

DEFINITIONS

AEMR	Annual Environmental Management Report
Applicant	Dixon Sand (Penrith) Pty Limited, or its successors
BCA	Building Code of Australia
CCC	Community Consultative Committee
Council	Baulkham Hills Shire Council
DA	Development Application
Day	Day is defined as the period from 7am to 6 pm on Monday to Saturday, and 8 am to 6 pm on Sundays and Public Holidays
DEC	Department of Environment and Conservation
Department	Department of Planning
Development area/ site	Land to which the DA applies
Director-General	Director-General of Department of Planning, or delegate
DNR	Department of Natural Resources
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
Existing quarry	Existing sand extraction operations and processing facilities on Lots 29 and 196 DP 752025 and Lots 1 and 2 DP 547255 off the Old Northern Road, Maroota
GTA	General Terms of Approval
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this consent
Minister	Minister for Planning, or delegate
Privately owned land	Land that is not owned by a public agency, or a quarrying company or its subsidiary
Receiver	As defined in the <i>NSW Industrial Noise Policy</i> (EPA 2000)
RTA	Roads and Traffic Authority
Truck Movement	Truck movements for the purposes of transporting sand extracted from the site.

SCHEDULE 2 ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Approval

2. The Applicant shall carry out the development generally in accordance with the:
 - (a) DA 165-7-2005;
 - (b) EIS titled *Dixon Sand (Penrith) Pty Limited Haerses Road Sand Quarry EIS*, dated June 2005, and prepared by Environmental Resources Management Australia Pty Limited; and
 - (c) conditions of this consent.
3. If there is any inconsistency between the above, the conditions of this consent shall prevail to the extent of the inconsistency.
4. The Applicant shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
 - (a) any reports, plans or correspondence that are submitted in accordance with this consent; and
 - (b) the implementation of any actions or measures contained in these reports, plans or correspondence.

Limits on Approval

5. This consent shall lapse 25 years after the date it commences.
6. The Applicant shall not extract more than 250,000 tonnes of sand a year from the quarry.
7. The Applicant shall not transport more than 60,000 tonnes of sand a year to local and regional markets directly from the quarry.
8. The Applicant shall not transport more than 190,000 tonnes of sand a year from the quarry to the existing quarry for processing.
9. The Applicant shall limit all truck movements from Wiseman's Ferry Road into the quarry to right hand turn movements that comprise of the following:
 - (a) a maximum of 10 right hand turn movements between the hours of 6am and 7am for the life of the development;
 - (b) a maximum of 15 right hand turn movements per day until such time that the intersection between Haerses Road and Wiseman's Ferry Road has been upgraded to a Type 'AUR' treatment to the satisfaction of the RTA (see condition 32 of Schedule 3);
 - (c) a maximum of 28 right hand turn movements per day following the upgrade of the intersection between Haerses Road and Wiseman's Ferry Road to a Type 'AUR' treatment to the satisfaction of the RTA (see condition 32 of Schedule 3);
10. The Applicant shall not undertake any extraction within 2 metres of the established wet weather groundwater level.

Note: The wet weather groundwater level shall be established in accordance with condition 2 of Schedule 3.

Structural Adequacy

11. The Applicant shall ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

Notes:

- Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.
- Part 8 of the EP&A Regulation sets out the requirements for the certification of development.

Demolition

12. The Applicant shall ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

13. The Applicant shall ensure that all plant and equipment used at the site is:
- (a) maintained in a proper and efficient condition; and
 - (b) operated in a proper and efficient manner.

Protection of Public Infrastructure

14. The Applicant shall:
- (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and
 - (b) relocate, or pay the full costs associated with relocating any public infrastructure that needs to be relocated as a result of the development.

Section 94 Contributions

15. The Applicant shall pay a contribution of 75 cents per tonne of material hauled from the site, to Council for the maintenance/ repair of public roads in accordance with Council's *Contributions Plan No: 6 – Extractive Industries*, to the satisfaction of Council.

SCHEDULE 3 SPECIFIC ENVIRONMENTAL CONDITIONS

GENERAL EXTRACTION PROVISIONS

Setbacks and boundaries

1. Within 6 months of the date of this consent, the Applicant shall:
 - (a) engage a registered surveyor to mark out the boundaries of the:
 - approved limits of extraction; and
 - buffer zones and setback requirements of the Baulkham Hills Shire Council Development Control Plan No. 16 – Extractive Industries;
 - (b) submit a survey plan of these boundaries to the Director-General; and
 - (c) ensure that the boundaries of each operational extraction area is clearly marked on site in a permanent manner that allows operating staff and inspecting officers to clearly identify these limits,
 to the satisfaction of the Director-General.

Maximum Extraction Depth Map

2. Prior to carrying out any development, the Applicant shall:
 - (a) establish the wet weather groundwater level for the site based on at least 12 months of site specific groundwater monitoring data;
 - (b) engage an appropriately qualified and experienced expert to establish the maximum extraction depths to which extraction can be undertaken on site, to comply with condition 10 of Schedule 2;
 - (c) submit a Maximum Extraction Depth Map (contour map or similar) for the development to the Director-General; and
 - (d) comply with the extraction depths specified in the map,
 to the satisfaction of the Director-General.
3. Within 3 months of the completion of the Independent Environmental Audit (see condition 5 of Schedule 5), the Applicant shall review and update the Maximum Extraction Depth Map for the development to the satisfaction of the Director-General.

Extraction Sequence

4. Unless otherwise authorised by the Director-General, the Applicant shall ensure that extraction is undertaken in accordance with the extraction plan and sequence in Figures 2.3 (a-d) of the EIS (as reproduced in Appendix 1).

¹NOISE

Note: The Applicant is required to obtain a licence for the development under the Protection of the Environment Operations Act 1997.

Noise Impact Assessment Criteria

5. The Applicant shall ensure that the noise generated by the development does not exceed the noise impact assessment criteria in Table 1.

Table 1: Noise impact assessment criteria dB(A)

Day <i>L_{Aeq}(15 minute)</i>	Shoulder (6am to 7am)		Land
	<i>L_{Aeq}(15 minute)</i>	<i>L_A(max)</i>	
37	37	45	1. F & J Roberts and J & D Young
40	40		2. E. Ramm
38	38		3. M. Ramm
37	37		4. B Ramm
35	35		All other residences on privately owned land

¹ Incorporates DEC GTA

Notes:

- However, if the Applicant has a written negotiated noise agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and the DEC, then the Applicant may exceed the noise limits in Table 1 in accordance with the negotiated noise agreement.
- Noise from the development is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the $L_{Aeq}(15 \text{ minute})$ noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
- Noise from the development is to be measured at 1 metre from the dwelling façade to determine compliance with the $L_{A(Max)}$ noise limits in the above table.
- The noise emission limits identified in the above table apply under meteorological conditions of wind speeds of up to 3 m/s at 10 metres above ground level, except under conditions of temperature inversions.

Operating Hours

6. The Applicant shall comply with the operating hours in Table 2.

Table 2: Operating Hours

Activity	Days of the Week	Time
• Material access to and from the site, and	Monday – Saturday	6am to 7am
• Material loading and unloading	Sunday and public holidays	No work at any time
• Random construction inspection	Monday – Saturday	7am to 6pm
• Material delivery to and from the site	Sunday and public holidays	No work at any time
• Material unloading and stacking	Monday – Saturday	7am to 6pm
• Material loading and unloading	Sunday and public holidays	No work at any time
• Site preparation work	Monday – Saturday	7am to 6pm
• Construction work	Monday – Saturday	7am to 6pm
• Construction work for the Bund	Monday – Saturday	7am to 6pm
• Construction work for the Bund	Sunday and public holidays	No work at any time

Note: Delivery of material outside of the hours of operation permitted by condition 6 is only allowed, where that delivery is required by the police or other authorities for safety reasons; and/or where the operation or personnel or equipment are endangered. In such circumstances, prior notification be provided to the DEC and affected residents as soon as possible, or within a reasonable period in the case of emergency.

Acoustic Bund Construction

7. The Applicant shall construct the two acoustic bunds outlined in Figure 6.8 of the EIS (as reproduced in Appendix 2) to the satisfaction of the Director-General. The construction of the acoustic bunds must be restricted to the following construction schedule:
- Western Bund: 3 weeks per year for 3 years starting in year 9; and
 - Northern Bund: 3 weeks in year 11.
8. Prior to the construction of any acoustic bunds, the Applicant shall develop (and following approval implement) an Acoustic Bund Construction Noise Management Plan, which details the procedures that would be undertaken to:
- keep surrounding residents informed of the proposed timing and duration of bund construction;
 - minimise and mitigate the noise impacts generated by the works; and
 - receive, handle and respond to complaints relating to the works.

Continuous Improvement

9. The Applicant shall:
- investigate ways to reduce the noise generated by the development, including noise impacts that may be enhanced by temperature inversions during the shoulder period (6am to 7am, Monday to Saturday);
 - implement all reasonable and feasible best practice noise mitigation measures on the site; and
 - report on the implementation of any new noise mitigation measures on site in the AEMR.
- to the satisfaction of the Director-General.

Monitoring

10. Prior to carrying out any development, the Applicant shall prepare (and following approval implement) a Noise Monitoring Program for the development, in consultation with the DEC, and to the satisfaction of the Director-General. This program must include a combination of attended and unattended noise monitoring and a noise monitoring protocol for evaluating compliance with the noise impact assessment criteria in this consent.

²AIR QUALITY

Note: The Applicant is required to obtain a licence for the development under the Protection of the Environment Operations Act 1997.

Impact Assessment Criteria

11. The Applicant shall ensure that the dust generated by the development does not cause any additional exceedences of the air quality impact assessment criteria listed in Tables 3, 4, and 5 at any residence on any privately owned land, listed in Table 1.

Table 3: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	50 µg/m ³
Particulate matter < 10 µm (PM ₁₀)	Annual	35 µg/m ³

Table 4: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM ₁₀)	24 hour	50 µg/m ³

Table 5: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m ² /month	4 g/m ² /month

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 1991, AS 3580.10.1-1991: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method.

Operating Conditions

12. The Applicant shall implement all practical measures to minimise and/or prevent the emission of dust from the site.
13. The Applicant shall ensure that all vehicles entering or leaving the site, carrying a load that may generate dust, are covered at all times, except during loading and unloading.

Monitoring

14. Prior to carrying out any development, the Applicant shall prepare (and following approval) implement an Air Quality Monitoring Program for the development, in consultation with the DEC, and to the satisfaction of the Director-General. This program must include an air monitoring protocol for evaluating compliance with the air quality impact assessment criteria in this consent.

Note: Except as may be expressly provided by an Environment Protection License, the Air Quality Monitoring Program for the development shall include the following PM₁₀ monitoring procedure:

² Incorporates DEC GTA

- if any rolling 24-hour average PM_{10} result measured at the existing TEOM air quality monitoring station near the Maroota Public School is found to be greater than $42 \mu\text{g}/\text{m}^3$, and the prevailing wind as measured at the existing metrological station location near the Maroota Public School, is from the south-south west quadrant (between 180° and 240°), the Applicant shall:
 - immediately notify the DEC;
 - take immediate action to reduce PM_{10} emissions generated by the development; and
 - if dust levels do not return to levels below $42 \mu\text{g}/\text{m}^3$ within 1 hour, cease all dust generating activities at the site; and
- dust generating activities on site may only recommence when the rolling 24-hour average PM_{10} result as measured at the existing TEOM air quality monitoring station near the Maroota Public School, is less than $42 \mu\text{g}/\text{m}^3$ for 4 consecutive 15 minute periods.

³SURFACE AND GROUNDWATER

Note: The Applicant is required to obtain a licence for the development under the Protection of the Environment Operations Act 1997.

Pollution of Waters

15. Except as may be expressly provided by an Environment Protection Licence, the Applicant shall comply with section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development.

Operating Conditions

16. The Applicant shall:
 - (a) install and maintain sediment basins with sufficient capacity to contain the rainfall and runoff generated from a 90 percentile, 5 day rainfall event ('the design event'), for the life of the development;
 - (b) ensure that the accumulated sediment in all sediment dams is kept below 30% of their design capacity;
 - (c) ensure that no fuel, oil, or other chemicals are stored on site; and
 - (d) undertake appropriate measures to ensure that vehicles do not track any material onto public roads.

Site Water Management Plan

17. Prior to carrying out any development the Applicant shall develop (and following approval) implement a Site Water Management Plan for the development, in consultation with the DEC, DNR and to the satisfaction of the Director-General. The plan shall include:
 - (a) a Soil and Water Management Plan; and
 - (b) a Groundwater Monitoring Program.
18. The Soil and Water Management Plan shall:
 - (a) describe what measures would be implemented to minimise soil erosion, and the discharge of sediment and other pollutants, during each stage of the development including:
 - road and intersection works;
 - initial clearing and topsoil stripping;
 - extraction; and
 - noise bund construction;
 - (b) include control measures that have the capacity to contain the rainfall and runoff generated by the 'design event' specified in condition 18 above; and
 - (c) be consistent with the *Landcom Managing Urban Stormwater: Soils and Construction Manual* (Volume 1, addition 4, March 2004).
19. The Groundwater Monitoring Program shall:
 - (a) describe what measures would be put in place to establish the site's wet weather groundwater levels;
 - (b) monitor any potential adverse impacts of the development on groundwater levels and quality;
 - (c) detail the contingency measures that would be put in place in the event that groundwaters are breached and/ or contaminated.

³ Incorporates DEC GTA

⁴ Incorporates Council GTA

20. Within 3 months of the completion of each Independent Environmental Audit (see condition 5 of Schedule 5), the Applicant shall review, and if required, revise the Site Water Management Plan to the satisfaction of the Director-General.

REHABILITATION AND LANDSCAPE MANAGEMENT

Specific Measures

21. The Applicant shall:
- (a) progressively rehabilitate all disturbed areas on site to a final landuse of agricultural land (minimum class 4), and in general accordance with the final landform in Figure 2.4 of the EIS (as reproduced in Appendix 3);
 - (b) consult with the landowners of Lot 167 DP 752039 to ensure that a consistent final landform is achieved on either side of Hitchcock Road;
 - (c) conserve, maintain and enhance the vegetation on site that would not be disturbed by the development;
 - (d) establish at least 2 hectares of vegetation on or adjacent to the site to replace the remnant vegetation removed by the development; and
 - (e) undertake screen plantings in general accordance with Figure 2.2 of the EIS (as reproduced in Appendix 4),
- to the satisfaction of the Director-General.

Rehabilitation and Landscape Management Plan

22. Within 6 months of the commencement of the development the Applicant shall prepare, and following approval, implement a Rehabilitation and Landscape Management Plan, in consultation with Council and DPI, and to the satisfaction of the Director-General. The plan must:
- (a) include a Vegetation Clearing Protocol;
 - (b) identify the areas likely to be disturbed by the development;
 - (c) describe in general the short, medium, and long-term measures that would be implemented to:
 - rehabilitate the site;
 - conserve, maintain and enhance the remnant vegetation on site; and
 - conserve, maintain and enhance the vegetation established on site for offset and screening purposes;
 - (d) describe in detail the measures that would be implemented over the next 5 years to:
 - rehabilitate the site;
 - conserve, maintain and enhance the remnant vegetation on site; and
 - conserve, maintain and enhance the vegetation established on site for offset and screening purposes;
 - (e) establish performance and completion criteria for:
 - the rehabilitation of the site;
 - the maintenance of remnant vegetation on site; and
 - the maintenance of vegetation established for offset and screening purposes;
 - (f) describe the measures that would be implemented to minimise or manage any ongoing environmental effects of the development; and
 - (g) describe how the performance of each measure described in the plan would be monitored over time.

Note: The Vegetation Clearing Protocol must be finalised prior to the commencement of any clearing works. The Applicant may wish to submit this plan separately.

23. Within 3 months of the completion of each Independent Environmental Audit (see condition 5 of Schedule 5), the Applicant shall review and if required revise the Rehabilitation and Landscape Management Plan for the development to the satisfaction of the Director-General.

Rehabilitation Bond

24. Prior to the commencement of the development, the Applicant shall lodge a suitable rehabilitation bond for the development with the Director-General. The sum of the bond shall be calculated at \$2.50/m², or as otherwise directed by the Director-General, for the area of disturbance in each 3 year review period.

Notes:

- *If the rehabilitation is completed to the satisfaction of the Director-General, the Director-General will release the rehabilitation bond.*
- *If the rehabilitation is not completed to the satisfaction of the Director-General, the Director-General will call in all, or part of, the rehabilitation bond, and arrange for the satisfactory completion of these works.*

25. Within 3 months of the completion of the Independent Environmental Audit (see condition 5 of Schedule 5), unless the Director-General directs otherwise, the Applicant shall review, and if necessary revise, the sum of the rehabilitation bond to the satisfaction of the Director-General. This review must consider:
- (a) the effects of inflation;
 - (b) any changes to the area of disturbance; and
 - (c) the performance of any progressive rehabilitation which has been undertaken at the site.

4TRAFFIC AND TRANSPORT

Note: The Applicant is required to obtain a permit for the development under the Roads Act 1993.

Transport Records

26. The Applicant shall:
- (a) keep records of the amount of sand transported from the site each year to the existing quarry for processing, and directly from the site to local and regional markets;
 - (b) keep records of all traffic movements in and out of the site each year; and
 - (c) include these records in the AEMR.

Road Works: Council

27. Prior to carrying out any development, the Applicant shall upgrade Haerses Road to meet the requirements for 'internal haul roads', under Baulkham Hills *Development Control Plan No. 16 – Extractive Industries*, to the satisfaction of Council.
28. The Applicant shall:
- (a) maintain safe access to the site to the public and emergency services for the duration of the development; and
 - (b) reinstate the extracted length of Haerses Road, to the satisfaction of Council.

Notes:

- *The Applicant shall ensure that the final alignment and design of Haerses Road is approved by Council prior to the commencement of the development;*
- *The Applicant shall bear the full costs associated with the design, survey and construction of the road works, including the relocation of utilities, if required.*
- *All works are to be in accordance with Council's Design Guidelines and Work Specifications for Subdivisions and Developments;*
- *Following the reconstruction of Haerses Road, the Applicant shall rehabilitate any temporary access roads that were established on site.*

Road Works: RTA

29. Prior to carrying out any development, the Applicant shall:
- (a) provide for appropriate sight distances at the intersection of Haerses Road and Wiseman's Ferry Road, by clearing and/or lopping vegetation along the eastern approach of Wiseman's Ferry Road;
 - (b) provide warning signage ("Truck Turning") on the eastern and western approaches of Wiseman's Ferry Road to the satisfaction of the RTA.

Note: The Applicant shall contact the RTA's Traffic Management Centre prior to installation of warning signage ("Truck Turning") along Wiseman's Ferry Road.

30. Within 12 months of the commencement of operations, the Applicant shall construct a Type 'AUR' treatment at the intersection of Haerses Road and Wiseman's Ferry Road to the satisfaction of the RTA. Until the intersection works have been completed to the satisfaction of the RTA, the Applicant shall limit the number of trucks entering the site to 15 truck movements per day.

Notes:

- *Prior to the Construction Certificate being released the Applicant shall:*
 - *enter into a Memorandum of Understanding with the RTA that the Type 'AUR' intersection treatment shall be fully constructed and handed over to the RTA within 12 months of the commencement of the development; and*
 - *issue a bank guarantee in favour of the RTA for the total cost of the intersection works (the cost to be determined following the approval of detailed design plans by the RTA).*
- *The Applicant shall ensure that the intersection works comply with the RTA's Road Design Guide.*
- *The Applicant shall bear the full costs associated with the design, survey and construction of the works, including the relocation of utilities, if required.*

Construction Traffic Management

31. Prior to commencement of the works referred to in conditions 31 and 32 above, the Applicant shall prepare and implement a Traffic Control Plan for the development to the satisfaction of the RTA.

WASTE MINIMISATION

32. The Applicant shall:
- (a) monitor the amount of waste generated by the development;
 - (b) investigate ways to minimise waste generated by the development;
 - (c) implement reasonable and feasible measures to minimise waste generated by the development; and
 - (d) report on waste and management and minimisation in the AEMR, to the satisfaction of the Director-General.

BUSHFIRE MANAGEMENT

33. The Applicant shall:
- (a) ensure that the development is suitably equipped to respond to any fires on site; and
 - (b) assist the Rural Fire Service and emergency services as much as possible if there is a fire on site during the development; and
 - (c) prepare a conservation sensitive Bushfire Management Plan for the site in consultation with, and to the satisfaction of Council and the Rural Fire Service.

PRODUCTION DATA

34. The Applicant shall:
- (a) provide annual production data to the DPI using the standard form for that purpose; and
 - (b) include a summary of this data in the AEMR.

SCHEDULE 4 ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. If the results of monitoring required in Schedule 3 identify that impacts generated by the development are greater than the relevant impact assessment criteria in Schedule 3, then the Applicant shall notify the Director-General and the affected landowners and/or existing or future tenants accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the criteria in Schedule 3.

INDEPENDENT REVIEW

2. If a landowner considers that the operations of the quarry are exceeding the impact assessment criteria in Schedule 3, then he/she may ask the Director-General in writing for an independent review of the impacts of the development on his/her land.

If the Director-General is satisfied that an independent review is warranted, the Applicant shall within 3 months of the Director-General advising that an independent review is warranted:

- (a) consult with the landowner to determine his/her concerns;
 - (b) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to conduct monitoring on the land, to determine whether the development is complying with the relevant criteria in Schedule 3, and identify the source/s and scale of any impact on the land, and the development's contribution to this impact; and
 - (c) give the Director-General and landowner a copy of the independent review.
3. If the independent review determines that the quarrying operations are complying with the relevant criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Director-General.
 4. If the independent review determines that the quarrying operations are not complying with the relevant criteria in Schedule 3, and that the quarry is primarily responsible for this non-compliance, then the Applicant shall:
 - (a) take all practicable measures, in consultation with the landowner, to ensure that the development complies with the relevant criteria; and
 - (b) conduct further monitoring to determine whether these measures ensure compliance; or
 - (c) secure a written agreement with the landowner to allow exceedences of the relevant criteria in Schedule 3,to the satisfaction of the Director-General.

If the additional monitoring referred to above subsequently determines that the quarrying operations are complying with the relevant criteria in Schedule 3, then the Applicant may discontinue the independent review with the approval of the Director-General.

If the Applicant is unable to finalise an agreement with the landowner, then the Applicant or landowner may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 5).

5. If the landowner disputes the results of the independent review, either the Applicant or the landowner may refer the matter to the Director-General for resolution.

If the matter cannot be resolved within 21 days, the Director-General shall refer the matter to an Independent Dispute Resolution Process (see Appendix 5).

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. Within 3 months of the commencement of the development the Applicant shall prepare (and following approval implement) an Environmental Management Strategy for the development to the satisfaction of the Director-General. This strategy must:
 - (a) provide the strategic context for environmental management of the development;
 - (b) identify the statutory requirements that apply to the development;
 - (c) describe in general how the environmental performance of the development would be monitored and managed during the development;
 - (d) describe the procedures that would be implemented to:
 - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
 - receive, handle, respond to, and record complaints;
 - resolve any disputes that may arise during the course of the development;
 - respond to any non-compliance;
 - manage cumulative impacts; and
 - respond to emergencies; and
 - (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the development.
2. Within 3 months of the completion of the Independent Environmental Audit (see condition 6 below) the Applicant shall review, and if necessary revise, the Environmental Management Strategy to the satisfaction of the Director-General.

ENVIRONMENTAL MONITORING PROGRAM

3. Prior to the commencement of the development the Applicant, shall prepare (and following approval) implement an Environmental Monitoring Program for the development in consultation with relevant agencies, and to the satisfaction of the Director-General. This program must consolidate the various monitoring requirements in schedule 3 of this consent into a single document.
4. Within 3 months of the completion of the Independent Environmental Audit (see condition 6 below), the Applicant shall review, and if necessary revise, the Environmental Monitoring Program to the satisfaction of the Director-General.

ANNUAL REPORTING

5. Each year, the Applicant shall prepare an AEMR to the satisfaction of the Director-General. This report must:
 - (a) identify the standards and performance measures that apply to the development;
 - (b) include a summary of the complaints received during the past year, and compare this to the complaints received in the previous 5 years;
 - (c) include a summary of the monitoring results on the development during the past year,
 - (d) include an analysis of these monitoring results against the relevant:
 - limits/criteria in this consent;
 - monitoring results from previous years; and
 - predictions in the EIS;
 - (e) identify any trends in the monitoring over the life of the development;
 - (f) identify and discuss any non-compliance during the previous year; and
 - (g) describe what actions were, or are being, taken to ensure compliance.

Note: The Applicant may, with the approval of the Director-General, combine the reporting requirements for the development in the AEMR for the Applicant's existing quarry, however, if it does this it must ensure that the above obligations are fully met in the combined process.

INDEPENDENT ENVIRONMENTAL AUDIT

6. Within 3 years of the date of this consent, and every 3 years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
 - (a) be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Director-General;
 - (b) be consistent with *ISO 19011:2002 – Guidelines for Quality and/or Environmental Systems Auditing*, or equivalent updated versions of these guidelines;

- (c) assess the environmental performance of the development, and its effects on the surrounding environment;
 - (d) assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
 - (e) review the adequacy of the Applicant's Environmental Management Strategy and Environmental Monitoring Program; and
 - (f) if necessary, recommend measures or actions to improve the environmental performance of the development, and/or the environmental management and monitoring systems.
7. Within 3 months of commissioning this audit, the Applicant shall submit a copy of the audit report to the Director-General, with a response to any of the recommendations contained in the audit report.

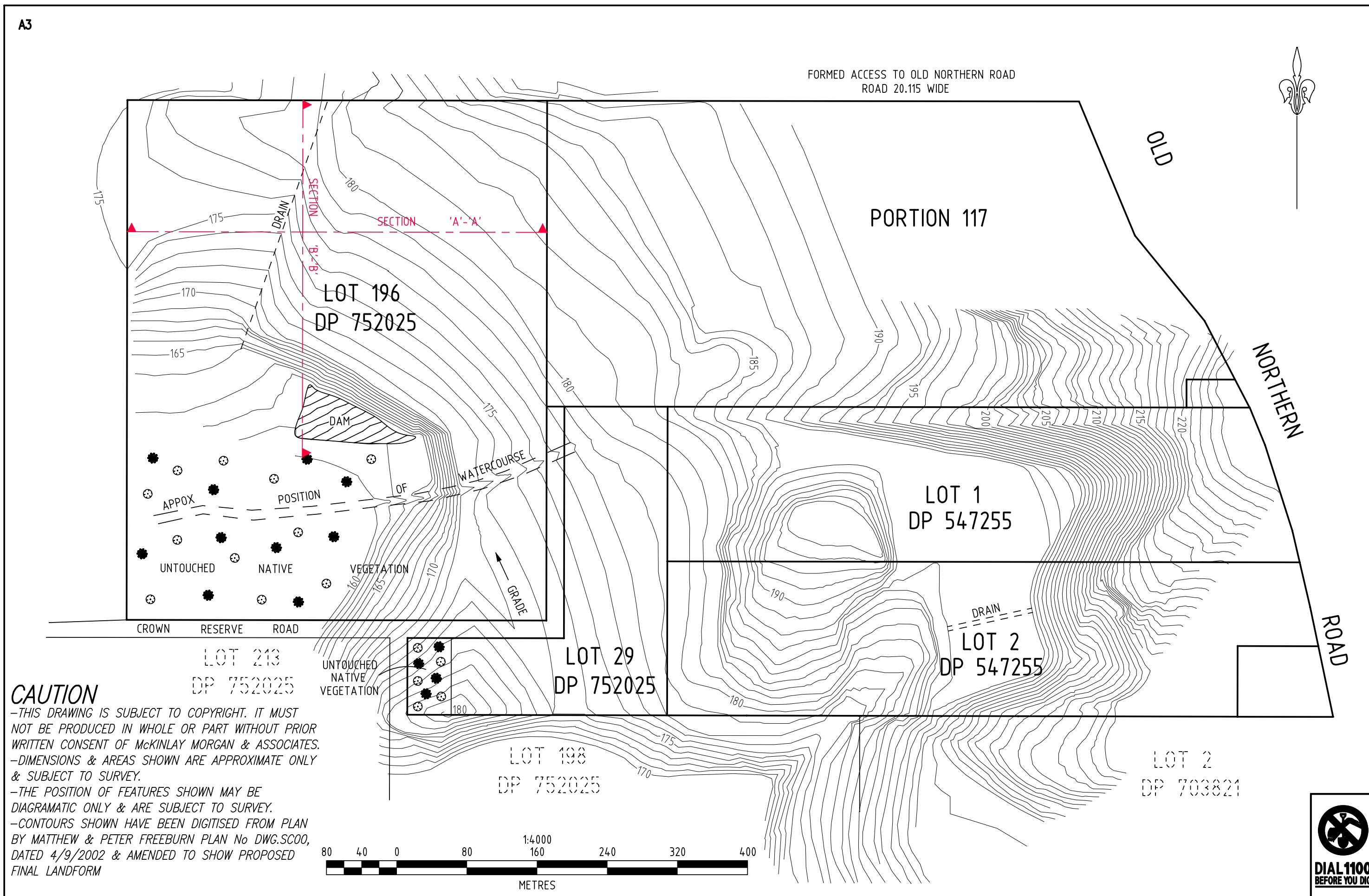
COMMUNITY CONSULTATIVE COMMITTEE

8. Prior to the commencement of the development the Applicant shall:
- (a) establish a Community Consultative Committee to oversee the environmental performance of the development; or
 - (b) combine the function of this CCC with the function of CCC for the Applicant's existing quarry.
9. The CCC (or combined CCC) shall:
- (a) be comprised of:
 - 2 representatives from the Applicant, including the person responsible for environmental management at the quarry;
 - 1 representative from Council (if available); and
 - at least 2 representatives from the local community, whose appointment has been approved by the Director-General in consultation with the Council;
 - (b) be chaired by an independent chairperson, whose appointment has been endorsed by the Director-General;
 - (c) meet at least twice a year; and
 - (d) review and provide advice on the environmental performance of the development, including any construction or environmental management plans, monitoring results, audit reports, or complaints.
10. The Applicant shall, at its own expense:
- (a) ensure that 2 of its representatives attend the Committee's meetings;
 - (b) provide the Committee with regular information on the environmental performance and management of the development;
 - (c) provide meeting facilities for the Committee;
 - (d) arrange site inspections for the Committee, if necessary;
 - (e) take minutes of the Committee's meetings;
 - (f) make these minutes available to the public;
 - (g) respond to any advice or recommendations the Committee may have in relation to the environmental management or performance of the development; and
 - (h) forward a copy of the minutes of each Committee meeting, and any responses to the Committee's recommendations to the Director-General within a month of the Committee meeting.

ACCESS TO INFORMATION

11. Within 1 month of the approval of any management plan/strategy or monitoring program required under this consent (or any subsequent revision of these management plans/strategies or monitoring programs), the completion of the independent audits required under this consent (see condition 6 above), or the completion of the AEMR (see condition 5 above), the Applicant shall:
- (a) provide a copy of the relevant document/s to the Council, relevant agencies and the CCC;
 - (b) ensure that a copy of the relevant documents is made publicly available at the quarry and/ or the Applicant's regional office; and
 - (c) put a copy of the relevant document/s on the Applicant's website, to the satisfaction of the Director-General.
12. During the life of the development, the Applicant shall:
- (a) make the results of the monitoring required under this consent publicly available both at the quarry (and/ or the Applicant's regional) and on the Applicant's website; and
 - (b) update these results on a regular basis (every 3 months or as soon as available), to the satisfaction of the Director-General.

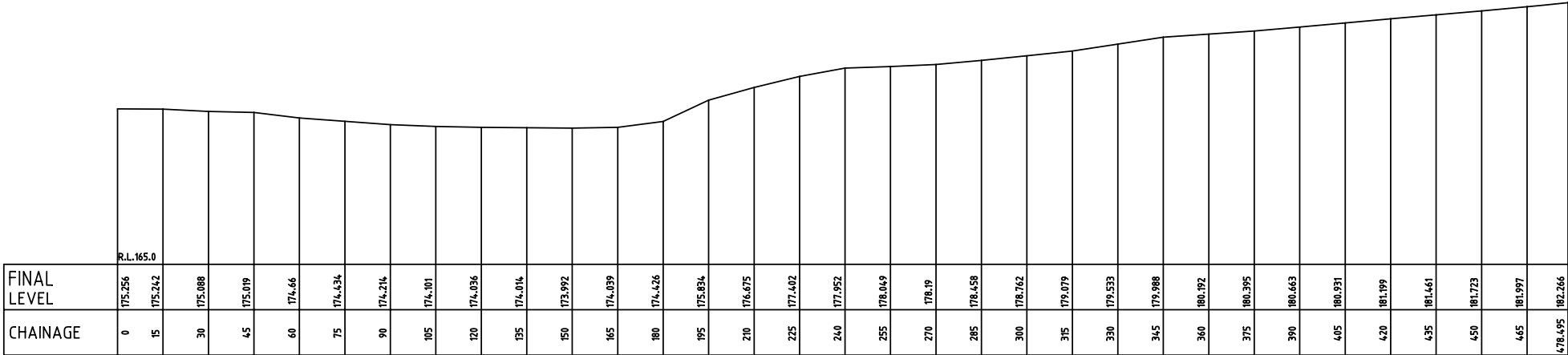
Attachment 13



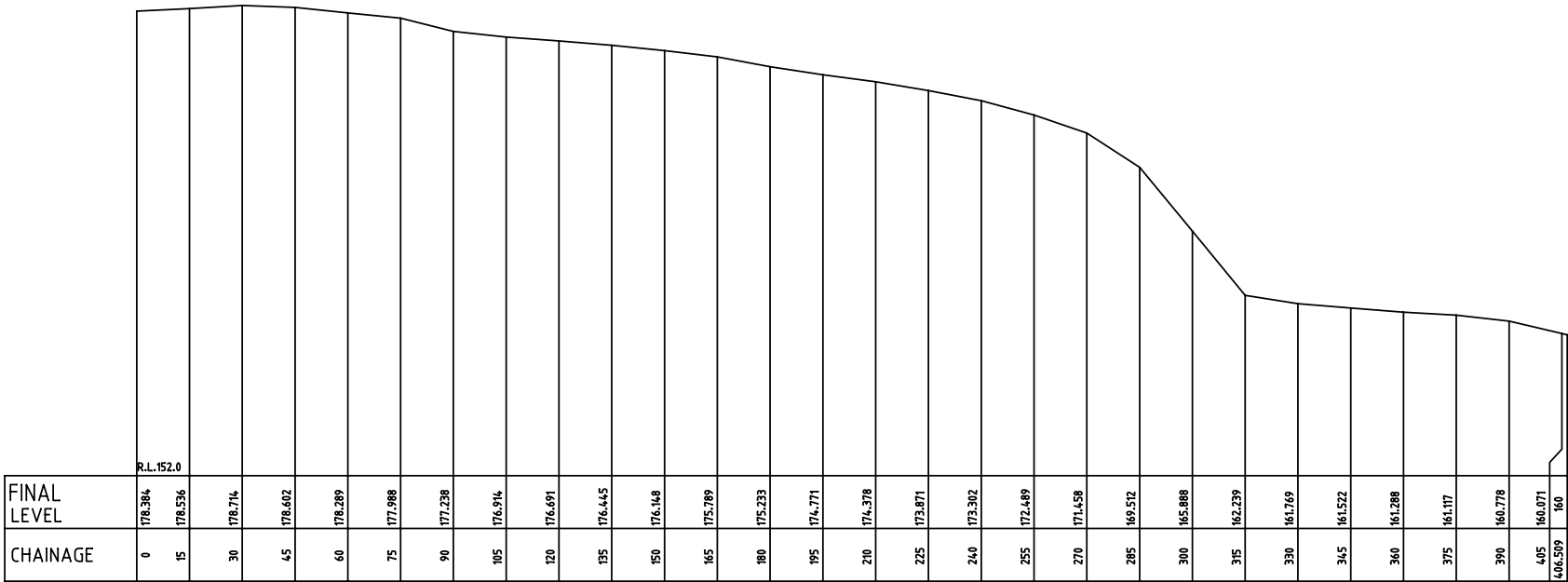
F	0	5	10	15	20	25	MILLIMETRES AT A3	50	55	60	65	70	75											
E								DESIGN BY	REDUCTION RATIO AT A3 1:4000						 McKINLAY MORGAN & ASSOCIATES Pty Ltd. ACN 003 750 525 ABN 23 003 750 525 CONSULTING SURVEYORS - PROJECT MANAGERS 122 Macquarie Street, Phone: 4577 6011 P.O. Box 217 Fax: 4577 4910 Windsor NSW 2756 Email: mail@mckinlaymorgan.com.au DX 8615 Windsor www.mckinlaymorgan.com.au									
D								SURVEY BY																
C								CALCS BY																
B								DRAWN BY	G.DOUGLAS															
A								CHECKED BY	AEDWARDS															
Date	REVISION																							

DATE 2/9/2011	CLIENT NAME DIXON SAND (PENRITH) Pty Ltd	
FILE No. 91930	LOCALITY MAROOTA	LGA THE HILLS SHIRE
COUNCIL REF	PLAN No. 91930:E:2	C.FILE: 91930E2.DWG

PLAN SHOWING FINAL LANDFORM CONTOURS OVER LOTS 29 & 196 DP 752025 OLD NORTHERN ROAD, MAROOTA	SHEET No. 1 OF 2 SHEET
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SECTION 'A'-'A'



SECTION 'B'-'B'

