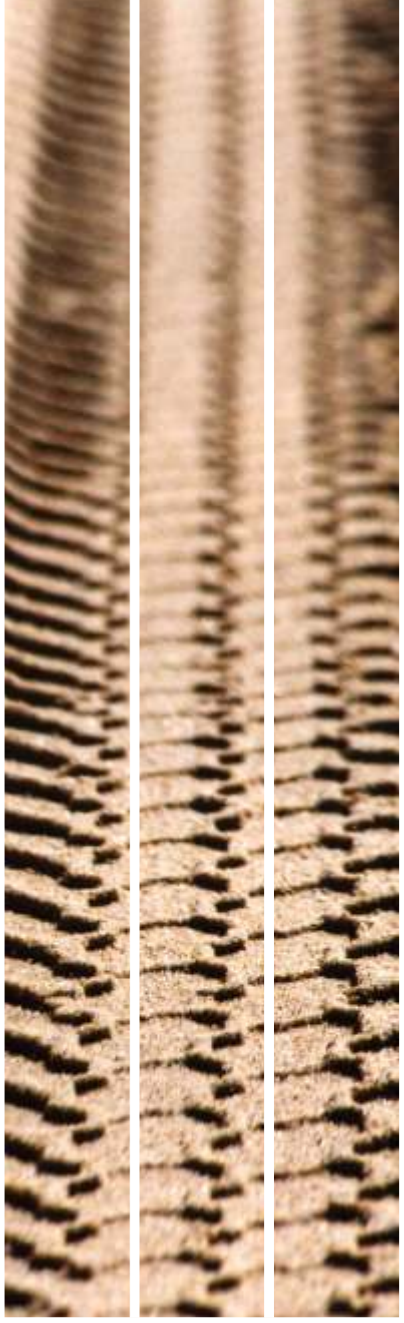
# ENVIRONMENTAL ASSESSMENT

## Modifications to Mackas Sand Extraction Operations on Lot 218 & Lot 220 Salt Ash, NSW



MACKA'S SAND PTY

JANUARY 2012

# Environmental Assessment of Modifications to Mackas Sand Extraction Operations on Lot 218 and Lot 220 Salt Ash NSW

**Prepared by**

**Umwelt (Australia) Pty Limited**

**on behalf of**

**Mackas Sand Pty Ltd**

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# Executive Summary

## INTRODUCTION

This Environmental Assessment has been prepared to accompany an application to the Minister for Planning and Infrastructure under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify Major Project Approval 08_0142. Major Project Approval 08_0142 to extract up to 1 million tonnes of sand per year from each extraction area on Lot 218 in DP 1044608 (Lot 218) and Lot 220 in DP 1049608 (Lot 220) was granted on 20 September 2009 by the then Minister for Planning. Location of the approved extraction areas are shown on **Figure 1.1**. Details of the original proposal including the extractive operations are contained within the Environmental Assessment (Umwelt, 2009a) and subsequent approval.

Lot 218 and Lot 220 are owned by Worimi Local Aboriginal Land Council (LALC) and contain approximately 20 million tonnes of sand resource. The potential to extract sand from these lots to generate employment, training and economic development opportunities for Worimi LALC was part of the agreement between Worimi LALC and the New South Wales Government that led to the establishment of the Worimi Conservation Lands on Stockton Bight in February 2007.

Worimi LALC has contracted Mackas Sand Pty Ltd (Mackas Sand) to obtain approval for and extract industrial grade and construction sand resources from the approved extraction areas on Lot 218 and Lot 220 on behalf of Worimi LALC.

Umwelt (Australia) Pty Limited (Umwelt) was engaged by Mackas Sand to undertake the necessary environmental assessments for this modification. The study area for this assessment consists of the proposed alternate haul route alignments and approved extraction areas on Lot 218 and Lot 220. The study area is located approximately 20 to 25 kilometres north-east of Newcastle, NSW.

Consultation has been undertaken with officers from the Department of Planning and Infrastructure who have confirmed that the proposed modification can be determined under Section 75W of the EP&A Act.

To date sand extraction has been undertaken on Lot 220 by Mackas Sand. No extraction has been undertaken on Lot 218 due to issues in regard to access to the approved extraction area.

Part of the modification sought is to construct and utilise an alternate route to access the approved sand extraction area on Lot 218 in DP 1044608 (Lot 218), Salt Ash.

The approved access to Lot 218 extraction area is via a public road reserve (Stockton Bight Track) that passes through Pt 76 and part of Pt 101 from where it leaves Stockton Bight Track and traverses across Pt 101 and Pt 13 of DP 753192 to Lot 227 DP 1097995 (Lot 227) which provides access to Lot 218 (see **Figure 1.2**). Pt 101 and Pt 13 in DP 753192 are owned by members of the Towers family and Lot 227 is owned by Worimi LALC. There is no current agreement with the owners of Pt 101 and Pt 13 in DP 753192 to access Lot 227 and Lot 218 via the approved access.

In addition, the approved route from Lot 227 onto Lot 218 would have resulted in a significant earthworks cutting being constructed through an elevated knoll within the mobile sand dunes. This knoll is now used as a viewing location as part of Worimi Sand Dune Adventures. As a

result, access into western side of Lot 218 extraction area via Pt 101, Pt 13 and Lot 227 is no longer the preferred access.

The preferred alternate access to the Lot 218 extraction area is via Stockton Bight Track which was realigned (as shown on **Figure 1.2**) by Port Stephens Council (PSC) to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192.

The modification sought is to construct and utilise an alternate route to access the approved sand extraction area on Lot 218 in DP 1044608 (Lot 218), Salt Ash. Two alignments (Route A and Route B as shown on **Figure 1.2**) have been identified for the eastern section of the haul route with Route A alignment being the preferred alignment. The preferred haul route would utilise approximately 1560 metres of public road known as Stockton Bight Track. Stockton Bight Track was realigned (as shown on **Figure 1.2**) by PSC to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192 which are owned by B & R B Mackenzie FT Pty Ltd. The realignment of Stockton Bight Track was gazetted on 1 September 2011. The remaining 610 metres of the preferred haul route is via a private haul road over Lot 2 DP 916061, Lot 122 DP 753192 and Lot 218.

Approximately 1250 metres of the Stockton Bight Track alignment follows an existing track and powerline easement and traverses bare earth with the remaining realigned 310 metre section of Stockton Bight Track being over disturbed grassland.

Approximately 190 metres of the alignment of the private haul road is to be constructed over disturbed grassland, approximately 270 metres will follow the alignment of an existing sand track through Coastal Sand Apple – Blackbutt Forest with the remaining 150 metres to be constructed through approximately 90 metres of Swamp Mahogany – Paperbark Forest and approximately 60 metres of Coastal Sand Apple – Blackbutt Forest.

In total the preferred alternate haul route would disturb an area of approximately 2.26 hectares of which approximately 1.25 hectares is unvegetated (existing track/bare earth/power easement), 0.50 hectares is disturbed grassland, 0.42 hectares is Coastal Sand Apple – Blackbutt Forest (consisting of haul route and small turning circle) and 0.09 hectares is Swamp Mahogany – Paperbark Forest.

As can be seen from **Figure 1.3**, Lot 218 adjoins the 4438 hectares of Worimi Conservation Lands to the south, east and north and is located adjacent to a significant tract of Coastal Sand Apple – Blackbutt Forest which includes pockets of Swamp Mahogany – Paperbark Forest. In total, construction of the preferred alignment of the alternate haul route would disturb approximately 0.51 hectares of these forest communities.

The preferred route deviates to the north along the western third of Lot 122 to avoid several clusters of ground orchids *Diuris praecox* and *Diuris arenaria* which are listed as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Threatened Species Conservation Act 1995* (TSC Act) respectively. No *Diuris praecox* or *Diuris arenaria* were identified along or adjacent to Route A within Lot 218. Trees and understorey along this alignment would be cleared and windrowed along the edge of the alignment.

Geotextile will then be placed over the ground surface where required prior to sand fill and road base material being placed along the alignment of the road. This will minimise potential disturbance of any subsurface archaeological material that may exist along the road alignment, as the entire southern boundary of Lot 122 has been identified as a Potential Archaeological Deposit (PAD). Adoption of Route A, which is the preferred route, will mean that the alternate haul route will be constructed over only approximately 50% of the identified PAD along the southern boundary of Lot 122 DP 753192.

Route B if adopted would follow the alignment of the existing track along the full length of the southern boundary of Lot 2 and Lot 122 and would require limited clearing of trees along the route. Field surveys undertaken during the September 2011 flowering period indicate that there are in excess of 250 *Diuris praecox* and approximately 50 *Diuris arenaria* located on the verges of the existing sand track and adjacent cleared land with these orchids showing a preference for the cleared areas along and adjacent to existing tracks. Approximately 30 to 50 of these plants would be removed if Route B was constructed. In addition, Route B would be constructed over the full length of the identified PAD. If Route B was adopted, the same construction techniques over the PAD will be used as for Route A.

Worimi LALC who owns Lot 218 has resolved unanimously at a meeting on 14 September 2011 that Worimi LALC has a strong preference for Route A to be adopted as it will result in a lesser impact on the PAD and require the removal of significantly less vulnerable orchids than Route B.

There are no changes proposed to the method of extraction for operations on Lot 218 other than that extraction will commence approximately 600 metres to the east of the western boundary of the approved extraction area and will progress in easterly and westerly directions from the access point.

Approval is also sought to lower the minimum extraction level in both Lot 218 and Lot 220 to being 0.7 metres above the maximum predicted groundwater level during extraction with the final landform being at least 1 metre higher than the maximum predicted groundwater level as is currently required.

This minor change in extraction depth is sought to improve the efficiency of extraction operations particularly in dry periods when the water table is well below its maximum predicted level. Efficiency is improved through increased trafficability of the exposed sand surface due to the greater moisture content increasing the stability and bearing capacity of the sand. The greater bearing capacity means that travel times and the amount of energy required to operate front-end loaders and dump trucks on the sand are significantly reduced.

In previous consultation in regard to maximum depths of extraction, NSW Office of Water (NOW) representatives have indicated that extraction to a depth 0.7 metres above the maximum predicted groundwater level may be accepted provided that the final landform for the site was reshaped to provide a minimum of 1 metre of sand above the maximum predicted groundwater level.

## APPROVAL PROCESS

The original proposal satisfied the definition of a Major Project under the then State Environmental Planning Policy (Major Development) 2005 and was approved by the Minister for Planning under Part 3A of the EP&A Act.

The then Department of Planning advised by email on 19 April 2010:

> The Department has decided not to issue specific Director-General's requirements for the proposed modification to the Mackas Sand project.
>
> Nevertheless, the EA for the proposed must address relevant matters from the DGRs issued in October 2008 for the project. The following matters are of particular interest to the Department:
>
> - Noise;
> - Air quality (dust emissions);

- Road safety arising from the use of a previously unformed road;
- Biodiversity issues (such as removal of vegetation to enable use of the proposed new access route); and
- Any interactions with adjacent landowners.

Please be aware that the *Environmental Planning and Assessment Amendment (Miscellaneous) Regulation 2010* commenced on 26 March 2010 and this may have application for the proposed modification, regarding landowner consent in particular.

## KEY ENVIRONMENTAL ISSUES

Key environmental issues associated with the modified proposal were identified through risk assessment, consultation activities and requirements for the environmental assessment provided by the Director-General of the then Department of Planning (DoP).

### Traffic Access and Public Safety

The approved access to Lot 218 extraction area from Lavis Lane is via Stockton Bight Track which is located within public road easement within Pt 76 and Pt 101 DP 753192 and then via land owned by the Towers family (Pt 101 and Pt 13 DP 753192) and Worimi LALC (Lot 227).

The alternate route will be constructed within the realigned and gazetted 20 metre wide public road reserve through Pt 76, Pt 101 and Pt 13 of DP 753192 and part Lot 2 DP 916061 (see **Figure 1.2**). Prior to use, this section of road will be constructed with an 8 metre wide formation and to a public road standard in accordance with the requirements of PSC. The minimum radius along the realigned road alignment is approximately 30 metres which is well in excess of minimum turning circle requirements for semi-trailers of 19 metres and will provide adequate space for two semi-trailers or smaller vehicles to safely pass at any location along the public road alignment.

Council requires that the first 100 metres of Stockton Bight Track adjacent to Lavis Lane is sealed to minimise dust and noise impacts. The remainder of Stockton Bight Track will initially be constructed with a gravel surface. Within six months of the commencement of haulage from Lot 218 the most western 650 metres of Stockton Bight Track will be sealed in accordance with the requirements of Condition 31 of Schedule 3 of Major Project Approval 08_0142.

Stockton Bight Track is a public road under the control of PSC. Mackas Sand will construct and maintain the alternate haul road section of Stockton Bight Track for the life of sand extraction operations on Lot 218 and will make a contribution to the maintenance and upkeep of Lavis Lane in accordance with Condition 13 of Schedule 2 of Major Project Approval 08_0142.

As shown on **Figure 1.2**, the alternate haul route will leave Stockton Bight Track on Lot 2 DP 916061 and will then travel across Lot 2 DP 916061 and Lot 122 DP 753192, Salt Ash which are owned by B & R B Mackenzie FT Pty Ltd and then via Lot 218 to the approved extraction area. This section of the road will have signs at the entrance stating that it is a private haul road. The alternate haul route will be constructed with an 8 metre wide gravel surface where possible but may be narrow to a minimum of 7 metre width in places to avoid disturbing vulnerable plant species or minimise potential impact on archaeological sites.

The preferred alternate haul route into Lot 218 is depicted as ‘Route A’ on **Figure 1.2**. Realignment and construction of Stockton Bight Track will increase the length of Stockton

Bight Track being used from approximately 650 metres to approximately 1560 metres with the remaining 610 metres being private haul road.

**Aboriginal Heritage**

A detailed Aboriginal Cultural Heritage Assessment was prepared in consultation with local Aboriginal representatives for the area that would be disturbed in construction of the alternate haul route. The road is to comprise an 8 metre wide gravel pavement. Five archaeological sites have been identified along the alignment of the proposed route. Those being:

- Mackas Access 1 – Midden;
- Mackas Access 2 – Artefact Scatter;
- Mackas Access 3 – Artefact Scatter;
- Mackas Access 4 – Artefact Scatter;
- A3 – Midden Material, Artefact Scatter and Associated PAD.

In addition, the alignment of Route A between Lot 122 and the extraction area on Lot 218 (Transect 9) has been identified as a PAD.

Two additional midden sites (AHIMS #38-4-0649 and #38-4-0658) are located 50 metres to 100 metres to the north of the alternate haul route as shown on **Figure 1.2**.

Where possible, potential impacts to these sites have been mitigated by changes in proposed road construction method and location. It is intended that sites Mackas Access 1, 2, 3, and proposed 4 will have artefacts collected from the surface in consultation with the Aboriginal Heritage Management Group. Sites Mackas Access 1, A3 and Transect 9 PAD have identified potential to contain more artefacts below the ground surface in addition to those currently visible on the ground surface. Surface artefacts within sections of these sites that will be disturbed during haul road construction will be collected in consultation with the Aboriginal Heritage Management Group. Following artefact collection and vegetation clearing, within the identified boundaries of these sites, a layer of geotextile will be placed on the ground surface prior to fill material and road base being placed as part of road construction.

This technique of road construction has been adopted to avoid disturbing below the current ground surface and therefore should avoid impacts to any artefacts that may also be present but not currently visible. There are no known archaeological sites along Route A between Lot 122 and the approved extraction area on Lot 218 however it is proposed to treat this section of road as a PAD.

The following Aboriginal parties that were previously involved in the assessment of Lot 220 were consulted in regard to the proposed alternate haul route:

1. Worimi LALC;
2. Nur-Run-Gee Pty Ltd (Nur-Run-Gee);
3. Worimi Traditional Aboriginal Elders and Owners Group;
4. Mur-Roo-Ma Incorporated (Mur-Roo-Ma); and

5. Maaiangal Aboriginal Heritage Co-operative (Maaiangal).

Following archaeological survey and review of the final draft archaeological assessment:

1. WLALC identified that the recommendations provided in Section 10 are 'a true and accurate record of the outcomes and findings of the Assessment Report'.

2. Nur-Run-Gee recommended that existing infrastructure on Lot 218 should be utilised and did not support the proposed haul route modification on the grounds that it will result in additional impacts to cultural items. However, provided that no other alternative to construction of the alternate haul route is available, Nur-Run-Gee agreed with the recommendations provided in Section 9 and the associated research design and methodology. Nur-Run-Gee also recommended some additional measures regarding placement of culverts within the proposed haul route to allow for water flow.

3. Mur-Roo-Ma recommended that the previously approved access to the sand extraction face should be utilised and the alternate haul route should not be approved as it results in additional impacts to Aboriginal heritage, flora and fauna. However, on the understanding that this recommendation may not be followed, Mur-Roo-Ma also supported the recommendations and associated research design and methodology.

4. During in-field inspection of the proposed haul route modification, representatives of WLALC, Nur-Run-Gee and Mur-Roo-Ma made additional recommendations regarding salvage requirements for impacts in the vicinity of Mackas Access 2, 3 and 4.

5. Both Maaiangal and Viola Brown recommended that the proposed modification is not approved because of its impacts on Aboriginal cultural heritage and the cultural landscape, including flora and fauna.

**Ecology and Biodiversity**

A detailed ecological assessment was undertaken for the proposed alternate haul route to determine the existing natural environment and likely impacts of the proposal on the biodiversity of the area, particularly on threatened species, populations and communities.

The proposed access will require the removal of several areas of vegetation that exist along sections of the new alignment. These include several areas of disturbed grassland where the alignment of the public road has been changed to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192. Along the gazetted alignment of Stockton Bight Track there are approximately eight *Angophora inopina*/*floribunda* hybrids that will be removed or disturbed (see **Figure 1.2**). *Angophora inopina* is listed as vulnerable under the EPBC Act.

The private haul route section of the alternate access will result in the removal of approximately 8 to 10 EPBC Act listed ground orchids (*Diuris praecox*) and possibly 1 to 2 ground orchids (*Diuris arenaria*) that are listed under the TSC Act. Removal of 8 *Angophora inopina*/*floribunda* hybrids, 8 to 10 specimens of *Diuris praecox* and 1 to 2 specimens of the *Diuris arenaria* is not expected to significantly impact on any of these vegetation communities.

Construction of alternate access Route A between Lot 122 and Lot 218 will require the removal of approximately 0.51 hectares of Swamp Mahogany – Paperbark and Coastal Sand Apple – Blackbutt forest communities. As can be seen from **Figure 1.3**, Lot 218 adjoins the 4438 hectares of Worimi Conservation Lands to the south, east and north and is located adjacent to a significant tract of Coastal Sand Apple – Blackbutt Forest which includes pockets of Swamp Mahogany – Paperbark Forest.

The loss of a small area of these forest communities will be offset by sand extraction reducing the rate at which the mobile sand dune system moves landward and smothers existing vegetation. Landward movement of the mobile dune system in this area is currently smothering approximately 0.4 hectares of vegetation per year per kilometre length of mobile dune.

The proposal to remove approximately eight *Angophora inopina*/*floribunda* hybrids and 8 to 10 specimens of *Diuris praecox* has been discussed with and referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC).

**Noise**

The proposed modification to use the alternate haul route alignment will not result in any additional noise impacts from those set out in the EA (Umwelt, 2009a).

Received noise levels at the closest residences to extraction operations on Lot 218 (Ford residence (R4) and Towers residence (R3) as shown on **Figure 1.4**), will be lower than previously predicted due to the initial extraction face being approximately 600 metres further to the east and shielded by the mobile sand dunes which are elevated to over 30 metres above the extraction floor.

Analysis indicates that truck traffic noise levels at the Towers and Ford residences which are adjacent to the Lavis Lane haul route, will remain within acceptable levels provided truck movements do not exceed 7 laden trucks (i.e. 14 trucks movements) per hour before 7.00 am (night time) and 19 laden trucks (i.e. 38 trucks movements) per hour after 7.00 am (daytime and evening).

A Noise Management Plan (Umwelt, 2009b) has been prepared for sand extraction operations on Lot 218 and Lot 220 and associated product transport. Key operational features relevant to the Noise Management Plan are:

- The approved hours of extraction being 24 hours a day 7 days a week except for operations within 250 metres of the Hufnagl Residence (R27) (see **Figure 1.4**) when operations are limited to 7.00 am to 6.00 pm Monday to Friday with no operations within 250 metres of R27 outside these times.

- Transportation of sand from Lot 220 along Oakvale Drive between 5 am and 10 pm Monday to Saturday and 8.00 am to 12.00 pm Sundays and Public Holidays in accordance with provisions of Condition 9 (b) of Schedule 3 of Project Approval 08_0142 as Mackas Sand has an agreement with the owners of residences off Oakvale Drive. A copy of this agreement has been provided to the Department of Planning and Infrastructure (DP&I).

- Transportation of sand from Lot 218 along Lavis Lane in accordance with the provisions of Condition 9 of Schedule 3 of Project Approval 08_0142 between:

    - 6.00 am and 6.00 pm (EST) Monday to Friday;
    - 6.00 am and 7.00 pm (DST) Monday to Friday;
    - 7.00 am to 4.00 pm Saturdays; and
    - No transport on Sundays or public holidays.

## Air Quality

The proposed modification to use the alternate haul route to Lot 218 will not increase air quality impacts from those set out in the EA (Umwelt, 2009a) and approved under Major Project Approval 08_0142 other than on Lot 2 and Lot 122 which are owned by B & R B Mackenzie FT Pty Ltd.

As stated in the EA (Umwelt, 2009a), the major source of potential dust generation is from traffic on unsealed access roads. The principal measure used to control dust will be dust suppression on the gravel sections of haul roads. This will be achieved using a contract water cart to keep roads moist during periods of product transport.

In accordance with PSC requirements, the most western 100 metres of Stockton Bight Track adjacent to Towers residence (R3) will be sealed as part of Mackas Sand upgrading Stockton Bight Track.

Within six months of commencing haulage of sand from Lot 218, the gravel section of Lavis Lane and the 650 metre section of the public road over Pt 76 DP 753192 will be sealed to a minimum width of 6 metres in accordance with the provisions of Condition 31 of Schedule 3 of Project Approval 08_0142.

In addition, dust control will be achieved by ongoing rehabilitation of parts of the extraction areas that were vegetated prior to extraction occurring.

Sand screening operations on Lot 218 and Lot 220 are unlikely to result in any significant increase in dust generation. This is attributed to the low dust content and moisture content of the sand that is being quarried. Lot 220 is sheltered from prevailing winds by surrounding vegetation and as a result the likelihood of dust being transported off site is low. Additional dust controls for sand screening operations are not considered to be required at Lot 220.

Sand extraction operations at Lot 218 will be located within the mobile dune field and will initially be approximately 1700 metres from the nearest residence.

Three dust deposition gauges have been established to monitor dust deposition levels as shown on **Figure 1.4**. One gauge (DDG1) is located to the north of the access road and approved extraction area on Lot 220. Two additional dust deposition gauges are located adjacent to the alternate haul route to Lot 218 (DDG2) and Lavis Lane (DDG3). Baseline dust deposition monitoring levels (Umwelt, 2011a) indicate high levels of airborne sand being present due to the natural windblown movement of the dunes on Lot 218. Deposition levels at monitoring site DDG2 vary significantly and have on several occasions exceeded 4 $g/m^2$/month. A High Volume Air Sampler (HVAS) will be established adjacent to residence R3 (Towers) at the commencement of construction of the alternate haul route.

## Interactions with Surrounding Land

The alternate access for which approval is sought will not increase impacts in terms of dust, noise, traffic movements and visual on surrounding non-project related properties beyond levels of impact approved as part of Major Project Approval 08_0142. Construction of the alternate haul route will result in the 100 metres of Stockton Bight Track adjacent to Towers residence (R3) being sealed prior to commencement of haulage rather than within six months of haulage commencing as is currently required by the Project Approval 08_0142.

The alternate haul route which is proposed to be used by Mackas Sand to access the approved extraction area on Lot 218 will utilise Stockton Bight Track which is under the control of PSC. As land owners, PSC has agreed to the use of Stockton Bight Track by quarry traffic provided that Mackas Sand undertakes to construct the section of Stockton

Bight Track that will be used by quarry traffic and maintain this section of road over the life of the operations.

Stockton Bight Track easement is adjoined by land owned by members of the Towers family and B & R B Mackenzie FT Pty Ltd. Towers family land has historically been used for quarry purposes by Quality Sands & Ceramics Pty Ltd. The alternate haul route will also utilise a private haul road which traverses land owned by B & R B Mackenzie FT Pty Ltd and Worimi LALC. B & R B Mackenzie FT Pty Ltd and Worimi LALC are both associated with the quarry development.

Approval for Worimi LALC's land dealings associated with the proposed modification to Major Project Approval 08_0142 was granted by NSW Aboriginal Land Council at its meeting on 28 September 2011.

Realignment of Stockton Bight Track to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192 was undertaken by PSC in consultation with the Towers family. Realignment of the road within Pt 101 DP 753192 was required as structures had been built over the former public road reserve preventing the movement of traffic along the former road reserve. The road was also realigned within Pt 13 DP 753192 to remove a tight bend in the road. The realignment of Stockton Bight Track was gazetted on 1 September 2011.

Use of the alternate haul route and extraction area access site will increase the location of the initial quarry face from being approximately 1100 metres from the nearest residence (Towers residence R3 on **Figure 1.4**) to being approximately 1700 metres away reducing interaction between surrounding residences and extraction operations. Use of the route will also potentially generate noise and dust impacts principally at Towers residence (R3 on **Figure 1.4**), however with appropriate controls such as limiting truck movement and sealing the adjacent 100 metres of Stockton Bight Track initially and an additional 550 metres within six months of commencing haulage from Lot 218 as discussed above, these are not predicted to exceed acceptable levels.

**Unexploded Ordnance**

An Unexploded Ordnance (UXO) assessment was undertaken as part of the EA (Umwelt, 2009a) and identified that there was potential for UXO to occur within the western part of the approved Lot 218 extraction area as a result of WWII use of the area as a bombing range and for explosives testing. This potential for UXO to occur is limited to the undisturbed sections of the landform that existed prior to approximately 1950.

The majority of the sand that will be removed from the approved Lot 218 extraction area will be windblown sand that has been deposited above the ground surface that existed prior to 1950. This material has negligible potential to contain UXO.

An Unexploded Ordnance Management Plan (UXOMP) (see **Appendix 5**) has been prepared for operations within Lot 218. The UXOMP has identified that there is a possibility of UXO and related debris existing within the Danger Zone which includes the western 1.5 kilometres of the approved extraction area in Lot 218 and the southern sections of Route A and Route B of the alternate haul route.

The UXOMP found that there is a low probability of UXO being encountered provided that any excavation within this area does not go below the stabilised ground surface as it existed prior to 1950. The UXOMP recommends that if excavation or works are likely to occur below the 1950 stabilised ground surface, an UXO survey should be undertaken by suitably qualified specialists.

Any extraction within the approved extraction area on Lot 218 that is within the Danger Zone will be restricted to being above the 1950 stabilised surface unless UXO surveys are undertaken by suitably qualified specialists and any identified UXO is cleared prior to extraction occurring.

An assessment of whether archaeological subsurface testing is required will also be undertaken once UXO survey and clearance is undertaken and prior to excavation below the 1950 stabilised ground surface occurring.

To minimise potential UXO impacts, it is proposed to construct that section of the alternate haul route that is within Danger Zone by filling above the 1950 stabilised landform. This can be readily achieved as the section of alternate haul route that is located within Danger Zone traverses a low-lying section of the terrain that is naturally prone to water logging. Along this section of the alternate haul route, vegetation will be cleared and windrowed along the edges of the haul road, geotextile will then be placed over the cleared ground surface and sand and road-base material will then be placed over the geotextile ensuring that excavation does not occur below the 1950 stabilised surface.

**Alternatives and Justification for Proposed Modifications**

A range of alternatives were considered in developing the proposed modifications to Major Project Approval 08_0142. These included:

- Not seek to establish an alternate haul route to the approved extraction area. This alternative is not preferred due to the uncertainty about obtaining access of the private section of the approved haul road and the ongoing ability to maintain this access over time. The alternate haul route will utilise Stockton Bight Track which is a public road and then traverse via Lot 2 DP 916061 and Lot 122 DP 753192. Lot 2 DP 916061 and Lot 122 DP 753192 are owned by B & R B Mackenzie FT Pty Ltd which is associated with Mackas Sand. Mackas Sand has agreed with PSC to construct and maintain the section of Stockton Bight Track that forms part of the alternate haul route and has long term certainty in regard to access to the haul route.

- Several alignments of the realigned section of Stockton Bight Track were considered prior to the road being gazetted on 1 September 2011 with the gazetted alignment being the alignment that was acceptable to the Towers family. This alignment was not the preferred alignment from a haulage route perspective which was for the route to travel in a relatively straight line from the eastern boundary of Pt 101 DP 753192 to the south-western corner of Pt 13 DP 753192.

- Two alignments for the private section of the alternate haul route along the southern boundary of Lot 122 DP 753192 and to the approved extraction area on Lot 218 were considered, being Route A and Route B. Route B required less vegetation clearing but disturbed a greater area of PAD and would have required the removal of many threatened ground orchids (*Diuris praecox* and *Diuris arenaria*). Route A was selected to minimise disturbance to the identified threatened ground orchids and the PAD. At a meeting of the Worimi LALC on 14 September 2011, it was agreed unanimously that Route A was the preferred route.

- The alternative of not seeking to temporarily reduce the maximum extraction depth to 0.7 metres above the maximum predicted groundwater level was also considered. This is not preferred as reducing the maximum extraction depth to 0.7 metres above the maximum predicted groundwater level allows sand to be extracted more efficiently through reducing travel times, fuel usage and wear and tear on the extraction and haulage equipment.

Approval of the alternate haul route will provide certainty of access to the approved Lot 218 extraction area. By facilitating the extraction of sand from Lot 218, the current proposal enables the creation of a number of additional benefits for the local community as assessed for the approved project (Umwelt, 2009a) through direct means such as employment and wages, and indirect processes such as spending and use of services.

The alternate access to Lot 218 will create a number of benefits for Worimi LALC including direct income that will enable implementation of a cultural development programme, employment opportunities, training and university scholarships that will be provided as part of a commercial arrangement that has been established between Mackas Sand and Worimi LALC. It will also enable the Worimi Sand Dune Adventures to continue to use an elevated knoll at the western end of Lot 218 extraction area that would have been removed as part of haul route construction if the approved access to Lot 218 extraction area was utilised.

The extraction of sand from Lot 218 will also create benefits for local, state and national governments through land tax, rates, GST, fuel excise and other taxes.

The proposal will provide access to sand within Lot 218 and create a long term and potentially indefinite supply of construction sand and at least 20 years supply of industrial grade sand for the Sydney and Hunter regional markets. It is anticipated that these markets will require up to 3.0 million tonnes of sand per year by 2015, if additional resources do not become available.

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# 1.0 Introduction

## 1.1 Overview

### 1.1.1 Background to the Modified Proposal

Major Project Approval 08_0142 was granted on 20 September 2009 to Mackas Sand Pty Ltd (Mackas Sand) for the extraction of up to 2 million tonnes annually from Lot 218 DP 1044608 and Lot 220 DP 1049608 in Salt Ash, Port Stephens as shown in **Figure 1.1**. Sand extraction has commenced in Lot 220. The original development consent includes provision for Mackas Sand to access Lot 218 by an unsealed road located within the Crown Road reserve on Pt 76 and the western part of Pt 101 and on private land on the remainder of Pt 101 and Pt 13 in DP 753192, Salt Ash.

Mackas Sand is seeking approval for modification of Major Project Approval 08_0142 to establish an alternate access route to Lot 218. The route will utilise the public road reserve through Pt 76, Pt 101 and Pt 13 of DP 753192 and travels through Lot 2 DP 916061 and Lot 122 DP 753192, Salt Ash to access Lot 218 as shown in **Figure 1.2**. Port Stephens Council has realigned sections of the Stockton Bight Track public road reserve in order to provide access to Lot 2 DP 916061 and Lot 122 DP 753192 which was effectively landlocked by infrastructure that was constructed across the former alignment of the public road reserve.

As can be seen from **Figure 1.3**, Lot 218 adjoins the 4438 hectares of Worimi Conservation Lands to the south, east and north and is located adjacent to a significant tract of Coastal Sand Apple – Blackbutt Forest which includes pockets of Swamp Mahogany – Paperbark Forest.

Umwelt (Australia) Pty Limited (Umwelt) has been engaged by Mackas Sand to undertake the necessary environmental assessments for the proposed modification. The modification proposal is being assessed under Part 3A of *Environmental Planning and Assessment Act 1979* (EP&A Act).

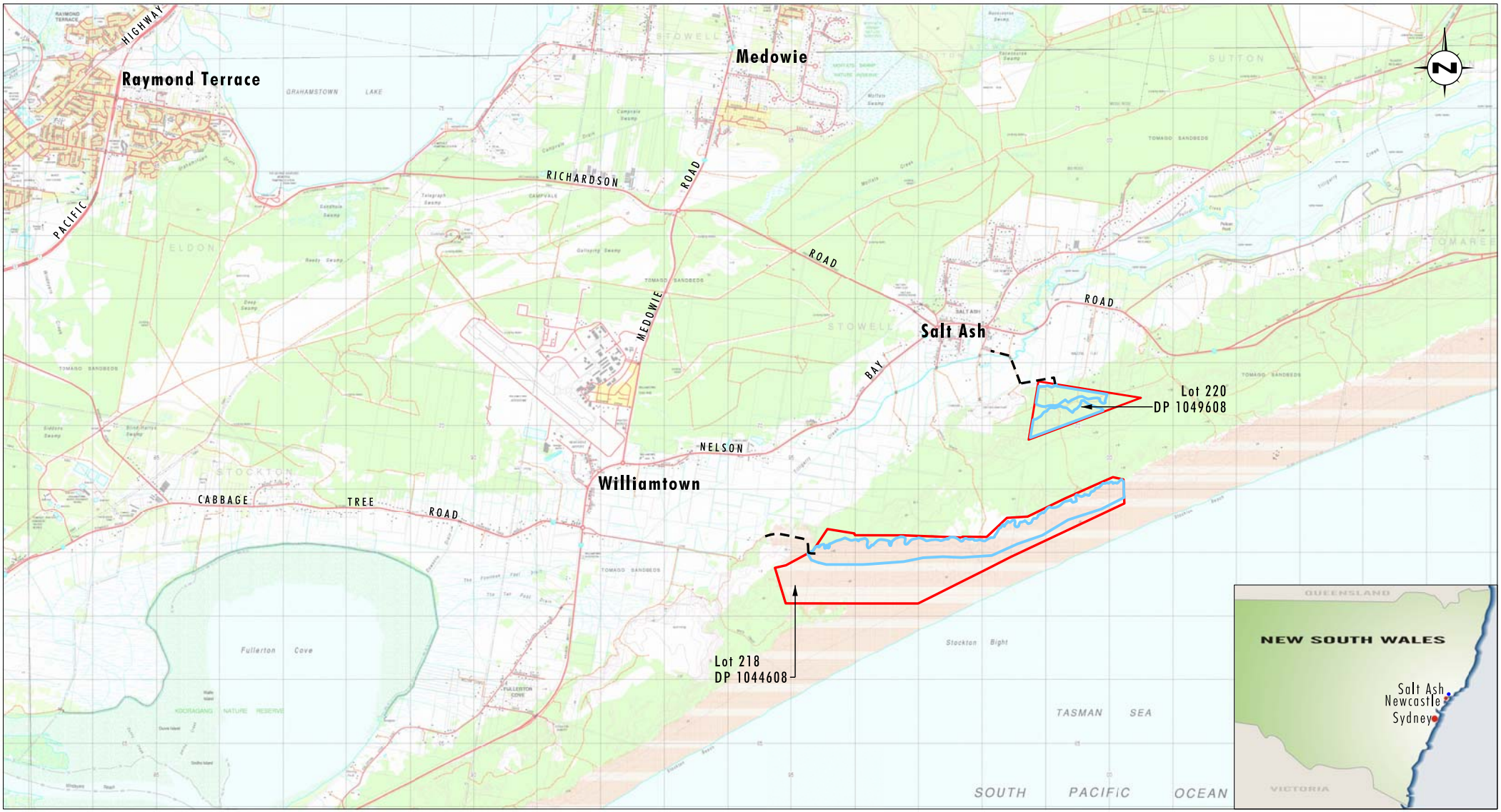
### 1.1.2 The Proponent

Mackas Sand currently undertakes sand extraction operations on Lot 218 and Lot 220 under agreement with the landowners, Worimi Local Aboriginal Land Council (LALC). Worimi LALC was formed under the *Aboriginal Land Rights Act 1983*. The objectives of Worimi LALC are to improve, protect and foster the best interests of all Aboriginal people within the Worimi LALC area and other people who are members of the Council.

### 1.1.3 The Proposed Modification

The modification proposal relates to the modification of the access road to Lot 218 and the access point to the approved Lot 218 extraction area as shown on **Figure 1.2**.

In order to provide road access to Lot 2 DP 916061 and Lot 122 DP 753192 which were effectively landlocked properties, Port Stephens Council has realigned the former public road reserve through Lot 76, Lot 101 and Lot 13 of DP 753192 as shown on **Figure 1.2**. The proposed modification seeks to utilise the new road alignment and construct a gravel road access from the existing Crown Road alignment approximately 1700 metres eastward through Lot 2 DP 916061 and Lot 122 DP 753192 to provide access to the approved extraction area on Lot 218. The proposed route will provide access to the mobile dunes in Lot 218 at an access point approximately 600 metres east of the previously approved access point at the western end of the Lot 218 extraction area.




Source: Department of Lands, 2006

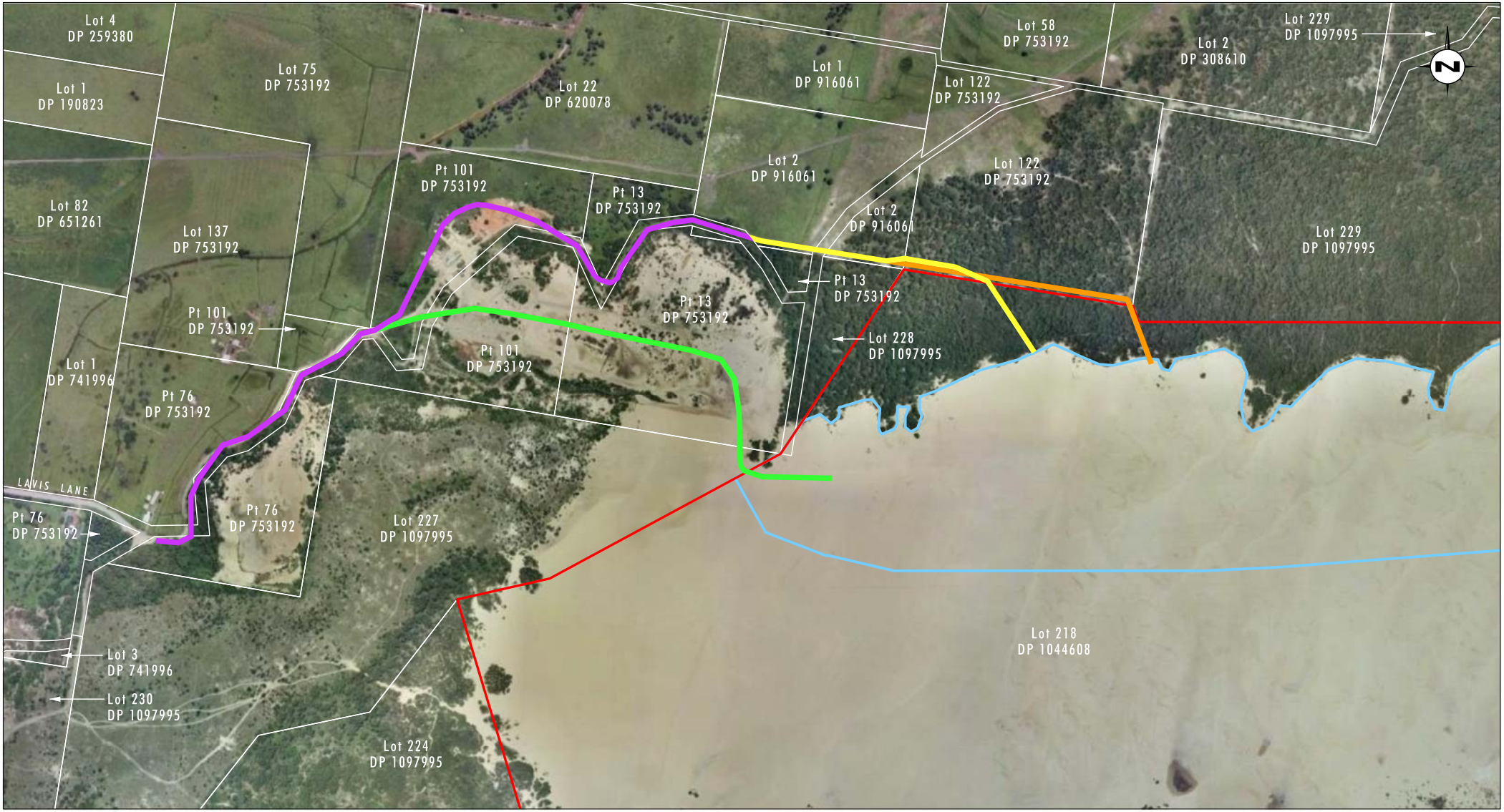
## Legend

- Lot Boundaries
- Approval Areas
- Approved Access Roads

FIGURE 1.1

Location of Approval Areas

File Name (A4): R30_V1/1646_256.dgn




**Source:** Aerial: Google Earth, 2008

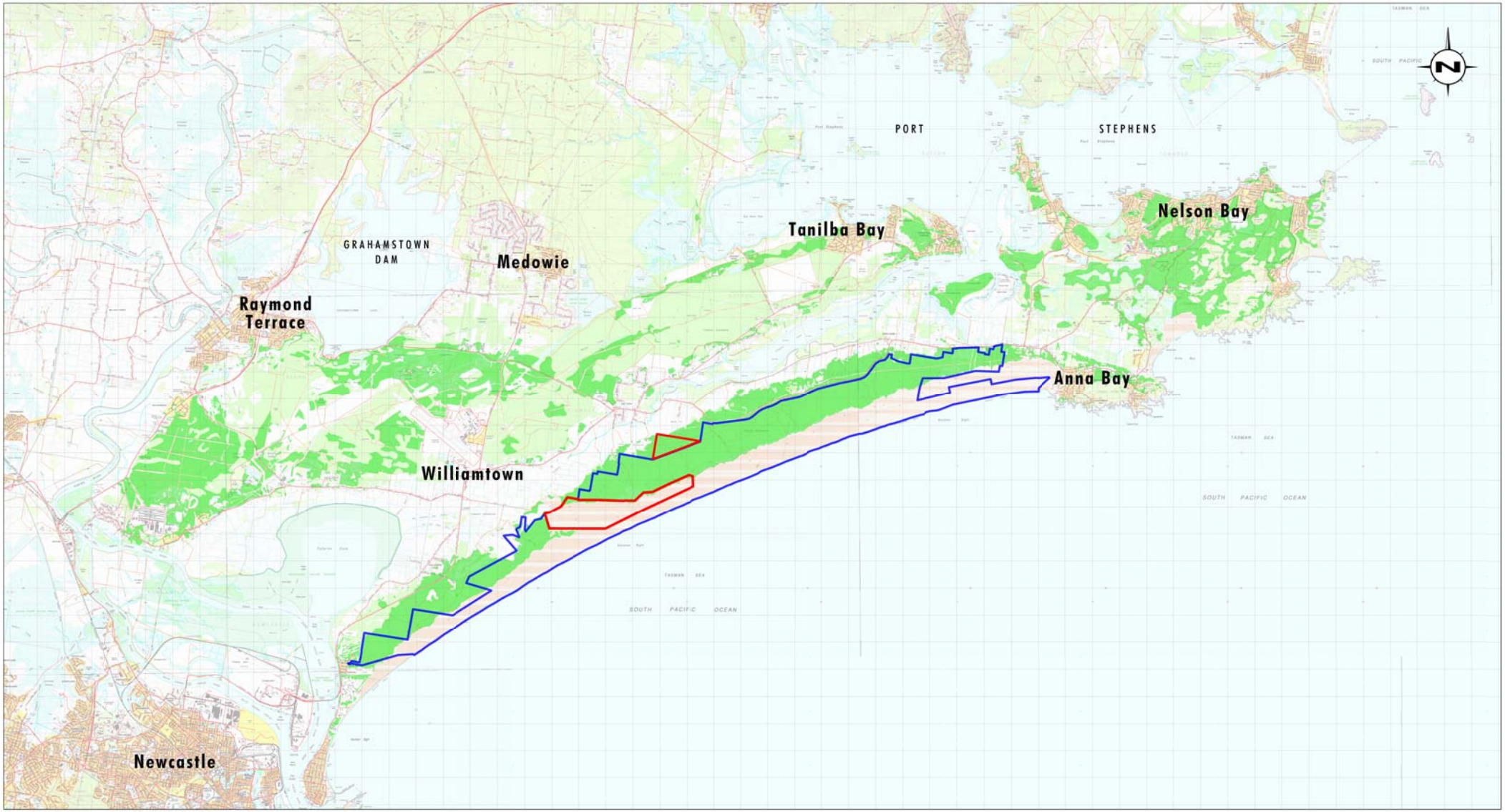
0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Stockton Bight Track
- Previously Approved Access Route
- Alternate Route A
- Alternate Route B

FIGURE 1.2

**Study Area**




**Source:** Department of Lands (2006), Hunter Councils (2003)

0 2.5 5 10km
1:200 000

**Legend**

- Lot Boundaries (218 & 220)
- Worimi Conservation Lands
- Coastal Sand Apple Blackbutt Forest

FIGURE 1.3

Coastal Sand Apple Blackbutt Forest

There are no proposed changes to the extraction areas, method of haulage or limits to extraction on Lot 218 or Lot 220 other than seeking to temporarily enable the minimum extraction depth to be 0.7 metres above maximum predicted groundwater level with the final landform being at least 1 metre above the maximum predicted groundwater level. This is sought to improve efficiency of operations particularly during dry periods when the groundwater level is well below the maximum predicted level.

A network of groundwater monitoring bores has been established as shown on **Figure 1.4**. It is proposed to augment this monitoring bore network by establishing additional monitoring bores within the approved Lot 218 and Lot 220 extraction areas once sufficient sand has been extracted to enable bores to be established on the quarry floor in a location that does not adversely impede on extraction and transport operations. These bores will be used to monitor groundwater level and quality within the extraction area.

Lot 218 has a total area of approximately 412 hectares with the approved extraction area being approximately 150 hectares in area. The approved extraction area consists of unvegetated mobile sand dunes. Vegetated dunes within Lot 218 and a Water Reserve adjoin the site to the north, while mobile dunes that form part of Stockton Sand Dunes adjoin the site to the south.

Quality Sands and Ceramics sand quarry adjoins the north-western corner of the Lot 218 extraction area.

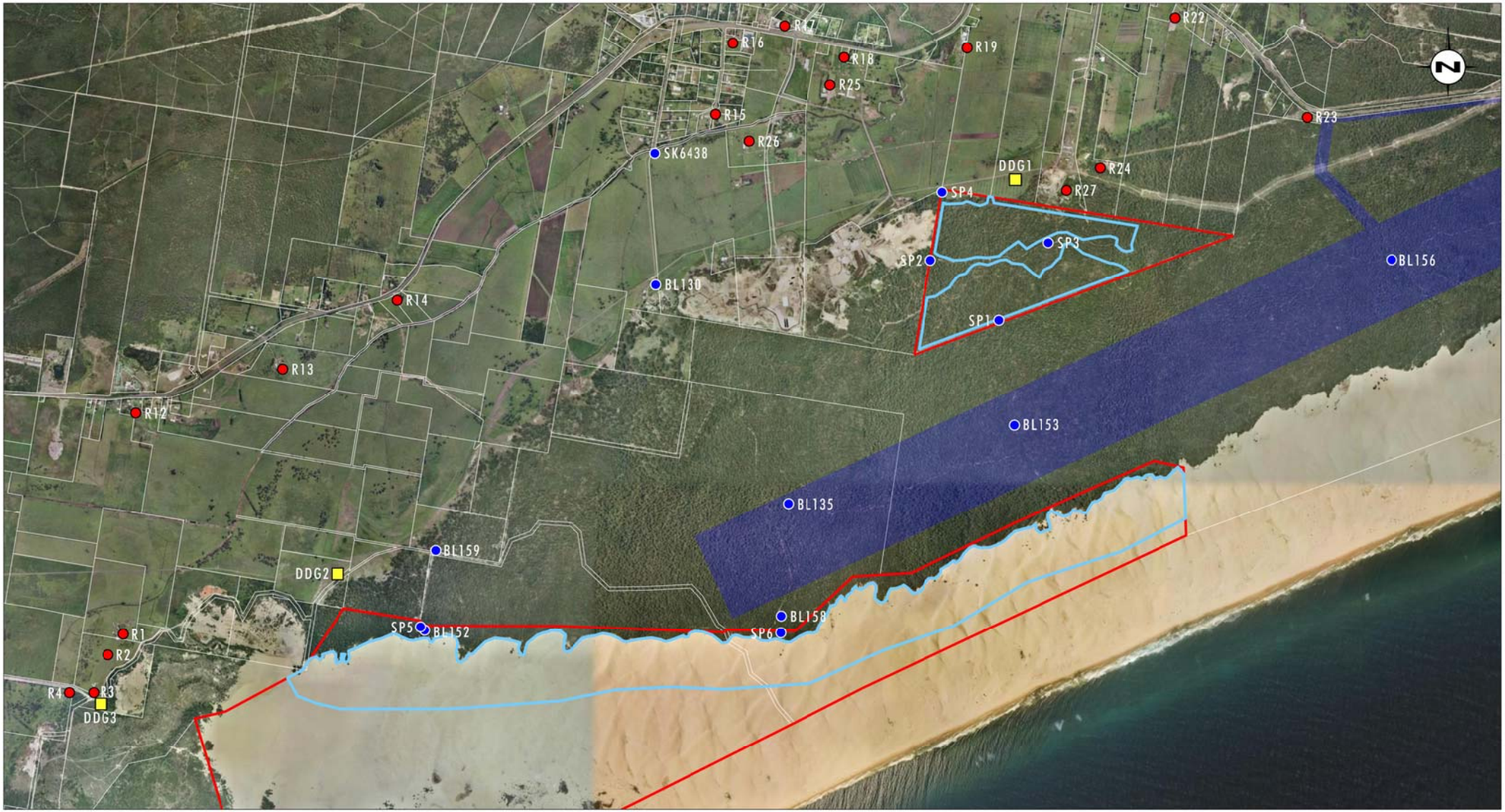
## 1.2 Approval Requirements

The original proposal satisfied the definition of a Major Project under State Environmental Planning Policy (Major Development) 2005 and was approved under Part 3A of the EP&A Act by the Minister for Planning.

The then Department of Planning advised by email on 19 April 2010:

> The Department has decided not to issue specific Director-General's requirements for the proposed modification to the Mackas Sand project.
>
> Nevertheless, the EA for the proposed must address relevant matters from the DGRs issued in October 2008 for the project. The following matters are of particular interest to the Department:
>
> - Noise;
> - Air quality (dust emissions);
> - Road safety arising from the use of a previously unformed road;
> - Biodiversity issues (such as removal of vegetation to enable use of the proposed new access route); and
> - Any interactions with adjacent landowners.
>
> Please be aware that the *Environmental Planning and Assessment Amendment (Miscellaneous) Regulation 2010* commenced on 26 March 2010 and this may have application for the proposed modification, regarding landowner consent in particular.

This modification application has been prepared to address the requirements of Part 3A of the EP&A Act, the requirements of the Environmental Planning and Assessment Regulation 2000 and amendments and specific requirements issued by the Director-General of the Department of Planning and Infrastructure (DP&I) (provided in **Appendix 1**).




**Source:** Aerial: Google Earth 2008, Cadastral: Department of Lands, 2003
**Note:** Contour Interval 2m

0 0.5 1 1.5km
1:30 000

## Legend

- Lot Boundaries (218 & 220)
- Approved Extraction Areas
- HWC Emergency Borefield Easement
- Residence
- Groundwater Monitoring Bore Location
- Dust Monitoring Location

FIGURE 1.4

**Monitoring Sites and Residences**

Further details on the approvals process and legislation that applies to the proposal are provided in **Section 3**.

## 1.3 Consultation

### 1.3.1 Agency Consultation

Consultation with government agencies has been undertaken during preparation of the environmental assessment (EA), during and following preparation of the management plans required by Major Project Approval 08_0142 and during the EA undertaken for this proposed modification. This has included consultation with:

- Department of Planning and Infrastructure (DP&I).
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPC);
- Port Stephens Council (PSC);
- NSW Office of Water (NOW);
- Office of Environment and Heritage (OEH); and
- Hunter Water Corporation (HWC).

Specific issues raised during this consultation in regard to the proposed alternate haul route have related to dust suppression, noise and potential impacts on HWC use of the emergency groundwater borefield or areas proximate for groundwater extraction. No specific issues have been raised in regard to the proposed temporary increase to maximum extraction depth, however, there has been extensive discussion particularly in regard to determination of the maximum predicted groundwater level. The outcomes of this consultation have been taken into consideration and addressed in relevant sections of the document.

### 1.3.2 Community Consultation

In general all new extractive operations in NSW are required to establish a Community Consultative Committee (CCC). The main purpose of the CCC is to allow for the effective communication between the management of the project (including Environmental Managers employed by the company) and the local community.

Membership of the CCC is made up of at least three members of the community, one member of the local council, an independent Chairperson, and two to three members of the project management team (including Environmental Managers). Advertisements calling for expressions of interest to be on the CCC were placed in the Port Stephens Examiner in December 2009 and August 2010. The CCC was formed and had its first meeting on 15 September 2010 and has met quarterly since.

The CCC meets to discuss issues relating to the operation and standing of Mackas Sand within the community in regards to environmental management. It is generally accepted that community members of the CCC will encourage conversation regarding the operation to gauge the attitudes of the community and report back to the CCC at meetings. As well as informal communication such as this, the Chairperson may hold formal information sessions to communicate relevant information to special interest groups.

In addition to this, a website (www.mackassand.com.au) is used to display plans, strategies, monitoring results and reports and to keep the community informed.

There have been no major issues brought to the CCC since it commenced and Mackas Sand has had no complaints in regard to its operations over this time.

There has been extensive consultation with representative Aboriginal groups, the Towers family and Port Stephens Council in regard to the alignment and use of the alternate haul road. The alignment has been modified on several occasions over approximately the 2 years it has been discussed to take on board the outcomes of this consultation.

At a meeting of Worimi LALC on 14 September 2011 it was resolved unanimously that Worimi LALC has a strong preference for Route A to be adopted as it will result in a lesser impact on the potential archaeological deposit (PAD) and require the removal of significantly less vulnerable orchids than Route B.

## 1.4 Environmental Assessment Team

Umwelt has prepared this modification application. Statement of Authorship and a full listing of the project team members and their respective roles is provided in **Appendix 2**.

## 1.5 Structure of the Environmental Assessment

An overview of the structure of this EA is provided below.

- **Executive Summary** provides a brief overview of the modification proposal, the major outcomes of the environmental assessment, and an outline of key commitments that will be made to mitigate any potential impacts.
- **Section 1** introduces the modification proposal, outlines the background to the proposal, provides a summary of key details, and outlines the structure of the EA.
- **Section 2** contains a detailed description of the modification proposal, the study area and the consideration of alternative access routes.
- **Section 3** describes the planning context and environmental context for the proposal, including the applicability of Commonwealth and State legislation.
- **Section 4** contains a description of the existing environment and a comprehensive analysis and assessment of the key environmental issues relevant to the proposal, including direct and cumulative impacts.
- **Section 5** details the draft Statement of Commitments proposed to be adopted throughout the life of the proposal in order to mitigate any potential impacts.
- **Section 6** contains a conclusion as required by the Environmental Assessment Requirements (EARs).
- **Section 7** provides a checklist of how the EARs have been addressed in the EA.
- **Section 8** provides a list of abbreviations referred to in the EA.

  **Section 9** provides a list of references referred to in the EA.

# 2.0 Description of the Proposed Modifications

## 2.1 Alternate Haul Route to Lot 218

The modification sought is to construct and utilise an alternate route to access the approved sand extraction area on Lot 218 in DP 1044608 (Lot 218), Salt Ash. Lot 218 has a total area of approximately 412 hectares with the approved extraction area occupying approximately 150 hectares. Lot 218 primarily consists of unvegetated mobile sand dunes. Vegetated dunes within a Water Reserve adjoin the lot to the north, while mobile dunes within Crown Reserve 91676 adjoin the site to the south. Quality Sands and Ceramics sand quarry adjoins the site to the north-west on Pt 13 DP 753192.

The approved access to Lot 218 extraction area is via a public road reserve (Stockton Bight Track) that passes through Pt 76 and part of Pt 101 from where it leaves Stockton Bight Track and traverses across Pt 101 and Pt 13 of DP 753192 to Lot 227 DP 1097995 (Lot 227) which provides access to Lot 218. Pt 101 and Pt 13 in DP 753192 are owned by members of the Towers family and Lot 227 is owned Worimi LALC. There is no current agreement with the owners of Pt 101 and Pt 13 in DP 753192 to access Lot 227 and Lot 218 via the approved access.

In addition, the approved route from Lot 227 onto Lot 218 would have resulted in a significant earthworks cutting through an elevated knoll within the mobile sand dunes that is now used as a viewing location as part of Worimi Sand Dune Adventures. As a result access into western side of Lot 218 extraction area via Pt 101, Pt 13 and Lot 227 is no longer the preferred access.

The preferred alternate access to the Lot 218 extraction area is via Stockton Bight Track which was realigned (as shown on **Figure 1.2**) by Port Stephens Council to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192. The realignment of Stockton Bight Track was gazetted on 1 September 2011. Lot 2 DP 916061 and Lot 122 DP 753192 are owned by B & R B Mackenzie FT Pty Ltd.

The alternate access will be constructed with an 8 metre wide gravel pavement that will be constructed within the alignment of the Stockton Bight Track 20 metre wide easement and then over private land on Lot 2 DP 916061, Lot 122 DP 753192 and Lot 218. The most western 100 metres of Stockton Bight Track will be sealed as part of Mackas Sand upgrading and constructing of Stockton Bight Track. An additional 550 metres of Stockton Bight Track within Pt 76 DP 753192 will be sealed within six months of commencing haulage from Lot 218.

A truck turning bay and loading area approximately 30 metres by 30 metres in area will be constructed adjacent to the advancing face of the mobile dune system. Construction of the proposed access road (including the turning bay) will involve establishing a level surface that can sustain traffic by heavy vehicles. The level of activity required to do this will vary along the proposed access road depending on factors such as the type of vegetation present, previous disturbance (including the level of existing vegetation clearance), landform and slope angle. In general terms, these activities may include vegetation clearance, cutting and filling of areas to create a level surface and the introduction of road base (or similar) materials.

Two possible alignments (Route A and Route B as shown on **Figure 1.2**) for the access between Lot 122 and the approved extraction area on Lot 218 have been identified and assessed. Each route traverses along the southern boundary of Lot 2 and Lot 122 and

predominantly follows the alignment of an existing sand track. The entire southern boundary of Lot 122 has been identified as a PAD.

Route A deviates approximately 10 metres northward of the existing track near the western boundary of Lot 122 as shown on **Figure 1.2** and then crosses into Lot 218 approximately one third the way along the southern boundary of Lot 122.

The route deviates to the north along the western third of Lot 122 to avoid several clusters of ground orchids *Diuris praecox* and *Diuris arenaria* which are listed as vulnerable under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Threatened Species Conservation Act 1995* (TSC Act) respectively. From Lot 122, Route A then traverses across approximately 150 metres of Lot 218 to the approved extraction area. Vegetation along this 150 metre section comprises Swamp Mahogany – Paperbark and Coastal Sand Apple – Blackbutt forest communities and will result in the removal of approximately 0.51 hectares of these vegetation communities to provide for the access route and a small turning area for trucks adjacent to the mobile dune field. No *Diuris praecox* or *Diuris arenaria* were identified along or adjacent to Route A within Lot 218.

Trees and understorey along this alignment would be cleared and windrowed along the edge of the alignment. Geotextile will then be placed over the ground surface prior to sand fill and road base material being placed over the geotextile.

Adoption of Route A which is the preferred route, will mean that the alternate haul route will be constructed over only approximately 50% of the identified PAD along the southern boundary of Lot 122. Along this section it is proposed that geotextile will be laid over the ground surface and fill and road base material will be placed on top of the geotextile to minimise potential disturbance of any subsurface archaeological material that may exist along the road alignment.

Route B if adopted would follow the alignment of the existing track along the full length of the southern boundary of Lot 2 and Lot 122 and would require limited clearing of trees along the route. Field surveys undertaken during the September 2011 flowering period indicate that there are in excess of 250 *Diuris praecox* and approximately 50 *Diuris arenaria* located on the verges of the existing sand track and adjacent cleared land with the orchids showing a preference for the cleared areas along and adjacent to existing tracks. Approximately 30 to 50 of these plants would be removed if Route B was constructed. In addition Route B would be constructed over the full length of the identified PAD. If Route B was adopted the same construction techniques over the PAD will be used as for Route A.

### 2.1.1 Land Use and Tenure of Alternate Haul Route

Pt 76, Pt 101 and Pt 13 of DP 753192, as well as Lot 2 DP 916061 and Lot 122 DP 753192, are all zoned 1(a) Rural Agriculture. The realigned section of Stockton Bight Track over Pt 76, Pt 101 and Pt 13 of DP 753192 traverses through previously disturbed grassland around the Quality Sands and Ceramics sand quarry drying plant before rejoining the existing gazetted road in the vicinity of a crushed tile storage area (see **Figure 1.2**).

The alignment of the alternate haul road through Lot 2 DP 916061 and Lot 122 DP 753192 follows an existing sand track that runs roughly parallel to the southern boundaries of the land parcels. Lot 2 and Lot 122 are currently used for grazing purposes.

The alignment of the proposed access road and its proximity to the former public road reserve and surrounding land parcels is shown on **Figure 1.2**.

Lot 218 is currently vacant, however is currently used for recreational purposes including off-road and four-wheel driving, horse riding, walking, sand tours etc. Parts of the site have also previously been used as a bombing range and for weapons testing. Lot 218 is zoned 7(c) Environmental Protection – Water Catchment under the Port Stephens Local Environmental Plan (LEP).

The land capability and agricultural suitability of the study area has been mapped by DECC Scientific Services Division (2009) and was found to be very low. Lot 218 and the lots through which the proposed road will pass were classified as having a land capability of VII to VIII and an agricultural suitability classification of 5 and are therefore unsuitable for agriculture

### 2.1.2 Road Construction

The alternate haul road will be constructed by Mackas Sand to comply with the following requirements as set by Port Stephens Council in a letter to Mackas Sand dated 22 June 2011:

1. A Roads Act application form and the associated fees need to be submitted. The form can be downloaded from the following link.
   http://www.portstephens.nsw.gov.au/planning/159623/158676.html
   The fees are $21.40 per lineal metre of constructed public road.

2. The following plans; Engineering construction plans to rural standard. i.e. including long section, cross sections, plan view including any drainage crossing/details as well as the location in proximity to the road reserve and property boundaries. Any other items that may be relevant such as trucks turning signage, etc

3. Erosion and sediment control details

4. Details of the Pavement design – it is noted that the level of construction for haulage activity will be in excess of council's rural standard.

5. Geotech report on the suitability of the route.

6. REF (Review of Environmental Factors) prepared by a suitably qualified person/firm.

7. A copy of the Major Project consent noting any conditions that may be applicable to the haulage road.

8. From your previous letter it is noted that a batter slope of 3:1 was proposed however council advises that 4:1 is the minimum standard for safety and maintenance reasons.

9. The first 100 metres of the new road from Lavis Lane should be sealed to reduce dust and provide an adequate surface for braking.

It is expected that the alternate haul road will take approximately three months to construct.

### 2.1.3 Services

An electricity transmission line and associated easement is located to the north of the proposed alternate track. There are no other services known to occur within the study area.

## 2.2 Modification to Maximum Depth of Extraction

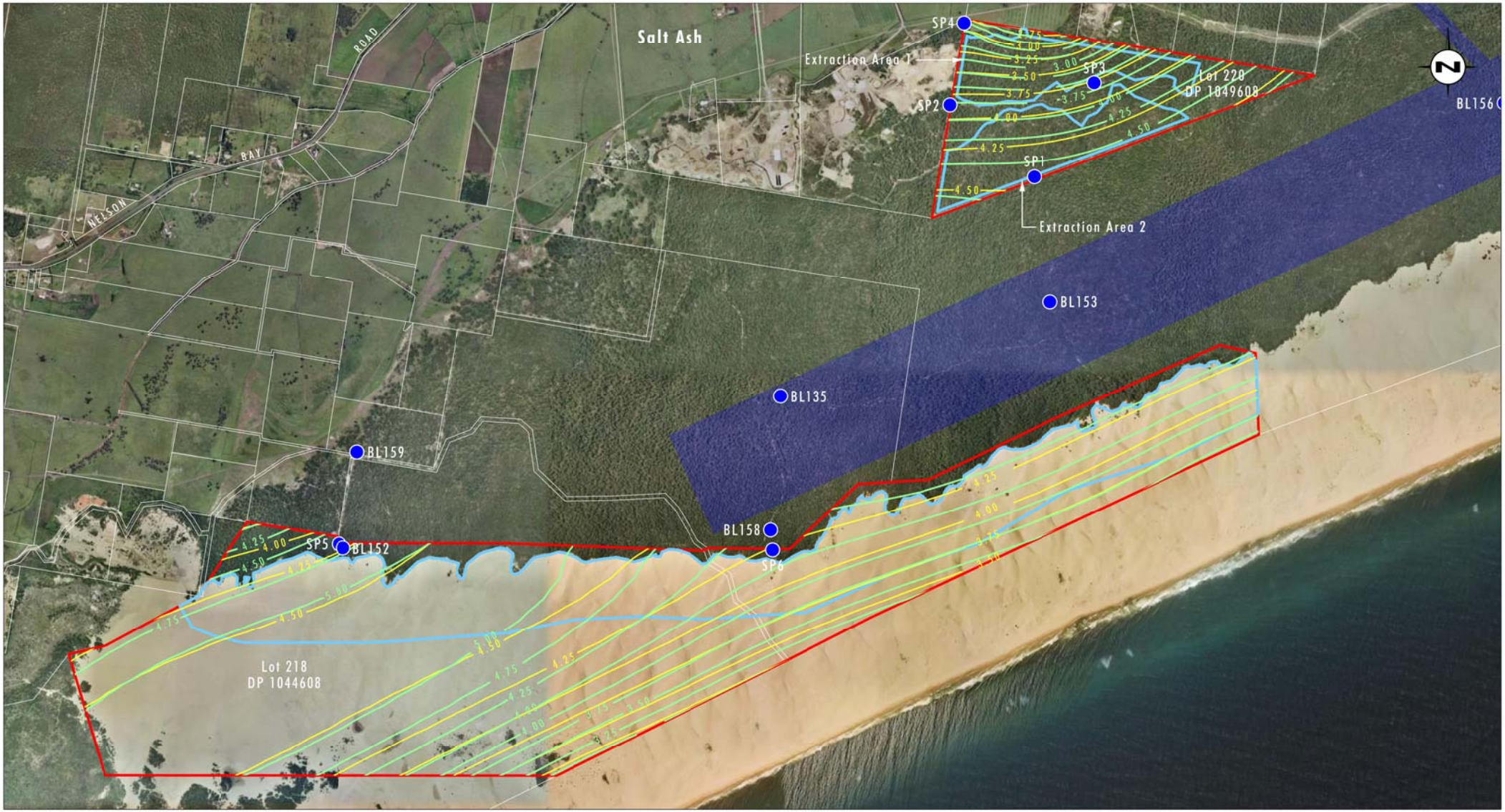
A detailed groundwater model (Umwelt, 2011c) has been developed for Lot 218 and Lot 220 and the surrounding areas of North Stockton Sand Beds. This model has been used to determine maximum permitted extraction depths for Lot 218 and Lot 220 as shown on **Figure 2.1**.

Major Project Approval 08_0142 permits extraction to a maximum depth not less than 1 metre above the highest predicted groundwater level and 2 metres above the average groundwater level. As can be seen from **Figure 2.1**, extraction depths across Lot 218 and Lot 220 permitted by these two criteria are similar, with the maximum predicted groundwater level determining the maximum extraction depth in most locations.

Approval is sought to lower the minimum extraction level in both Lot 218 and Lot 220 to being 0.7 metres above the maximum predicted groundwater level during extraction with the final landform being at least 1 metre higher than the maximum predicted groundwater level as is currently required.

This minor change in extraction depth is sought to improve the efficiency of extraction operations particularly in dry periods when the water table is well below its maximum predicted level. Efficiency is improved through increased trafficability of the exposed sand surface due to the greater moisture content increasing the stability and bearing capacity of the sand. The greater bearing capacity means that travel times, the amount of energy required to operate front-end loaders and dump trucks on the sand, and wear and tear, are significantly reduced.

In previous consultation in regard to maximum depths of extraction, NSW Office of Water (NOW) representatives have indicated that extraction to a depth 0.7 metres above the maximum predicted groundwater level may be accepted provided that the final landform for the site was reshaped to provide a minimum of 1 metre of sand above the maximum predicted groundwater level.




**Source:** Aerial: Google Earth 2008, Cadastral: Department of Lands, 2003

0 0.5 1 1.25km
1:25 000

**Legend**

- Lot Boundaries (218 & 220)
- Approved Extraction Area
- HWC Emergency Borefield Easement
- 2 metres above Average Groundwater Level
- 1 metre above Maximum Predicted Groundwater Level
- Groundwater Monitoring Bore Location

FIGURE 2.1

**Maximum Extraction Depth Map showing Minimum Final Landform Elevation for Lot 218 and Lot 220**

**File Name (A4):** R30_V1/1646_286.dgn

# 3.0 Planning Context

## 3.1 Commonwealth Legislation

### 3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires any action that has, or is likely to have, a significant impact on Commonwealth land or Matters of National Environmental Significance to obtain approval of the Commonwealth Minister for the Environment.

A search of the Commonwealth Government's Protected Matters Search Tool was undertaken on 24 May 2011 and did not identify any Matters of National Environmental Significance in relation to the proposal. The proposal will not affect any Commonwealth lands.

A discussion of impacts to actual and potential EPBC listed flora and fauna is included in **Section 4.3**. The proposed modification has been referred under the EPBC Act to DSEWPC.

### 3.1.2 Native Title Act 1993

The Commonwealth *Native Title Act 1993* provides for determinations of native title in Australia. The main objects of the Act are:

- to provide for the recognition and protection of Native Title;
- to establish ways in which future dealings affecting Native Title may proceed and to set standards for those dealings;
- to establish a mechanism for determining claims to Native Title; and
- to provide for, or permit that validation of past acts, and intermediate period acts, invalidated because of the existence of Native Title.

Native Title claims are investigated by the National Native Title Tribunal and determined by the Federal Court of Australia.

On 28 November 2005, it was determined that Native Title did not exist for an area that included Lots 218, 220 and 227.

## 3.2 New South Wales Legislation

### 3.2.1 Environmental Planning and Assessment Act 1979

The original proposal satisfied the definition of a Major Project under the State Environmental Planning Policy (Major Development) 2005 and approval was given in accordance with the requirements of the now repealed Part 3A of the EP&A Act. Modifications to projects approved under Part 3A that are outside the scope of the original approval are permitted with consent under Section 75W of the EP&A Act. The Minister for Planning and Infrastructure is the determining authority for modifications under Section 75W of the EP&A Act.

### 3.2.2 Aboriginal Land Rights Act 1983

Ownership of Lots 218, 220 and 227 and what is now the Worimi Conservation Lands have been transferred to Worimi LALC in accordance with the provisions of Section 36 of the *Aboriginal Land Rights Act 1983*. Clause 45(2) of the *Aboriginal Land Rights Act 1983* states:

> 45(2) Not withstanding any other Act, but subject to this section:
>
> (a) any transfer of lands to an Aboriginal Land Council under section 36 includes the transfer of mineral resources or other natural resources contained in those lands,
>
> (b) any vesting of the title to lands in an Aboriginal Land Council under Section 37 includes, subject to that section, the vesting of the title to the mineral resources or other natural resources contained in those lands.

Under the *Aboriginal Land Rights Act 1983*, consent is required from NSW Aboriginal Land Council for land dealings associated with the development. NSW Aboriginal Land Council issued a Dealing Approval Certificate on 11 October 2011 under Division 4 of Part 2 of the *Aboriginal Land Rights Act 1983* for Worimi LALC providing their consent to the proposed amendment to the access road for Major Project Approval 08_0142 for the purpose of sand extraction at Lot 218 in DP 1044608.

### 3.2.3 Other Legislation

**Table 3.1** discusses the application of other NSW legislation to the proposal.

**Table 3.1 – NSW Legislation**

| Legislation | Key Requirements | Relevance to the Proposal |
|---|---|---|
| *Heritage Act 1977* | Approval is required from the Heritage Council of NSW to disturb or excavate land where this will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. | No approval is required under this legislation for projects assessed under Part 3A of the EP&A Act. |
| *National Parks and Wildlife Act 1974* | Approval is required from DECC to knowingly destroy, deface or damage; or knowingly cause or permit the destruction of or damage to an Aboriginal object or Aboriginal Place. | No approval is required under this legislation for projects assessed under Part 3A of the EP&A Act. |
| *Native Vegetation Act 2003* | Approval is required under this Act from the relevant Catchment Management Authority to clear native vegetation in certain circumstances. | No approval is required under this legislation for projects assessed under Part 3A of the EP&A Act. |
| *Protection of the Environment Operations Act 1997* | Environment Protection Licences are required from OEH for 'scheduled activities' and 'scheduled development work'. | The sand extractive activities approved under Major Project Approval 08_0142 are subject to EPL 13218. No EPL will be required for the proposed modification to the approved project |
| *Roads Act 1993* | Development that affects a public road, Crown road, highway, main road, freeway or tollway requires approval from the NSW Roads and Traffic Authority or the local Council under this Act. | There are no works required on public roads located in the study area. No approval is required under this legislation. |

**Table 3.1 – NSW Legislation (cont)**

| Legislation | Key Requirements | Relevance to the Proposal |
|---|---|---|
| *Threatened Species Conservation Act 1995* | Approval is required to:<br>(a) harm any animal that is of, or is part of, a threatened species, population or ecological community;<br>(b) pick any plant that is of, or is part of, a threatened species, population or ecological community;<br>(c) damage critical habitat; or<br>(d) damage habitat of a threatened species, population or ecological community. | A comprehensive ecological assessment has been prepared for the proposed modification and is presented in **Appendix 3**. Impact assessments prepared for the proposal in accordance with this Act concluded that approval is not required under this legislation. |
| *Water Management Act 2003* | Approval is required to interfere with any groundwater sources contained in the Tomago, Tomaree and Stockton aquifers in accordance with the Water Sharing Plan for the Tomago-Tomaree-Stockton Groundwater Sources 2003, which was made in accordance with this legislation. | No approvals under the *Water Management Act 2003* are sought at this time. A water access licence may be sought in the future but will be the subject of a separate application. |

#### 3.2.3.1 Hunter Water (Special Areas) Regulation 1997

The Hunter Water (Special Areas) Regulation 1997 is a regulation under the *Hunter Water Act 1991* that applies to the Chichester, Grahamstown, Nelson Bay, North Stockton and Tomago Catchment Areas. The proposal lies within the North Stockton Catchment (or Special Area). Under Clause 13 of the Regulation a person can only engage in an extractive industry with an approval given by the Director-General of the Department of Infrastructure, Planning and Natural Resources (now NSW Office of Water).

A permit under Hunter Water (Special Areas) Regulation 1997 was granted on 18 November 2009 and an extension to this permit has been sought.

## 3.3 Local Planning Instruments

### 3.3.1 Port Stephens Local Environment Plan 2000

The proposal has been considered in accordance with the provisions of the Port Stephens Local Environmental Plan 2000. This plan sets the broad planning framework for development in Port Stephens. The proposed haul road modification is predominantly located within Zone 1(a) Rural Agriculture. The objective of this zone is to maintain the rural character of the area and to promote the efficient and sustainable utilisation of rural land and resources and regulate development for purposes other than agriculture, so that the development is compatible with rural land uses, the environment and the amenity of the locality.

The construction and use of this road is considered to be consistent with the objectives of the zone 1(a) Rural Agriculture.

### 3.3.2 Port Stephens Development Control Plan 2007

The Port Stephens Development Control Plan 2007 (the DCP) provides guidelines for development within the Port Stephens Local Government Area (LGA). Under Section 75R of the EP&A Act, the DCP does not apply to projects being assessed under Part 3A of that Act. However, Port Stephens Council has requested that consideration is given to the DCP in the EA. **Table 3.2** outlines relevant elements of the DCP and their relevance to the proposal.

**Table 3.2 – Port Stephens Development Control Plan 2007**

| Section | Relevant Requirement | Relevance to Proposal |
|---|---|---|
| B2.3 | *Development must comply with the provisions of Council's Urban Stormwater and Rural Water Quality Management Plan.* | The proposal is consistent with Port Stephens Council's Urban Stormwater and Rural Water Quality Management Plan. |
| B2.4 | *Development Applicants should refer to Port Stephens Local Environmental Plan 2000 section 51 A – Development of Land Identified on Acid Sulphate Soils for relevant development standards.* | The proposed alternate haul route will not involve any excavation or disturbance of potentially acid generating soils or lower the groundwater table in areas where potentially acid generating soils may occur. |
| B2.C14 | *Clearing must not be carried out as an activity in itself for an unspecified end-use. Clearing must only be considered where it is necessary to enable a land use permitted on the land.* | Clearing will be necessary to enable the proposed alternate haul route to be constructed. This is addressed in **Section 4.3**. |
| B2.C15 | *Development must provide filter and protection strip to natural drainage lines, watercourses, streams, foreshores of constructed drainage corridors, riparian habitat strips and exclusion zones for preserving vulnerable and/or significant remnant vegetation and species.* | A detailed Soil and Water Management Plan has been prepared setting out sediment and erosion controls that are to be implemented and maintained along the alternate haul route as discussed in **Section 4.9**. Potential impacts to biodiversity are discussed in **Section 4.3**. |
| B2.C16 | *Development near watercourses must provide riparian buffer up to 40 metres.* | There are no watercourses within 40 metres of the proposed alternate haul route. |
| B2.C18 | *Development must contain nutrient and sediment flows and minimise weed dispersal in non-urban zones or on sites adjoining remnant bushland or semi-natural open spaces using permanent mitigation measures (such as bund walls, catch drains, swales and settling ponds).* | Measures to prevent erosion and sediment transport are outlined in **Section 4.9**. |
| B2.C19 | *The proposed means of clearing must be appropriate to soil type, species of understorey or tree to be retained. Details must be provided with the development application.* | Clearing methods are detailed in **Section 4.3**. |
| B2.20 | *Erosion and sediment controls during and after construction should have minimal impact on watercourses and remnant bushland*. | The proposed erosion and sediment controls will not cause additional environmental impacts (refer to **Section 4.9**). |
| B2.C21 | *Development should reuse cleared material where possible.* | Cleared material will be re-used along the proposed alternate haul route and for rehabilitation of the site (refer to **Sections 4.9** and **4.10**). |

**Table 3.2 – Port Stephens Development Control Plan 2007 (cont)**

| Section | Relevant Requirement | Relevance to Proposal |
|---|---|---|
| B2.C23 | *Development must provide buffer zones as screening to roads for the protection of identified core habitats, koala habitat buffer area and Endangered Ecological Communities.* | The study area does not contain core koala habitat, koala habitat buffer areas or any Endangered Ecological Communities (refer to **Section 4.3**). |
| B2.C25 | *Development must provide temporary tree/vegetation protection measures prior to any clearing works.* | Clearing methods have been developed to minimise disturbance to fauna species (refer to **Section 4.3**). |
| B2.C26 | *All millable timber must be retrieved. Waste vegetation must be recycled as chip, tub grindings or mulch. The use of woodchip, topsoil and tub grindings for on site mulching or seedbank regeneration is preferred.* | All cleared timber will be retained for use along the proposed alternate haul route and in rehabilitation (refer to **Sections 4.3** and **4.10**). |
| B2.C27 | *Development must provide full time supervision of clearing works to protect environmental values.* | A Mackas Sand representative, and ecologist, and representatives of the Aboriginal Heritage Management Group will be present during clearing activities (refer to **Sections 4.3** and **4.4**). |
| B2.C28 | *Development must include rehabilitation or revegetation works for any areas adversely affected by clearing or construction works.* | The alternate haul route will be maintained as an access through and beyond the life of the quarry. Vegetated sections of the extraction areas will be rehabilitated in accordance with the approved Landscape Management Plan (refer to **Sections 4.3** and **4.10**). |
| B2.C29 | *Development must include effective measures to mitigate any potential adverse impacts from soil erosion, siltation of watercourses and alteration to drainage patterns, the spread of weeds, rubbish dumping and incursion by domestic or feral animals.* | Measures to mitigate potential erosion and sediment impacts are detailed in **Section 4.9.** Measures to mitigate potential biodiversity issues are detailed in **Section 4.2**. |
| B2.C30 | *A separate approval for vegetation clearance may be required from the Catchment Management Authority (CMA) in accordance with the Native Vegetation Act 2003. The applicant should consult with the CMA prior to lodging an application with Council.* | Approval is not required under the *Native Vegetation Act 2003* for projects being assessed under Section 75 W of the EP&A Act. |

**Table 3.2 – Port Stephens Development Control Plan 2007 (cont)**

| Section | Relevant Requirement | Relevance to Proposal |
|---|---|---|
| B2.C34 | *An application for development on sites that contain Preferred or Supplementary Habitat, Habitat Buffers and Habitat Linking Areas as identified in Port Stephens Comprehensive Koala Plan of Management must include:*<br>• *An assessment of koala habitat, by a suitably qualified person, in accordance with the Guidelines for Koala Habitat Assessment (Appendix 6 of the CKPoM);*<br>• *Clear details concerning which vegetation is to be cleared or disturbed and which is to be retained;*<br>• *Details of proposed building envelopes and fire fuel reduction zones and how they will be enforced;*<br>• *Proposed measures to restore koala habitat that will result in a net gain of habitat;*<br>• *Proposed measures to allow safe movement of koalas and measures to mitigate the impact from dogs that occupy the adjacent habitat;*<br>• *Details of any proposed program to monitor koalas and their habitat during and following construction; and*<br>• *Proposed measures to mitigate the impact of motor vehicles on koalas.* | An assessment of koala habitat was made during the ecological assessment of the study area (refer to **Section 4.3**). **Section 4.3** provides details of vegetation clearing and measures to mitigate impacts to fauna such as koalas. |
| B2.C44 | *During the construction phase development must provide:*<br>• *Controls to prevent the spread of weeds on machinery including a disposal and wash down area;*<br>• *An area for storage of contaminated spoil that is separate from clean material;*<br>• *Certification that any soil, mulch and plants brought onto the site is free of weeds and weed seeds; and*<br>• *Site inductions for all personnel and visitors that includes weed management practices as required by Council.* | The alignment of the alternate haul route is not substantially affected by weeds.<br>No soil, mulch or plants will be imported to the site as part of the proposed alternate haul route modification other than road-base and sub-base that will be free of weeds. |
| B2.C45 | *Tree removal must be in accordance with the provisions of the Port Stephens Tree Preservation Policy (1998).* | As the proposal is being considered under Part 3A of the EP&A Act, the policy does not apply. |
| B2.C46 | *Tree and vegetation removal must comply with the provisions of the Native Vegetation Act 2003.* | As the proposal is being considered under Part 3A of the EP&A Act, the Act does not apply. |
| B2.C51 | *Control run-off from site must comply with Hunter Water Corporation's Special Areas Regulation 1989.* | The proposal is consistent with the *Hunter Water Corporation (Special Areas) Regulation 1989* (refer to **Section 3.3.3.1**). |

## Table 3.2 – Port Stephens Development Control Plan 2007 (cont)

| Section | Relevant Requirement | Relevance to Proposal |
|---|---|---|
| B2.C71 | *Figure B2.3 Building Site Acceptability Based on ANEF* (Australian Noise Exposure Forecast) *Zones shows the acceptability of different types of development and their acceptability based on Australian Standard 2021-2000. It specifies the detail required to be submitted with development applications for each type of development. When a development application is received for a type of development that is not listed Council will exercise its discretion as to whether an acoustic report is required.*<br>*Where Figure B2.3 specifies that a development application is 'Conditionally Acceptable' an acoustic report must be submitted that is signed and endorsed by an acoustic engineer. The report must demonstrate that Australian Standard 2021-2000 has been considered in the design of the building and any proposed attenuation measures must be incorporated into the design and conditions of the consent.* | Small sections of Lot 218 are located in zones marked 20-25 ANEF and 25-30 ANEF on Figure B2.3 of the DCP.<br>The proposal does not involve any development for residential or accommodation purposes. The proposal is not consistent with any of the development types listed in Section B2 of the DCP, which relate to these types of development. It is considered unlikely that the proposal will be adversely affected by aircraft noise. |
| B2.C73 | *Erosion and sediment control measures for development works must be prepared in accordance with the Erosion and Sediment Control Regional Policy and Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom 2004).* | Any erosion and sediment controls will be prepared in accordance with the Erosion and Sediment Control Regional Policy (Port Stephens Council 2002) and Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom 2004) (refer to **Section 4.9**). |
| B3.C2 | *New development proposals, including the change of use or intensification of existing businesses, must provide the required number of parking spaces in accordance with* ***Schedule of Car Parking Requirements.*** *In the case of a combination of uses on a single site, the car parking requirements must be added together.* | The proposal is not consistent with any of the development types listed in the Schedule of Car Parking Requirements provided in the DCP. |
| B3.C4 | *Where the proposed development is not listed within the Schedule of Car Parking Requirements, Council must determine the required number of car parking spaces, by either:*<br>• *The applicant submitting a traffic report prepared by either a suitably qualified consultant to determine the required number of car parking spaces; or*<br>• *Council staff establishing a rationale to calculate the required number of car parking spaces.* | An assessment of traffic impacts was undertaken for the proposal (refer to **Section 4.6**).<br>External car parking has not been considered in the EA as the proposal will not affect existing car parking areas or require the construction of additional car parking spaces. |

# 4.0 Environmental Assessment

## 4.1 Relevant Previous Work and Conditions

Potential environmental impacts of extractive operations on Lot 218 were addressed as part of the EA (Umwelt, 2009a) that accompanied Major Project Approval application 08_0142 to the Minister for Planning. Through the review and submission process, appropriate environmental controls were refined with these controls set out in approval conditions granted on 20 September 2009, licence conditions and Statement of Commitments from the proponent, Mackas Sand.

Since that time an Environmental Management Strategy (Umwelt, 2011a) and a number of reports, management plans and monitoring programs have been prepared and submitted to relevant government agencies. These include:

- Maximum Extraction Depth Map;
- Groundwater Monitoring Report;
- Soil and Water Management Plan;
- Landscape Management Plan;
    - Biodiversity Monitoring program;
    - Weed Management Plan;
    - Rehabilitation and Decommissioning Plan;
- Archaeology and Cultural Heritage Management Plan;
- Non-Indigenous Heritage Management Plan;
- Noise Management Plan;
- Summer and Winter Noise Monitoring Programs;
- Air Quality Monitoring Program;
- Unexploded Ordnance Management Plan; and
- Annual Environmental Management Report.

Extraction operations at Lot 220 and environmental performance are discussed in detail in the Annual Environmental Management Report (AEMR) (Umwelt, 2011b). The AEMR includes:

- details of production levels since operations commenced;
- description of operations that have been undertaken and are proposed for the next 12 months;
- results and analysis of dust, noise and groundwater monitoring undertaken;

- records of complaints (none received); and
- performance of Mackas Sand Lot 220 operations against relevant approval and licence conditions.

Each of the above reports, management plans and monitoring programs are available on Mackas Sand website (www.mackassand.com.au.com). These reports detail the current status of sand extraction operations under Major Project Approval 08_0142.

Prior to lodging this modification application, there had been no extractive operations undertaken at Lot 218. Mobile sand within the approved extraction area has continued to move landward since 2009 with groundwater monitoring bore SP6 which was located approximately 20 metres north of the advancing edge of the mobile dune being buried by several metres of windblown sand between February and March 2011. The rate of sand advancement means that surveying and pegging the landward boundary of the approved extraction area as required by approval conditions is not feasible. An alternative is to delineate the approved landward boundary of the mobile dunes using GPS as is approved for delineating the seaward boundary of the approved Lot 218 extraction area. The boundary and survey co-ordinates of the approved extraction area on Lot 218 are shown on **Figure 4.1**.

## 4.2 Environmental Risk Analysis

During the planning and consultation process for the proposed alternate haul route modification a preliminary risk analysis was undertaken. The following potential environmental impacts of constructing and using the alternate haul route were considered and have been addressed as part of the EA as noted:

- Ecology – This is assessed further in **Section 4.3**.
- Aboriginal Cultural Heritage – This is assessed further in **Section 4.4**.
- Historic Heritage – This is further assessed in **Section 4.5**.
- Traffic and Access – This is assessed further in **Section 4.6**.
- Noise – This is assessed further in **Section 4.7**.
- Air Quality – This is assessed further in **Section 4.8**.
- Water Resources – This is assessed further in **Section 4.9**.
- Rehabilitation – This is assessed further in **Section 4.10**.
- Surrounding Land Use – This is assessed further in **Section 4.11**.
- Unexploded Ordinances – This is assessed further in **Section 4.12**.
- Greenhouse Gas and Energy – This is assessed further in **Section 4.13**.
- Visual – No further assessment as there is no change to visual aspects of the development.
- Cumulative Impacts – This is assessed further in **Section 4.14**.

## TABLE OF MGA 94 GRID COORDINATES

MGA 94 COORDINATES ADOPTED FROM PM 16461 (EASTING 391 733.038 NORTHING 6 368 336.068 ZONE 56 CLASS A ORDER 1 CSF=0.999744)

| CADASTRAL BOUNDARY CORNERS | | | EXTRACTION AREA | | | EXTRACTION AREA | | | EXTRACTION AREA | | | EXTRACTION AREA | | | EXTRACTION AREA | | | EXTRACTION AREA | | | EXTRACTION AREA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING | POINT | EASTING | NORTHING |
| 1 | 394734.195 | 6367764.842 | EA1 | 395357.758 | 6368032.789 | EA35 | 396054.561 | 6368176.92 | EA69 | 396844.275 | 6368153.814 | EA103 | 398015.323 | 6368178.9 | EA137 | 398626.906 | 6368475.976 | EA171 | 399447.629 | 6368789.556 | EA205 | 400096.159 | 6369094.554 |
| 2 | 394905.168 | 6367803.93 | EA2 | 395377.434 | 6368084.454 | EA36 | 396067.755 | 6368198.705 | EA70 | 396885.18 | 6368197.385 | EA104 | 398041.713 | 6368176.92 | EA138 | 398656.595 | 6368485.879 | EA172 | 399483.915 | 6368803.42 | EA206 | 400115.291 | 6369085.972 |
| 3 | 395331.375 | 6368035.128 | EA3 | 395409.99 | 6368096.379 | EA37 | 396106.021 | 6368205.967 | EA71 | 396917.507 | 6368206.627 | EA105 | 398093.173 | 6368209.928 | EA139 | 398669.79 | 6368495.121 | EA173 | 399481.936 | 6368827.846 | EA207 | 400123.208 | 6369085.972 |
| 4 | 395351.264 | 6368032.141 | EA4 | 395429.782 | 6368079.875 | EA38 | 396155.502 | 6368217.85 | EA72 | 396957.751 | 6368213.229 | EA106 | 398136.056 | 6368229.073 | EA140 | 398692.881 | 6368478.617 | EA174 | 399479.297 | 6368835.768 | EA208 | 400133.764 | 6369091.254 |
| 5 | 395357.291 | 6368072.028 | EA5 | 395444.956 | 6368091.758 | EA39 | 396186.51 | 6368199.365 | EA73 | 396998.656 | 6368225.772 | EA107 | 398171.682 | 6368228.413 | EA141 | 398721.25 | 6368446.929 | EA175 | 399474.784 | 6368849.488 | EA209 | 400165.432 | 6369124.262 |
| 6 | 395564.838 | 6368367.582 | EA6 | 395444.956 | 6368108.922 | EA40 | 396199.045 | 6368170.978 | EA74 | 397040.879 | 6368219.17 | EA108 | 398191.475 | 6368236.995 | EA142 | 398736.424 | 6368450.89 | EA176 | 399476.691 | 6368869.608 | EA210 | 400167.744 | 6369126.714 |
| 7 | 395990.106 | 6368296.734 | EA7 | 395490.479 | 6368122.786 | EA41 | 396186.51 | 6368116.184 | EA75 | 397089.7 | 6368197.385 | EA109 | 398202.031 | 6368268.023 | EA143 | 398765.453 | 6368460.792 | EA177 | 399492.638 | 6368884.177 | EA211 | 400191.821 | 6369126.615 |
| 8 | 396001.207 | 6368266.911 | EA8 | 395506.312 | 6368124.106 | EA42 | 396193.107 | 6368080.535 | EA76 | 397118.07 | 6368179.56 | EA110 | 398227.101 | 6368299.711 | EA144 | 398777.328 | 6368476.636 | EA178 | 399516.038 | 6368890.942 | EA212 | 400213.505 | 6369119.875 |
| 9 | 396762.072 | 6368270.795 | EA9 | 395520.167 | 6368106.942 | EA43 | 396208.281 | 6368065.351 | EA77 | 397141.161 | 6368180.881 | EA111 | 398258.109 | 6368357.146 | EA145 | 398793.162 | 6368511.625 | EA179 | 399544.612 | 6368879.339 | EA213 | 400224.292 | 6369110.771 |
| 10 | 396873.034 | 6368280.382 | EA10 | 395517.528 | 6368071.292 | EA44 | 396234.011 | 6368075.914 | EA78 | 397197.239 | 6368192.764 | EA112 | 398266.686 | 6368378.171 | EA146 | 398810.975 | 6368530.77 | EA180 | 399564.404 | 6368875.378 | EA214 | 400230.133 | 6368956.578 |
| 11 | 398396.648 | 6368524.676 | EA11 | 395532.806 | 6368059.409 | EA45 | 396240.609 | 6368084.496 | EA79 | 397269.151 | 6368201.346 | EA113 | 398293.075 | 6368385.533 | EA147 | 398828.129 | 6368531.43 | EA181 | 399594.752 | 6368887.261 | EA215 | 400233.725 | 6368861.722 |
| 12 | 398723.349 | 6368539.25 | EA12 | 395547.217 | 6368069.312 | EA46 | 396259.082 | 6368112.883 | EA80 | 397317.972 | 6368191.443 | EA114 | 398309.569 | 6368416.561 | EA148 | 398851.22 | 6368532.09 | EA182 | 399611.906 | 6368911.688 | EA216 | 400233.725 | 6368861.722 |
| 13 | 400080.553 | 6369157.962 | EA13 | 395551.835 | 6368078.554 | EA47 | 396279.534 | 6368110.242 | EA81 | 397346.341 | 6368180.22 | EA115 | 398324.743 | 6368435.046 | EA149 | 398878.269 | 6368563.779 | EA183 | 399624.441 | 6368901.785 | EA217 | 399875.417 | 6368679.276 |
| 14 | 400244.775 | 6369118.973 | EA14 | 395551.175 | 6368089.777 | EA48 | 396304.604 | 6368136.649 | EA82 | 397376.03 | 6368187.482 | EA116 | 398335.959 | 6368423.163 | EA150 | 398876.95 | 6368579.623 | EA184 | 399648.192 | 6368905.086 | EA218 | 399353.09 | 6368509.332 |
| 15 | 400251.921 | 6368741.12 | EA15 | 395552.495 | 6368100.34 | EA49 | 396348.807 | 6368178.9 | EA83 | 397450.581 | 6368215.869 | EA117 | 398343.216 | 6368407.318 | EA151 | 398919.173 | 6368605.369 | EA185 | 399661.387 | 6368893.203 | EA219 | 398946.124 | 6368265.639 |
| 16 | 398447.046 | 6367932.082 | EA16 | 395552.495 | 6368110.903 | EA50 | 396400.267 | 6368199.365 | EA84 | 397449.921 | 6368203.986 | EA118 | 398350.473 | 6368407.979 | EA152 | 398947.542 | 6368628.475 | EA186 | 399685.137 | 6368893.203 | EA220 | 398555.181 | 6368130.967 |
| 17 | 396989.191 | 6367205.222 | EA17 | 395573.606 | 6368109.582 | EA51 | 396451.727 | 6368195.404 | EA85 | 397470.373 | 6368205.967 | EA119 | 398357.071 | 6368434.385 | EA153 | 398959.418 | 6368616.592 | EA187 | 399694.374 | 6368914.328 | EA221 | 398151.419 | 6367948.198 |
| 18 | 394903.865 | 6367205.222 | EA18 | 395567.009 | 6368091.758 | EA52 | 396505.826 | 6368183.521 | EA86 | 397480.27 | 6368227.753 | EA120 | 398385.44 | 6368456.831 | EA154 | 398975.252 | 6368626.495 | EA188 | 399717.465 | 6368951.958 | EA222 | 397673.956 | 6367916.133 |
| 19 | 397693.495 | 6368242.102 | EA19 | 395567.009 | 6368072.613 | EA53 | 396542.772 | 6368173.619 | EA87 | 397509.594 | 6368237.91 | EA121 | 398387.419 | 6368470.095 | EA155 | 398991.745 | 6368644.979 | EA189 | 399743.195 | 6368958.56 | EA223 | 397379.146 | 6367928.959 |
| 20 | 397693.943 | 6368241.678 | EA20 | 395577.565 | 6368064.031 | EA54 | 396532.876 | 6368145.892 | EA88 | 397533.407 | 6368237.019 | EA122 | 398405.232 | 6368489.179 | EA156 | 399006.659 | 6368657.365 | EA190 | 399768.265 | 6368973.743 | EA224 | 397068.313 | 6367912.926 |
| 21 | 397719.056 | 6368184.56 | EA21 | 395590.1 | 6368071.292 | EA55 | 396534.855 | 6368130.048 | EA89 | 397562.078 | 6368233.034 | EA123 | 398413.809 | 6368473.996 | EA157 | 399034.263 | 6368672.238 | EA191 | 399782.78 | 6369004.111 | EA225 | 396763.89 | 6367852.003 |
| 22 | 397800.631 | 6368135.319 | EA22 | 395597.357 | 6368093.078 | EA56 | 396545.411 | 6368106.942 | EA90 | 397607.6 | 6368216.53 | EA124 | 398437.56 | 6368468.714 | EA158 | 399060.956 | 6368684.987 | EA192 | 399801.912 | 6369008.732 | EA226 | 396251.177 | 6367813.525 |
| 23 | 397832.11 | 6368024.689 | EA23 | 395593.399 | 6368105.621 | EA57 | 396562.564 | 6368103.641 | EA91 | 397636.629 | 6368194.084 | EA125 | 398477.144 | 6368501.062 | EA159 | 399085.526 | 6368693.486 | EA193 | 399836.879 | 6369019.295 | EA227 | 396119.794 | 6367807.112 |
| 24 | 397930.131 | 6367938.475 | EA24 | 395593.399 | 6368128.727 | EA58 | 396570.481 | 6368136.649 | EA92 | 397664.998 | 6368170.978 | EA126 | 398499.576 | 6368506.344 | EA160 | 399105.221 | 6368699.113 | EA194 | 399872.505 | 6369054.944 | EA228 | 395661.557 | 6367807.112 |
| 25 | 397978.512 | 6367849.305 | EA25 | 395627.706 | 6368141.27 | EA59 | 396582.357 | 6368172.958 | EA93 | 397691.388 | 6368175.599 | EA127 | 398513.43 | 6368498.422 | EA161 | 399150.744 | 6368701.754 | EA195 | 399884.639 | 6369063.994 | EA229 | 395546.197 | 6367807.112 |
| 26 | 398064.416 | 6367741.31 | EA26 | 395705.555 | 6368178.24 | EA60 | 396639.754 | 6368218.51 | EA94 | 397720.417 | 6368212.569 | EA128 | 398518.708 | 6368471.355 | EA162 | 399192.308 | 6368718.258 | EA196 | 399914.279 | 6369077.349 | EA230 | 395421.428 | 6367836.365 |
| 27 | 398046.015 | 6367732.135 | EA27 | 395773.509 | 6368196.725 | EA61 | 396718.924 | 6368243.597 | EA95 | 397744.168 | 6368216.53 | EA129 | 398511.451 | 6368443.628 | EA163 | 399226.615 | 6368736.083 | EA197 | 399933.201 | 6369082.671 | EA231 | 395422.887 | 6367834.566 |
| 28 | 397961.675 | 6367838.165 | EA28 | 395841.463 | 6368225.772 | EA62 | 396763.786 | 6368238.975 | EA96 | 397779.134 | 6368203.986 | EA130 | 398511.451 | 6368421.182 | EA164 | 399258.282 | 6368767.771 | EA198 | 399966.848 | 6369093.234 | EA232 | 395308.986 | 6367878.268 |
| 29 | 397914.161 | 6367925.737 | EA29 | 395888.305 | 6368204.647 | EA63 | 396791.496 | 6368218.51 | EA97 | 397816.739 | 6368201.346 | EA131 | 398527.945 | 6368404.678 | EA165 | 399287.971 | 6368790.877 | EA199 | 399990.599 | 6369083.332 | EA233 | 395252.115 | 6367978.088 |
| 30 | 397814.385 | 6368013.495 | EA30 | 395925.251 | 6368188.803 | EA64 | 396786.878 | 6368192.764 | EA98 | 397837.192 | 6368208.608 | EA132 | 398546.417 | 6368396.096 | EA166 | 399329.535 | 6368803.42 | EA200 | 400009.732 | 6369101.156 | EA234 | 395345.625 | 6368023.379 |
| 31 | 397783.455 | 6368122.195 | EA31 | 395950.981 | 6368186.822 | EA65 | 396780.94 | 6368153.153 | EA99 | 397855.664 | 6368203.326 | EA133 | 398560.932 | 6368400.717 | EA167 | 399373.078 | 6368812.002 | EA201 | 400033.483 | 6369107.758 | | | |
| 32 | 397703.208 | 6368170.634 | EA32 | 396007.059 | 6368200.025 | EA66 | 396784.239 | 6368132.028 | EA100 | 397878.756 | 6368186.822 | EA134 | 398575.446 | 6368414.58 | EA168 | 399400.787 | 6368830.487 | EA202 | 400053.935 | 6369097.855 | | | |
| 33 | 397677.17 | 6368229.857 | EA33 | 396014.108 | 6368197.385 | EA67 | 396796.114 | 6368123.446 | EA101 | 397915.701 | 6368184.181 | EA135 | 398584.023 | 6368448.909 | EA169 | 399403.426 | 6368801.439 | EA203 | 400056.574 | 6369082.671 | | | |
| 34 | 397663.227 | 6368243.034 | EA34 | 396040.706 | 6368180.881 | EA68 | 396819.865 | 6368129.387 | EA102 | 397959.904 | 6368196.064 | EA136 | 398598.537 | 6368473.996 | EA170 | 399423.878 | 6368782.955 | EA204 | 400077.026 | 6369089.933 | | | |

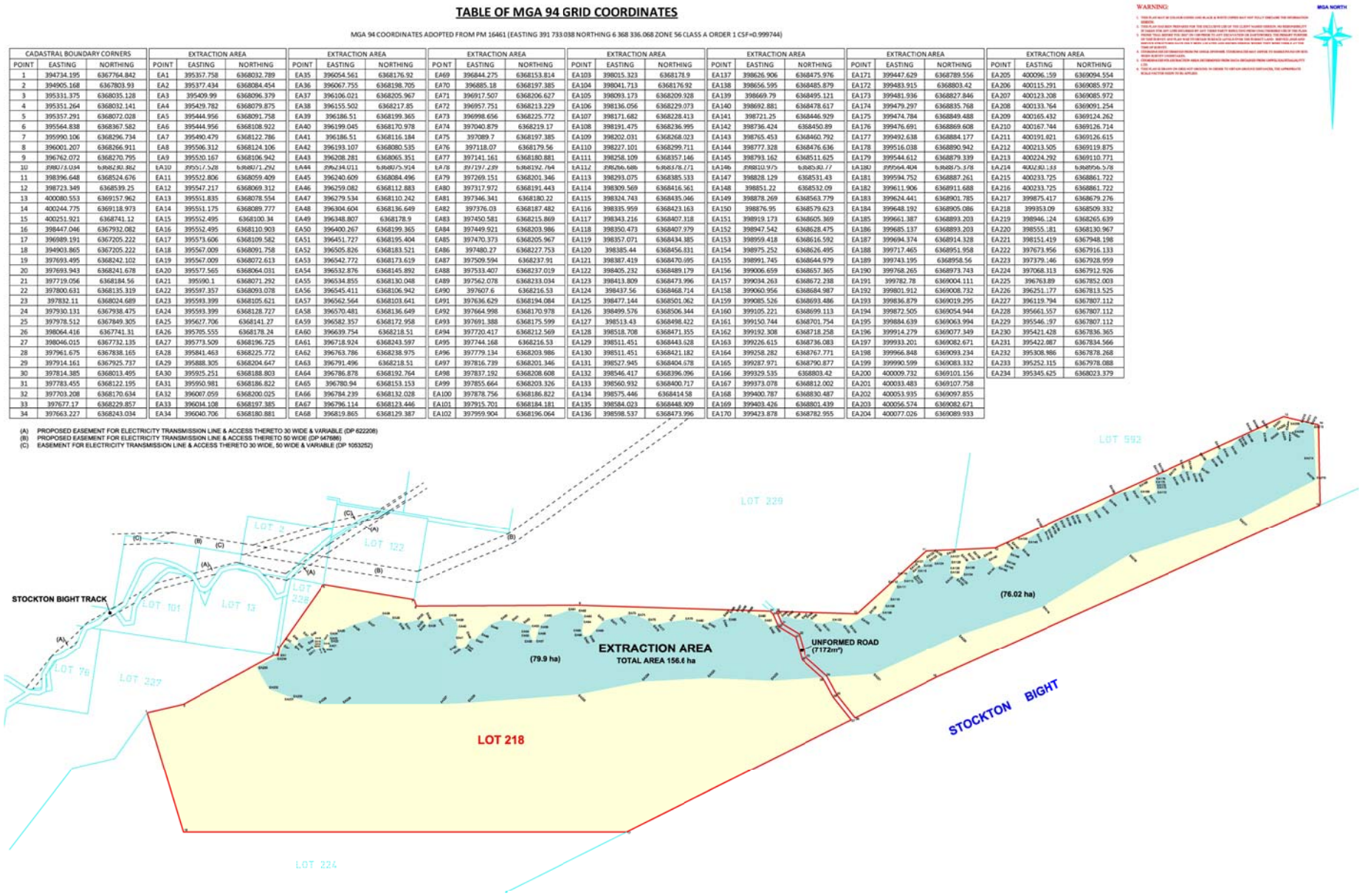



FIGURE 4.1

Lot 218 Extraction Area Boundary

Source: LE MOTTEE Group

File Name (A4): R30_V1/1646_293.dgn

# 4.3 Ecology

A detailed ecological assessment of the study area was prepared by Umwelt and is presented in **Appendix 3**.

The purpose of the assessment was to determine the existing natural environment and likely impacts of the proposal on the biodiversity of the area, in particular threatened species, populations and communities listed under the TSC Act and the EPBC Act.

As shown on **Figure 1.3**, the proposed development is located adjacent to the 4438 hectares of Worimi Conservation Lands and Worimi National Park, which contain similar and higher quality vegetation communities to those of the project area.

## 4.3.1 Flora

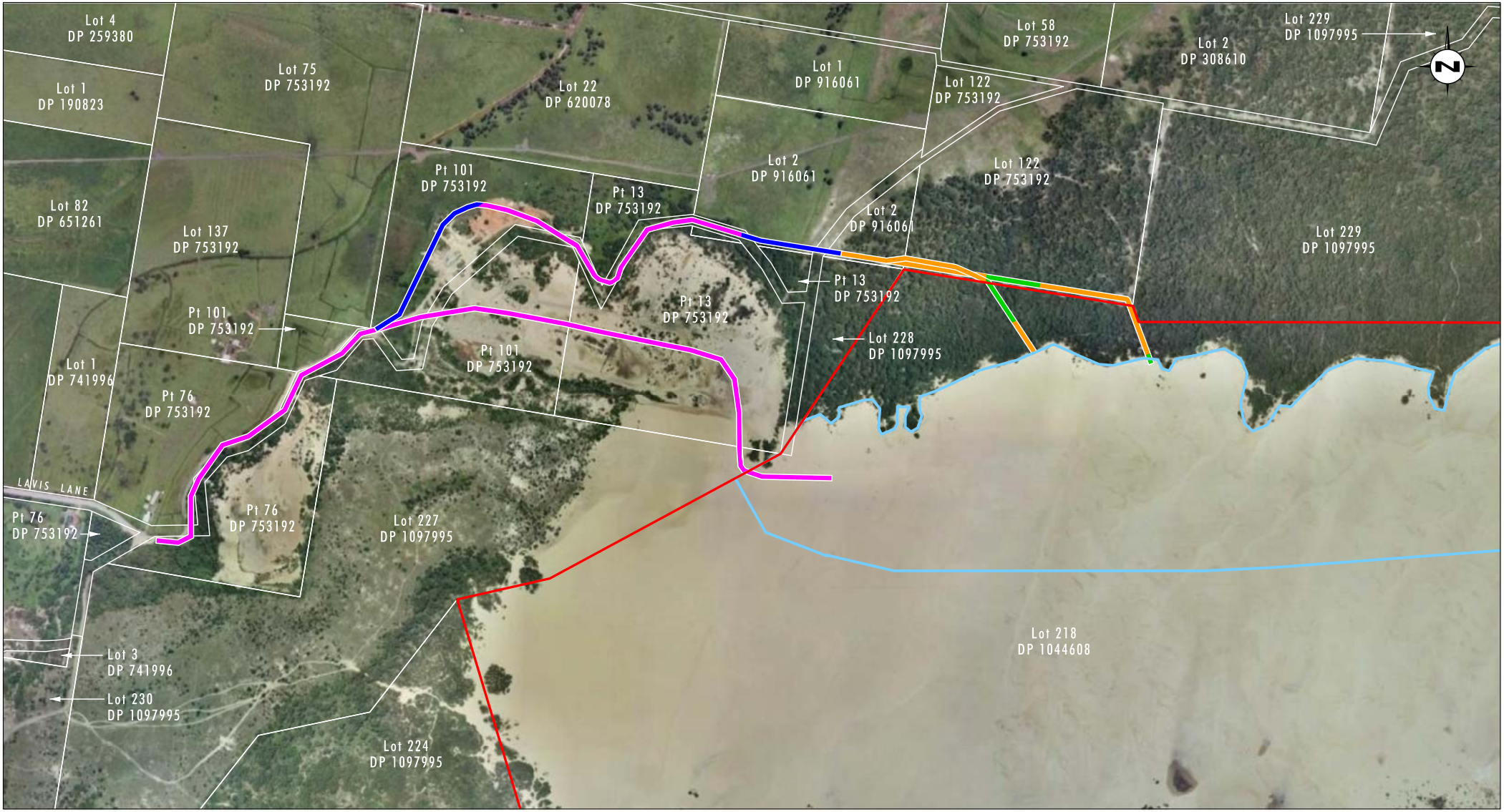
In total, 136 flora species were recorded within the study area, comprising 49 families. Of the 136 flora species recorded, 22 (16%) were introduced species. Three vegetation communities were recorded within the project area: Coastal Sand Apple – Blackbutt Forest, Swamp Mahogany – Paperbark Forest and Previously Disturbed Grassland. The distribution of these communities within the project area is shown in **Figure 4.2**. No vegetation occurs in the Lot 218 operational area.

An intergrade of *Angophora floribunda* and *Angophora inopina* was identified in the project area. Taking into consideration the Precautionary Principle, this species was assessed as the Charmhaven Apple (*Angophora inopina*) for the purpose of this report. *Angophora inopina* is listed as vulnerable under the TSC Act and threatened under the EPBC Act. The trees were found in the central area of Stockton Bight Track, where approximately 11 individuals were recorded (refer **Figure 4.3**). Further discussion of the Charmhaven Apple is included within **Section 4.3.3.1**.

In addition to the quadrat and rapid assessment plots that were completed, targeted orchid surveys were undertaken on 2 and 14 September 2011. These surveys consisted of meander transects undertaken on-foot targeting the threatened orchid species sand doubletail (*Diuris arenaria*) and rough doubletail (*Diuris praecox*). Any of these threatened orchid species identified in the field were way-pointed with a GPS in order to identify locations to be avoided and for mapping purposes.

The initial targeted orchid survey carried out on 2 September 2011 was undertaken along the alternate haul route within suitable habitat on Lot 2 DP 916061 and Lot 122 DP 753192 by an ecologist for an approximate two hour period (equating to two person hours of survey). This survey, which was undertaken during the flowering period, identified the presence of numerous threatened orchids that would be disturbed or removed by construction of the alternate haul route if it accessed Lot 218 from the south-eastern corner of Lot 122 DP 753192 (referred to as *Alternate Route B* on **Figure 4.3**).

An alternate alignment (referred to as *Alternate Route A* on **Figure 4.3**) was identified that would avoid disturbance of the majority of the identified orchids. A survey of Route A was carried out on 14 September 2011 by two ecologists (equating to a total of four person hours), and was undertaken in order to identify if there were any threatened orchid species along Route A.




**Source:** Aerial: Google Earth, 2008

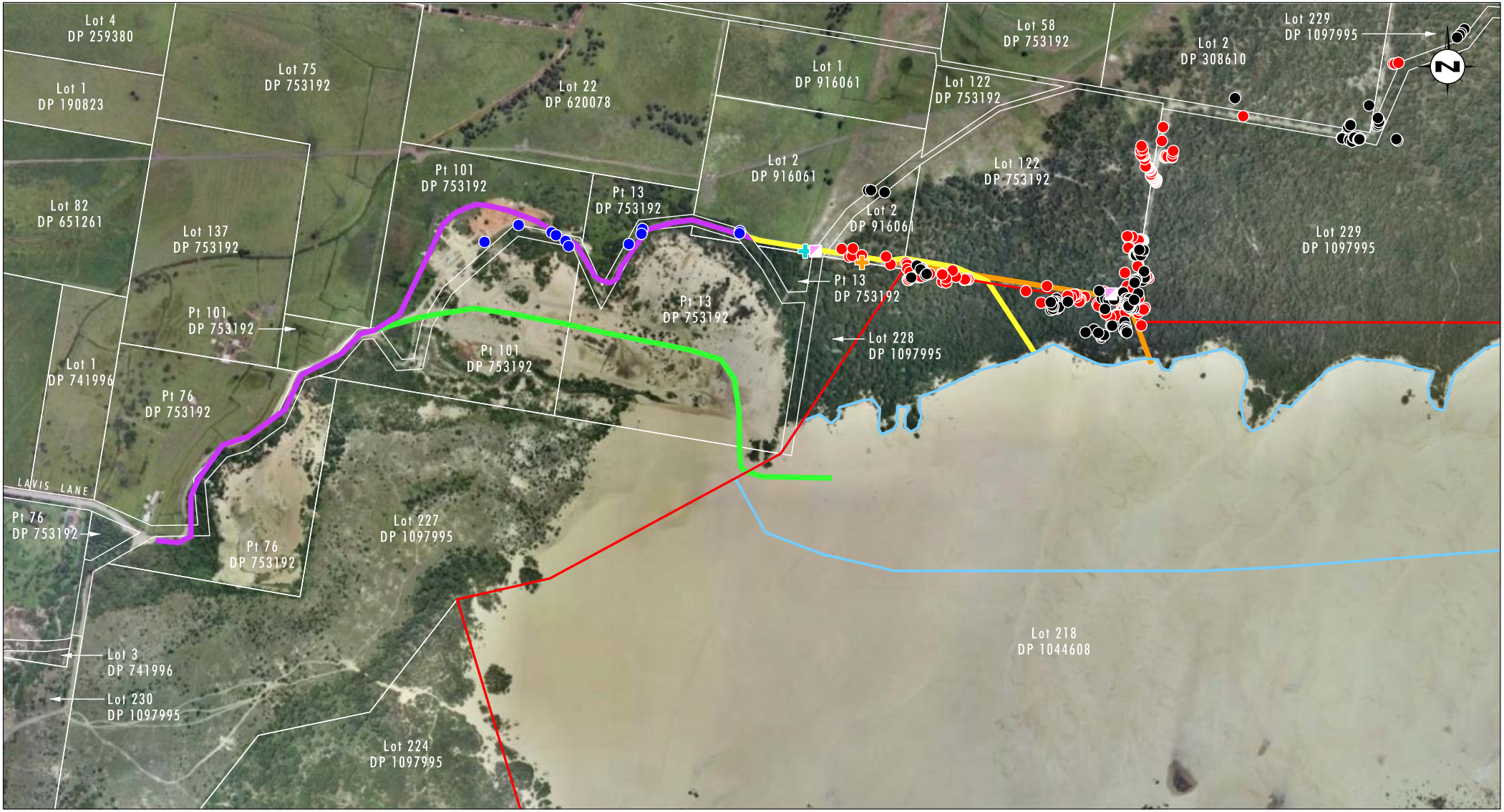
0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Coastal Sand Apple-Blackbutt Forest
- Swamp Mahogany-Paperbark Forest
- Previously Disturbed (Grassland)
- Previously Disturbed (Existing Track and Power Easement)

FIGURE 4.2

## Vegetation Communities




**Source:** Aerial: Google Earth, 2008

0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Stockton Bight Track
- Previously Approved Access Route
- Alternate Route A
- Alternate Route B
- Grey-headed Flying-fox
- Little Bentwing-bat
- Greater Broad-nosed Bat
- *Angophora floribunda/inopina*
- *Diuris arenaria*
- *Diuris praecox*

FIGURE 4.3

## Threatened Species

#### 4.3.1.1 Coastal Sand Apple – Blackbutt Forest

The Coastal Sand Apple – Blackbutt Forest occurs in the eastern parts of the project area covering 0.42 hectares within the preferred alternate haul route alignment but extends beyond this area. This community is characterised by a canopy stratum to 30% cover, up to 16 metres in height, dominated by blackbutt (*Eucalyptus pilularis*) and smooth-barked apple (*Angophora costata*). A sub-canopy layer is present and is dominated by old man banksia (*Banksia serrata*) and broom-heath (*Monotoca elliptica*). The sub-canopy typically has a canopy cover of 10% and a height of up to 10 metres.

The understorey stratum is mostly open (5% canopy cover) and dominated by Sydney golden wattle (*Acacia longifolia*), prickly Moses (*Acacia ulicifolia*), bossiaea (*Bossiaea rhombifolia*) and *Platysace lanceolata*. The ground cover is generally dense (to 50% canopy cover) consisting of common bracken fern (*Pteridium esculentum*), kangaroo grass (*Themeda australis*), blady grass (*Imperata cylindrica* var. *major*), raspwort (*Gonocarpus teucrioides*) and flax lily (*Dianella caerulea* var. *producta*). This community generally consists of a good succession of species in all strata.

The introduced plant species lantana (*Lantana camara*) and bitou bush (*Chrysanthemoides monilifera* subsp*. rotundata*) were the only dominant introduced species to occur in this community. Dense stands of both occur along the existing access track and at the base of the dunal system.

#### 4.3.1.2 Swamp Mahogany – Paperbark Forest

Approximately 0.09 hectares of Swamp Mahogany – Paperbark Forest occurs within the preferred alternate haul route alignment in a moist depression in the east of the alternate haul route, adjacent to Coastal Sand Apple – Blackbutt Forest. This community occurs in the lowest point of the alternate haul route in a location where the water table is high. The community has broader coverage outside the project area.

This vegetation community is characterised by a canopy stratum to 30% canopy cover, 15 metres in height, dominated by swamp mahogany (*Eucalyptus robusta*), broad-leaved paperbark (*Melaleuca quinquenervia*) and blackbutt (*Eucalyptus pilularis*).

The understorey is open (10-15% cover), to 8 metres in height, consisting of prickly tea-tree (*Leptospermum juniperinum*) and lemon-scented tea-tree (*Leptospermum polygalifolium*). The groundcover stratum is typically dense (60% canopy cover), and is dominated by *Juncus* spp., saw-sedge (*Gahnia clarkei*) and swamp water fern (*Blechnum indicum*).

#### 4.3.1.3 Previously Disturbed Grassland

A significant proportion of the alternate haul route comprises previously disturbed areas such as existing bitumen or dirt roads, as well as 1.25 hectares of previously disturbed grassland where all vegetation has been cleared for agricultural purposes, leaving only ground cover vegetation, typically less than 0.5 metres in height.

The derived grassland in most cases is dominated by introduced grasses such as paspalum (*Paspalum dilatatum*), kikuyu (*Pennisetum clandestinum*) and red Natal grass (*Melinis repens*). Introduced herbs were also common, including fireweed (*Senecio madagascariensis*), white clover (*Trifolium repens*), Paddy's lucerne (*Sida rhombifolia*) and cobbler's pegs (*Bidens pilosa*).

Native species were also recorded in the grassland, including common couch (*Cynodon dactylon*), slender rat's tail grass (*Sprorobolus creber*), and in areas subject to inundation

native species included *Juncus* sp., common reed (*Phragmites australis*) and broadleaf cumbungi (*Typha orientalis*).

#### 4.3.1.4 Threatened Flora Species and Endangered Populations

As described in **Section 4.3.1**, a stand of trees occurring along the alternate haul route has been determined to comprise trees being intergrades of *Angophora floribunda* and *Angophora inopina*, the latter being a threatened species listed as vulnerable under the TSC Act. This was confirmed by the Royal Botanic Gardens Sydney. Such hybrids are not technically required to be treated as the threatened species. However, for the purposes of this assessment, using the Precautionary Principle, the hybrid is treated as the threatened species, *Angophora inopina*. The locations of the *Angophora inopina* hybrids within or close to the project area are shown on **Figure 4.3**. The trees were found in or adjacent to the central area of the alternate haul route, where approximately 11 individuals were recorded.

Additionally, the sand doubletail (*Diuris arenaria*) which is listed under TSC Act and rough doubletail (*Diuris praecox*) which is listed under TSC and EPBC Acts were both identified during targeted field surveys. Approximately 250 individuals of *Diuris praecox* were identified, however only nine of these individuals were identified in or close to the route alignment of Route A. In addition, approximately 50 individuals of sand doubletail (*Diuris arenaria*) were identified during the targeted surveys; however none of these records are within the route alignment of the alternate haul route.

Although it was not identified during surveys of the Project Area, potential habitat was identified for the threatened leafless tongue-orchid (*Cryptostylis hunteriana*). Despite the absence of records, it should be noted that surveys were not undertaken during the flowering season of this orchid (November to January) and that despite the rarity of this species there was considered to be potential for this species to occur. The leafless tongue orchid (*Cryptostylis hunteriana*) is listed as a vulnerable species under the TSC Act and the EPBC Act.

No other threatened flora species or endangered flora populations were recorded along the alternate haul route.

A list of all threatened flora species recorded or regarded to have potential to occur within a 10 kilometre radius of the Project Area (based on database searches and literature review) is presented in **Appendix 3**. Of these, only Charmhaven apple (*Angophora inopina*), sand doubletail (*Diuris arenaria*), rough doubletail (*Diuris praecox*) and leafless tongue orchid (*Cryptostylis hunteriana*) were known to occur or found to have potential to occur in the Project Area.

### 4.3.2 Fauna

#### 4.3.2.1 Fauna Habitat

The project area provides foraging, roosting and nesting habitats for a variety of fauna species. Two broad habitat types were identified along the alternate haul route: open forest and previously disturbed/grassland. While the previously disturbed/grassland areas provide mostly foraging habitat value, the open forest areas provide a range of habitat niches for fauna species.

The canopy trees also provide foraging resources such as insects, nectar and foliage, for a wide variety of fauna including small and medium sized arboreal mammals, birds and reptiles. The swamp mahogany (*Eucalyptus robusta*) provides an important winter foraging

resource for a wide range of species, in particular migratory birds such as the swift parrot (*Lathamus discolor*) and regent honeyeater (*Anthochaera phrygia*).

The open, mid-stratum of the open forest habitat supports tea-trees and paperbarks, providing a good nectar resource for birds and arboreal mammals. These shrubs, combined with the dense ground stratum of grasses and sedges, also provide important cover and refuge for reptiles, small mammals and birds.

The Lower Hunter and Central Coast Regional Biodiversity Conservation Strategy (House, 2003) identified the Coastal Sand Apple – Blackbutt Forest occurring along the Stockton Bight dune system as regionally significant habitat and as a regionally significant habitat linkage.

#### 4.3.2.2 Koala Habitat

The project area supports potential habitat for the koala (*Phascolarctos cinereus*), in particular in the Coastal Sand Apple – Blackbutt Forest and the Swamp Mahogany – Paperbark Forest. No koalas were observed at this site.

#### 4.3.2.3 Animal Species

A total of 53 fauna species were recorded in the survey area during field surveys. These comprise 37 species of bird, 14 mammal, one reptile species and one amphibian species.

#### 4.3.2.4 Threatened and Endangered Animal Species

Three threatened fauna species were identified in the study area and an additional 16 threatened or endangered fauna species are considered to have potential habitat in the study area (refer to **Appendix 3**). No endangered fauna populations were identified in the study area and none are known to occur in adjacent areas. Threatened fauna species known or expected to occur in the study area include:

- little bentwing-bat (*Miniopterus australis*);
- grey-headed flying-fox (*Pteropus poliocephalus*);
- long-nosed potoroo (*Potorous tridactylus*);
- varied sittella (*Daphoenositta chrysoptera*);
- glossy black-cockatoo (*Calyptorhynchus lathami*);
- swift parrot (*Lathamus discolor*);
- regent honeyeater (*Anthochaera phrygia*);
- masked owl (*Tyto novaehollandiae*);
- powerful owl (*Ninox strenua*);
- brush-tailed phascogale (*Phascogale tapoatafa*);
- koala (*Phascolarctos cinereus*);
- eastern pygmy possum (*Cercatetus nanus*);

- squirrel glider (*Petaurus norfolcensis*);
- eastern freetail-bat (*Mormopterus norfolkensis*);
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- greater broad-nosed bat (*Scoteanax rueppellii*);
- yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*);
- large-eared pied-bat (*Chalinolobus dwyeri*); and
- spotted-tail quoll (*Dasyurus maculatus*).

#### 4.3.2.5 Migratory Species

Ten migratory species listed under the EPBC Act were recorded within the study area during surveys:

- welcome swallow (*Hirundo neoxena*);
- tree martin (*Hirundo nigricans*);
- silvereye (*Zosterops lateralis*);
- magpie-lark (*Grallina cyanoleuca*);
- spangled drongo (*Dicrurus bracteatus*);
- black-faced cuckoo-shrike (*Coracina novaehollandiae*);
- black-shouldered kite (*Elanus axillarus*);
- white-bellied sea-eagle (*Haliaeetus leucogaster*);
- whistling kite (*Haliastur sphenurus*); and
- swamp harrier (*Circus approximans*).

### 4.3.3 Potential Impacts

#### 4.3.3.1 Flora

Development of Lot 218 extraction area will not remove any vegetation or create any ecological impacts beyond the boundary of the operational area. The development of the proposed alternate haul route involves the disturbance of approximately 1 hectare of remnant native vegetation and approximately 1.25 hectares of previously disturbed grassland. As shown on **Figure 1.3**, there is similar and higher quality vegetation in the large expanse of vegetation extending along the Stockton dune system, which is contiguous with the project area. This includes the Worimi Conservation Lands and Worimi National Park.

Although the natural vegetation within the project disturbance area is of ecological significance (approximately 1 hectare), the small area of impact will not significantly reduce the area of any vegetation communities or affect floristic diversity on a local or regional scale.

Assessments of significance (in accordance with the EP&A Act and EPBC Act) prepared for Charmhaven apple hybrids (*Angophora inopina*) and rough doubletail (*Diuris praecox)* which occur along the alternate haul route alignment are included within **Appendix 3**. The proposal has been discussed with a DSEWPC representative and has been referred under the EPBC Act.

#### 4.3.3.2 Fauna

The project area covers 2.26 hectares, of which 1.0 hectare supports native vegetated habitat utilised by a known 52 fauna species and likely a wide variety of other species. These habitats provide known habitat for three threatened fauna species, and potential habitat for a further 16 threatened fauna species. As mentioned in **Section 4.3.3.1** above, there are similar and higher quality habitats in the large expanse of vegetation extending along the Stockton dune system, which is contiguous with the project area.

The habitats of the project area support a number of important ecological values. Nonetheless, they are widely represented and conserved in the local area and region and the removal of 1 hectare of these native habitats is not expected to be significant.

Assessments of significance (in accordance with the EP&A Act) prepared for the three recorded threatened fauna species and the 16 potentially occurring threatened fauna species (**Appendix 3**) determined that the proposed development would not have a significant impact on any threatened fauna species.

### 4.3.4 Proposed Management and Mitigation Measures

#### 4.3.4.1 Vegetation Clearance

The following mitigation measures are based on those developed for the EA Umwelt (2009a) for approved sand extraction operation (Major Project Approval 08_0142). The following sections describe the relevant mitigation measures, how they relate to the proposed development and how they should be integrated with the ecological management of the approved sand extraction operations.

Vegetation clearance will occur in accordance with the following procedures:

- Within the area of clearing, hollow-bearing trees (if any are identified) and other habitat structures such as stags, logs and stumps will be clearly marked by an appropriately qualified and experienced person to prevent accidental clearing.
- Vegetation surrounding the marked habitat structures will be cleared and the marked structures left undisturbed for a period of 24 hours.
- Marked hollow-bearing trees will be shaken prior to felling using a bulldozer and then left for a short period to allow any fauna using the hollows to be observed.
- Hollow-bearing trees will be slowly pushed over using a bulldozer, with care taken to avoid damage to hollows.
- Immediately following tree felling each of the identified hollows will be examined for fauna by a suitably qualified and experienced person.
- Where practical, felled trees will be left for a 24-hour period prior to removal in order to allow species to move in to adjoining vegetation of their own volition.

- Nocturnal species which do not immediately move into adjoining vegetation will be captured and kept in a warm, dark and quiet place prior to release within the same vegetation community from which it was captured at night.

- Captured nocturnal animals will be released on the evening of capture and will not be held for extended periods of time.

- Suitable hollows and other habitat structures (including logs, stumps and stags) appropriate for relocation to areas not intended for future development or for use in rehabilitation, will be selected by the appropriately qualified and experienced person.

- Hollows intended for re-erection will be removed and then capped with marine plywood or other suitable material.

- Logs, stumps, stags and hollows intended for ground habitat will be cut into sections, as required and stockpiled for use in rehabilitation.

- In the event that injured fauna are identified, species will be immediately taken to the nearest veterinarian or certified wildlife carer for treatment.

The timing of clearing operations will be designed to reduce the potential impact on breeding species, particularly the squirrel glider and threatened micro-bats. Clearing will (where possible) avoid the winter months when micro-bats and the eastern pygmy possum are in a state of torpor and squirrel gliders begin to breed.

Salvaged tree hollows and logs will be stockpiled and used in site rehabilitation. Once rehabilitation is structurally mature, salvaged tree hollows will be replaced in similar densities to those in unaffected vegetation on the site. Salvaged logs and branches will be spread following topsoil spreading to enhance ground fauna characteristics.

Nest boxes will be used in lieu of salvaged tree hollows if appropriate, as determined as part of the rehabilitation management of the site.

#### 4.3.4.2 Road Usage Rules for the Protection of Ecological Values

A number of threatened fauna species have potential to be injured or killed as a result of traffic on the proposed alternate haul route. The koala (*Phascolarctos cinereus*), brush-tailed phascogale (*Phascogale tapoatafa tapoatafa*) and the eastern pygmy possum (*Cercartetus nanus*) are examples of species that have potential to pass over the alternate haul route on the ground. Other fauna species such as kangaroos, wallabies and possums also have potential to be injured crossing this road.

Due to the potential risk of injury/death to fauna crossing the alternate haul route, it is appropriate to have road usage rules to minimise potential impacts on native fauna. The following road usage rules are proposed:

- enforce a 40 kilometre per hour maximum speed limit on the alternate haul route for all quarry traffic;

- minimise night traffic where possible (most fauna collisions are likely to occur at night time, in particular dusk and dawn);

- erect signage at either end of the alternate haul route to inform drivers of the ecological values of the habitats through which it passes and therefore the need to drive with caution; and

- leave tree canopies overhanging the track where safe and appropriate as this will allow some gliding species to cross without coming to the ground.

#### 4.3.4.3 Rehabilitation

It is intended that the section of Stockton Bight Track that is to be constructed as part of the alternate haul route which is a public road and the private haul road section will remain functional road at the end of the life of extraction operations on Lot 218. If however, the private haul road section is not to continue to be used on the completion of sand extraction works on Lot 218, the haul road will be rehabilitated in accordance with the rehabilitation principles outlined in the approved Landscape Management Plan (Umwelt, 2009d).

Broadly, rehabilitation of the private haul road, should it no longer be required will aim to re-establish the native vegetation communities that existed prior to clearing for its construction. Revegetation of disturbed areas will utilise locally occurring plant species in a composition that closely resembles that of the pre-development vegetation communities. Monitoring of any revegetated areas along the road access should be integrated with any monitoring program for the sand extraction areas.

#### 4.3.4.4 Biodiversity Offsetting Considerations

The vegetation present in the project area supports known and potential habitat for a number of threatened flora and fauna species. Although there are threatened species habitats present, the area of impact of the proposed development is relatively small (less than two hectares of remnant native vegetation) and the project area adjoins a very large remnant of vegetation which offers similar or higher quality habitats for the same threatened species, some of which are conserved in Worimi Conservation Lands and Worimi National Park. The project area does not comprise unique values or areas that are dissimilar to the surrounding coastal dune system. The proposed development will have very little impact on threatened species habitats in the locality and as such is not regarded to warrant the negotiation of any additional biodiversity offsetting areas.

Worimi LALC owns a significant area (4438 hectares) of native vegetation along the Stockton dune system which is managed for its conservation values. The Worimi Conservation Land includes the 524 hectare Worimi National Park. The dedication of the Conservation Land was part of an agreement to allow some parts of the Stockton sand dune system to be developed (including for sand extraction) while dedicating other areas to conservation. Establishment of the Worimi Conservation Land included consideration of biodiversity offsets for sand extraction operations on Lot 218 and Lot 220. As such, the Worimi Conservation Lands was agreed to form the biodiversity offsets for the approved 48 hectare vegetated sand extraction area on Lot 220 and sand extraction on Lot 218. Establishment of the Worimi Conservation Lands is also considered to be an appropriate offset for the development of the alternate haul route which will disturb less than two hectares of native vegetation.

## 4.4 Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Management Plan (ACHMP) for the extraction areas was completed in consultation with the relevant Aboriginal stakeholders and in accordance with Condition 29 of Major Project Approval 08_0142 (Umwelt, 2009c). The ACHMP was approved by the then Department of Planning on 9 November 2009. An Aboriginal Heritage Management Group (AHMG) was subsequently established in accordance with the ACHMP.

A comprehensive Aboriginal Cultural Heritage Assessment was undertaken for the proposal and is presented in **Appendix 4**. The assessment included:

- undertaking detailed consultation with relevant Aboriginal stakeholders in accordance with the DECCW *Interim Community Consultation Requirements for Applicants;*
- reviewing the environmental and archaeological context of the Stockton Bight region and the alternate haul route in order to develop a model with which to predict the likelihood that archaeological material;
- undertaking a survey of the alternate haul route in consultation with the relevant Aboriginal stakeholders;
- assessing the cultural heritage significance of the alternate haul route primarily based upon the scientific and Aboriginal cultural heritage;
- reviewing the impacts of the alternate haul route in relation to the archaeological assessment; and
- providing appropriate recommendations to manage and mitigate impacts to cultural heritage associated with the alternate haul route.

### 4.4.1 Environmental and Archaeological Context

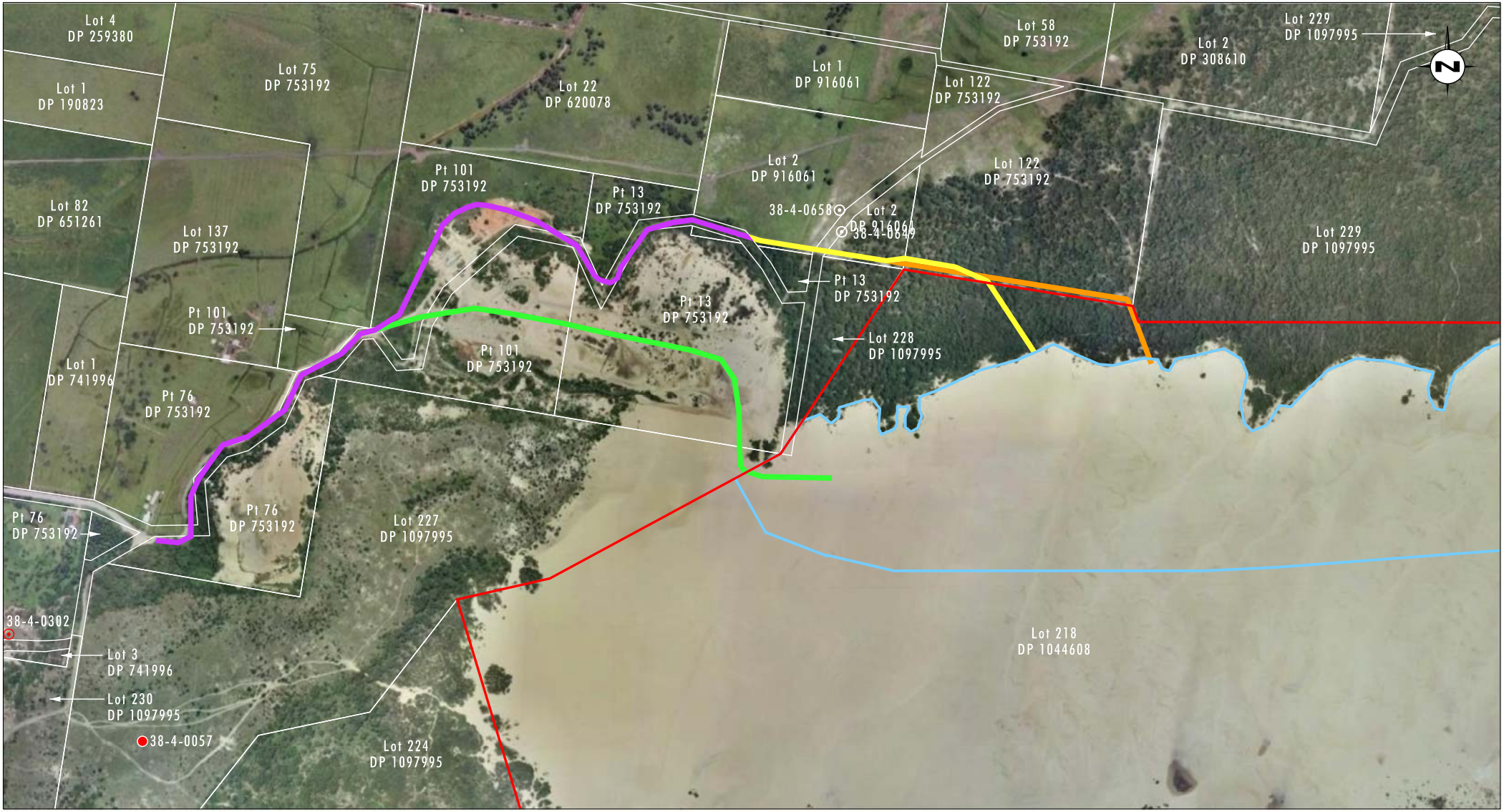
Environmental factors such as the availability of fresh water and other resources influence the choices people make about how they use the landscape and also affect the likelihood that archaeological evidence will be present and detectible. The alternate haul route is located at the interface between stabilised dunes of Holocene age and the inter-barrier depression. This area would have provided direct access to the swamp resources of the inter-barrier depression whilst also being within two kilometres of the current beachfront and marine resources. Furthermore, the Coastal Sand Apple – Blackbutt vegetation community that populated the dunes would have provided a very broad variety of animal and plant resources.

**Figure 4.4** identifies two sites located in proximity to the alternate haul route. Site A3 (AHIMS #38-4-0649) was originally recorded by ERM (2003) as a series of exposures containing stone artefacts and shell on an elevated area bordering the inter-barrier depression. ERM (2003) stated that it was not possible to determine the full extent of the site due to vegetation coverage.

### 4.4.2 Archaeological Surveys and Identified Sites

Archaeological field surveys were undertaken along transects of the alternate haul route on 29 March 2010, 21 May 2010 and 10 October 2011. A further on-site discussion in regard to proposed management measures was undertaken on 27 October 2011. The survey team included representatives of Worimi LALC, Mur-Roo-Ma Inc and Nur-Run-Gee Pty Limited. The alternate haul route was surveyed on foot with the exception of the sections of the alternate haul route that are located within the inter-barrier depression. Survey focused on areas with enhanced ground surface visibility associated with the site A3.

Five archaeological sites (including one previously identified site) were identified during the survey and are shown in **Figure 4.5**. In accordance with Section 91 of the *National Parks and Wildlife Act 1974*, OEH site cards have been submitted for all recorded sites.




Source: Aerial: Google Earth, 2008

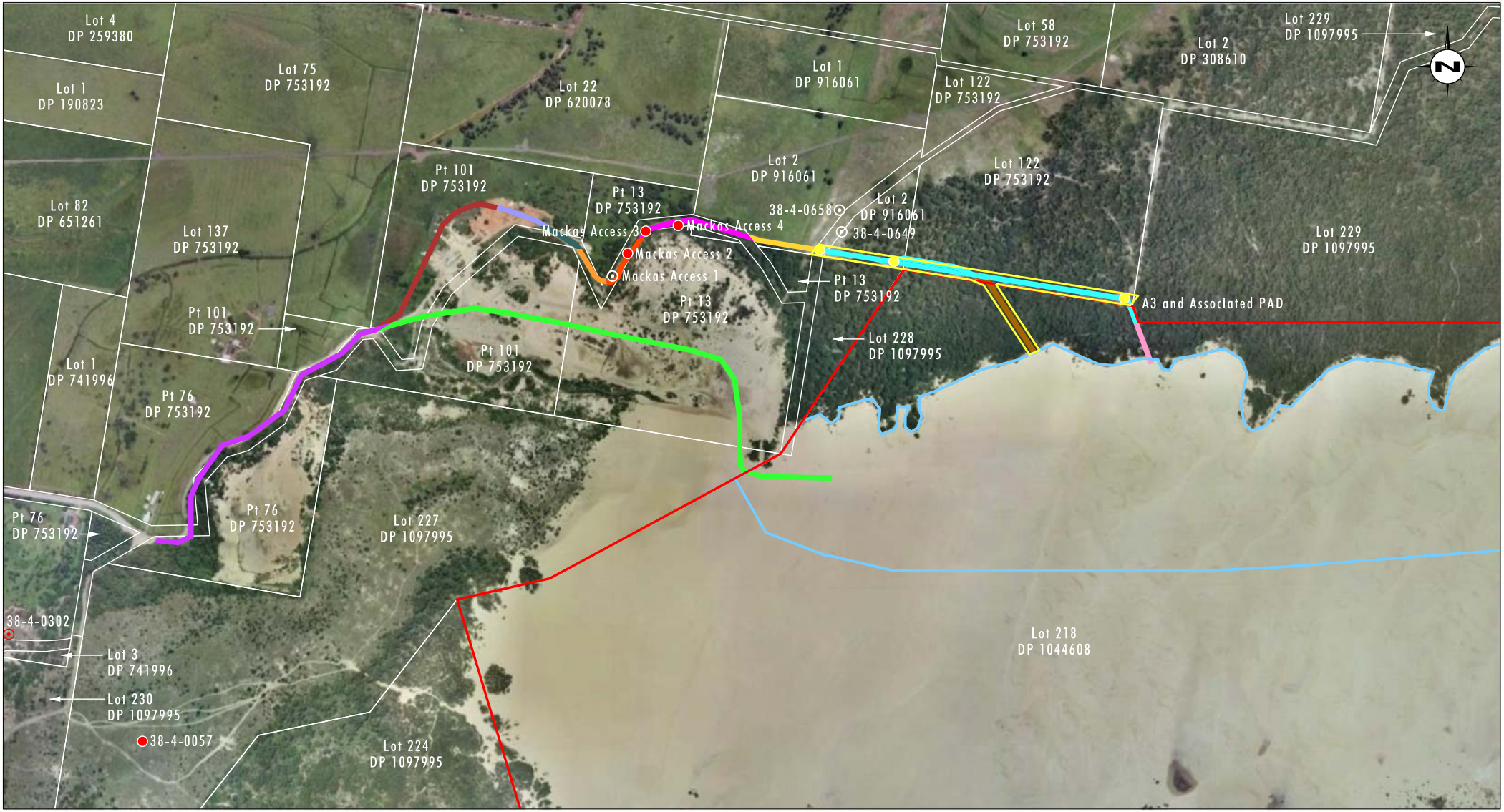
0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Stockton Bight Track
- Previously Approved Access Route
- Alternate Route A
- Alternate Route B
- Artefact Scatter
- Midden
- Midden / Artefact Scatter

FIGURE 4.4

Location of AHIMS Registered Sites




**Source:** Aerial: Google Earth, 2008

0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Stockton Bight Track
- Previously Approved Access Route
- Site Boundary A3
- Visible Midden Material within A3
- Artefact Scatter
- Midden
- Midden / Artefact Scatter
- Transect 1
- Transect 2
- Transect 3
- Transect 4a
- Transect 4b
- Transect 5
- Transect 6
- Transect 7
- Transect 8
- Transect 9

Transects 1, 4, 6 Not Formally Surveyed

FIGURE 4.5

**Survey Transects and Identified Sites**

#### 4.4.2.1 Mackas Access 1

Mackas Access 1 is located on an existing vehicle track adjoining an existing sand extraction area. The landscape surrounding Mackas Access 1 has been significantly modified in association with previous sand extraction activities and ongoing use of the vehicle track. Prior to these impacts, it is likely that Mackas Access 1 was located on a gently inclined lower dune slope that extended into the inter-barrier depression.

Surface artefact distribution within the site extends over approximately 20 metres by 1.5 metres (the width of the track). The site contains relatively high quantities of very fragmented and weathered pipi shell, with the highest density of shell fragments being confined to an area of approximately 75 centimetres by 50 centimetres. More sparsely distributed pipi fragments are present across an area of approximately 2 metres by 1.5 metres. Two loci containing stone artefacts were also present. Locus A contains seven flakes, two broken flakes, two cores and one flaked piece whilst Locus B contains a core and a flake. All stone artefacts have been manufactured from Nobbys Tuff. Exposed soils within the vehicle track consist of mid grey fine sand with frequent charcoal flecks and fragments. Introduced materials in the form of broken tile and road base are also present within the site and presumably have been introduced as a result of vehicle movements.

Visibility within the site area was excellent as a result of vehicle movements. Similar levels of visibility and exposure are present within the vehicle track that continues outside the area described above and no surface artefacts were present. However, this may reflect the rapid movement of sand and its potential to conceal sub-surface deposits. The remaining adjoining gently inclined dune slopes (where modification has not removed the original landform) have the potential to contain similar deposits in a sub-surface context and thus are mapped as part of the Mackas Access 1 site area.

#### 4.4.2.2 Mackas Access 2

Mackas Access 2 is located immediately adjacent to a vehicle track on a very steeply inclined dune slope. The track cuts into the toe of the dune slope and Mackas Access 2 is exposed approximately 3 metres from the track and approximately 20 metres from the inter-barrier depression. The artefacts are concentrated within an area of approximately 20 centimetres by 20 centimetres within which visibility was good. Visibility in the surrounding area was severely constrained by vegetation cover.

Mackas Access 2 contains a flake and a core, both made of Nobbys tuff. The core is a single platform core that has been manufactured from a large cobble of Nobbys tuff. Striations are also present on one surface of the core, indicating that it has been used for grinding.

Mackas Access 2 is located on the lower portion of a very steeply inclined dune slope and the possibility of the artefacts having moved down the slope as a result of colluvial processes was recognised in the field. An inspection of the adjoining higher section of dune slope and the crest of the dune revealed the presence of sparsely distributed shell fragments and an additional flake of Nobbys tuff within an area extending a maximum of 15 metres upslope from Mackas Access 2. This area was not inspected or recorded in detail. However, in view of the presence of similar artefacts upslope and the ongoing colluvial movement of material on this steep slope, it is considered likely that the artefacts within Mackas Access 2 originated from the crest of the dune and have been moved to their present location by natural processes. For this reason, it is considered that Mackas Access 2 is not directly associated with the access track.

#### 4.4.2.3 Mackas Access 3

Mackas Access 3 is located on a moderately inclined lower slope of a high dune adjoining an existing vehicle track. The artefacts identified at Mackas Access 3 are clustered in an exposure at the base of a small eucalypt. The landscape surrounding Mackas Access 3 has been significantly modified by the creation and ongoing use of the vehicle track, with the section of track adjoining Mackas Access 3 appearing to have been created by filling the toe of the dune slope where it formerly adjoined the inter-barrier depression, rather than being cut into the dune slope as in other areas.

Surface artefact distribution within the site is confined to an area of approximately 2 metres by 1.5 metres within the exposure surrounding the tree root. Artefacts within the exposure include a silcrete flake and a flake of fine-grained volcanic material. Four flakes and four broken flakes of Nobbys Tuff were also present.

Visibility within the adjoining sections of the moderately inclined lower dune slope was severely constrained by vegetation. However, based on the proximity of this landform to the inter-barrier depression, it is considered that additional artefacts may be present but are sub-surface or concealed by vegetation. For this reason, Mackas Access 3 is defined as extending along the moderately inclined lower dune slope within the inspected area.

#### 4.4.2.4 Mackas Access 4

Mackas Access 4 is located on a near level lower section of dune slope that forms a bench in an otherwise steeply inclined slope of a high dune bordering the inter-barrier depression. The existing access track cuts in beneath the bench and a power-pole is located towards the eastern end of the bench. There is no exposed rock or other material that would indicate that the bench is a natural formation and it is almost certainly the result of modifications associated with the power-pole. Two loci containing artefacts are present within the site. Locus A is an exposure of approximately 4 metres by 2 metres whilst Locus B is an exposure of approximately 2 metres by 2 metres at the base of the power pole.

Nine artefacts of Nobbys tuff (five broken flakes, three flakes and a broken backed artefact) are present within Locus A. In addition, a fragment of very heavily weathered long bone was also present. Locus B contains two flakes and one broken flake of Nobbys tuff and flaked piece of ignimbrite.

As discussed above, the site has been significantly disturbed as a result of access track and power-line construction. It is likely that the loci within the site have been exposed as a result of these activities. Visibility within the area surrounding Mackas Access 4 was low due to vegetation cover. However, based on the proximity of the lower dune slope to the inter-barrier depression, it is considered that additional artefacts may be present but not currently detectible. Mackas Access 4 is therefore defined as extending along this section of lower dune slope within the alternate haul route.

#### 4.4.2.5 A3 (AHIMS #38-4-0649)

As discussed in **Section 4.4.1**, previously recorded site A3 is present within the alternate haul route and was identified during the survey. Within the surveyed area, A3 consists of a low elevation dune finger extending into the inter-barrier depression and is closest to the inter-barrier depression within the western section of Transect 7 (see **Figure 4.5**).

The western extent of A3 consists of an area of exposure associated with an existing vehicle access track and that has been cleared of vegetation and used for grazing purposes. Grazing of the area by cattle has resulted in exposure of light to mid grey sand and has

inhibited vegetation regrowth, resulting in a high level of visibility. Locus A is largely defined by this area of visibility and exposure and contains a moderately dense scatter of fragmented pipi shell within an area of approximately 30 metres east-west by 30 metres north-south (width of the alternate haul route). Within Locus A the density of shell fragments averaged approximately five fragments per square metre but in some sections was as high as 30 to 40 fragments within a square metre. The dispersal and fragmentation of the shell has been significantly accelerated by the presence of cattle within the area. One stone artefact (a large fragment of broken sandstone with a ground surface) was present within this area. An additional fragment of pipi shell (Locus B) is also present approximately 100 metres east of Locus A.

Locus C is located within an area of vegetation clearance located on the eastern boundary of Lot 2 towards the end of Transect 7. It consists of a low density scatter of highly fragmented pipi shell within an area of approximately 20 metres east-west by 30 metres north-south (width of alternate haul route). Use of this area by vehicles and horses or cattle has resulted in similar conditions of exposure and visibility to those within Locus A.

Visibility within the low dune containing these three loci was relatively low due to vegetation coverage. In considering the potential for other artefactual material to be present but not visible within this context, it is necessary to consider the landform as a whole. Whilst the distance from this landform to the inter-barrier depression increases from west to east along the alternate haul route, the landform contains localised swales associated with *melaleuca* swamp and within which water would be periodically available at the surface and permanently (or near permanently) available just below the ground surface. Therefore, the entirety of this landform constitutes a level surface with ready access to fresh water and swamp resources. For this reason, A3 is mapped as extending across the entirety of this landform within the alternate haul route area. Based on previous recordings A3 also extends well outside the boundary of the alternate haul route along the interface between the dune and the inter-barrier depression however this was not inspected as part of the current survey.

### 4.4.3 Potential Archaeological Deposit

As discussed throughout the site descriptions provided above, the detection and identification of archaeological material is closely related to levels of exposure and visibility, that is, archaeological material that is obscured by vegetation or is beneath the ground surface will not be recorded during an archaeological survey. For the purposes of archaeological assessment and cultural heritage management, the likelihood that artefacts may be present below the ground surface has important archaeological and legislative implications for any proposed land use, hence the definitions of site boundaries provided above. In terms of the archaeological assessment, it is also necessary to consider whether any sites or areas with sub-surface archaeological material should be identified as potential archaeological deposit.

The term ‘potential archaeological deposit’ (PAD) can be defined in a number of different ways. However, the primary archaeological importance of sub-surface deposits is the possibility that they will provide information that can be used to interpret changes in the archaeological record through time and space. Consequently, for the purposes of this assessment, a landform or area will only be designated as a PAD if it meets one or more of the following criteria:

1. it should be likely that the PAD will contain enough archaeological material to allow for statistically viable detailed analysis and comparison of the artefact assemblage both within and between sites;

2. the PAD should not have been significantly disturbed and should retain a degree of archaeological integrity; and

3. it is predicted that the PAD should contain materials that can be dated, either in relative or absolute terms.

A relatively large proportion of the alternate haul route is located within the inter-barrier depression, a context that certainly would have been used by Aboriginal people but not for activities likely to generate detectable quantities of artefacts (such as camping, manufacturing stone artefacts and preparing and consuming meals). This portion of the alternate haul route does not constitute a PAD.

Within Transects 2, 3, 4a, 4b and 5 (see **Figure 4.5**), the alternate haul route incorporates an existing access track that has been constructed at the interface of the inter-barrier depression and varying inclination lower slopes of high dunes. The majority of these slopes are steeply to moderately inclined and would not be expected to be associated with large concentrations of artefacts. The relatively high degree of slope inclination also results in significant colluvial movement of soils (including any artefacts they may contain). Furthermore, disturbance associated with construction and on-going use of the existing vehicle track has significantly compromised the integrity of the area and is also likely to have impacted on the integrity of any sub-surface deposits that may be present in proximity to the existing access track. Transect 8 similarly consists of landforms not typically associated with large concentrations of artefacts, namely a moderately inclined dune slope and a depression. For this reason, no areas of PAD were identified in Transects 2, 3, 5 and 8 and there are no areas of PAD associated with sites Mackas Access 3 and 4. Mackas Access 2 is in a secondary context, with artefacts at this location likely to have originated from the dune crest rather than representing occupation of the steeply inclined dune slope by Aboriginal people. For this reason, there is no PAD associated with the portion of Mackas Access 2 within the alternate haul route. However, it is noted that, although these sites do not meet the formal criteria for a PAD, there is the potential that additional artefacts may be present in the dune slope above these sites.

In contrast, Mackas Access 1 is located in a modified area that previously is likely to have been a relatively gently inclined lower slope immediately adjoining the inter-barrier depression. Prior to disturbance, this area would have been suitable for occupation by Aboriginal people and evidence of this occupation (in the form of stone artefacts or shell) may exist below the depth of current disturbance. Consequently, Mackas Access 1 is considered as an artefact scatter with associated PAD.

A3 (comprising all of Transect 7) consists of a low dune with access to the inter-barrier depression at its eastern end and localised swales containing swamp resources along its length. With the exception of two areas affected by vegetation clearance and use by livestock, disturbance within the remainder of A3 is limited to the existing narrow access track. Previous excavations within sections of A3 outside the alternate haul route have demonstrated that this landform is associated with high density deposits of stone artefacts and shell and a probable hearth feature. The presence of scattered shell at three loci within the alternate haul route indicates that similar sub-surface deposits may be present within the alternate haul route section of A3. For these reasons, A3 is defined as a site that has both surface loci and PAD.

Transect 9 is located on a gently inclined dune slope immediately bordering a swamp located between the inter-barrier depression and coastal zone. Whilst this swamp is likely to be significantly more developed now due to the encroachment of mobile sands, this area would have been suitable for occupation by Aboriginal people and evidence of this occupation (in the form of stone artefacts or shell) may exist but is not currently visible. For this reason, Transect 9 is identified as a PAD, albeit with lower potential than A3.

### 4.4.4 Aboriginal Cultural Significance

Aboriginal cultural significance refers to the significance placed on cultural (and sometimes natural) heritage by Aboriginal people. It must be determined by Aboriginal people and refers to the value they place on a site, place or landscape.

A draft copy of the Aboriginal Cultural Heritage Assessment prepared for the proposal (refer to **Appendix 4**) was provided to all relevant Aboriginal stakeholders and it was requested that comment be provided regarding the Aboriginal cultural significance of the sites and areas of PAD within the study area, and on the significance of the proposal areas as a whole. Mur-Roo-Ma stated that the project area is of high significance to the local Aboriginal community. Aboriginal stakeholders have previously indicated that Stockton Bight is of very high Aboriginal cultural significance due to its social, spiritual, aesthetic and educational value to the Aboriginal community (ERM, 2006). The study area is therefore considered to have high Aboriginal cultural significance.

### 4.4.5 Archaeological Significance

In relation to the alternate haul route, the assessment of archaeological significance has two components: the archaeological significance of sites and PADs (if any) associated with the alternate haul route; and the archaeological significance of the landscape encompassed by the alternate haul route as a whole. The application of the archaeological significance criteria to sites and PADs is relatively straightforward however the assessment of the significance of the alternate haul route as a landscape warrants further discussion. A cultural landscape can be defined as the connection between Aboriginal heritage (including sites and features and their relationships) and the natural elements of the landscape such as landscape history, topography and flora and fauna. Using this approach, archaeological material comprises one element of a cultural landscape and the significance of this landscape may be separate from that of the sites or features that it contains (ERM, 2006:101).

#### 4.4.5.1 Mackas Access 2, 3 and 4

Mackas Access 2, 3 and 4 are small low density artefact scatters located on lower dune slopes bordering the inter-barrier depression. Based on the landform context of these sites it is considered likely that any additional archaeological material that may be present will also consist of relatively sparse low density stone artefacts and shell. These sites have been impacted by the construction and on-going use of an existing vehicle access track. In addition, Mackas Access 4 has been subject to significant modification in association with a power-pole located in the site, whilst the artefacts within Mackas Access 2 are likely to originate from the crest above the steeply inclined dune slope. As discussed in Umwelt (2009c), sites of this type with similar level of integrity and potential for additional sub-surface deposits are common within Stockton Bight. There is no evidence to directly connect these sites to any other sites in the surrounding area, except as part of a broader cultural landscape. Whilst these sites contain artefacts that are relatively rare within the local context (namely a backed artefact, a core of Nobbys tuff with pebble cortex and grinding striations, a flake of volcanic material that had possibly been ground and a fragment of long bone), artefacts of this type are already known from the archaeological record. Thus, Mackas Access 2, 3 and 4 have low archaeological significance in relation to rarity, representativeness, integrity, connectedness and overall research potential.

#### 4.4.5.2 Mackas Access 1

Mackas Access 1 is a small scatter of stone and shell present in a disturbed context that would formerly have been a landform type commonly associated with relatively high

concentrations of archaeological material in this locality. The surface artefacts within this site are relatively low in density and have been impacted by the construction and on-going use of the existing vehicle access track. However, it is not possible to determine the extent of sub-surface disturbance at the site and it is possible that sub-surface deposits of higher density or size may remain and may retain some integrity. Consequently, Mackas Access 1 has low archaeological significance in relation to rarity, representativeness and connectedness but moderate archaeological significance in relation to integrity and research potential. It therefore has low to moderate archaeological significance overall.

#### 4.4.5.3 Transect 9 PAD

The Transect 9 PAD does not contain any visible archaeological material. Therefore any assessment of its significance is based purely on potential. On the assumption that if this PAD contains archaeological material, it would be comparable to that found in the local area, the Transect 9 PAD has low archaeological significance in relation to rarity, representativeness and connectedness but moderate archaeological significance in relation to integrity and research potential. It therefore has low to moderate archaeological significance overall.

#### 4.4.5.4 A3

When viewed in its entirety, A3 is an extensive midden extending over a low elevation dune to the shoreline of the inter-barrier depression. Archaeological investigations within A3 approximately 500 metres to the north-east of the alternate haul route have resulted in the recovery of very high numbers of stone artefacts and large quantities of shell (predominantly pipi). Whilst the majority of A3 that is located within the alternate haul route is not directly adjacent to the shoreline of the inter-barrier depression, there are localised swales present along this low dune that would have provided a comparable resource base. It is therefore considered likely that the same potential for sub-surface deposits should be considered to apply to A3 (and the associated PAD) as a whole. Sites of this size with extensive deposits of high density shell and stone are not common within the local context and can contribute significantly to current understandings of how Aboriginal people used this area. The density of materials at this site indicates that it was used extensively for activities generally associated with camping such as the preparation of stone artefacts and the consumption of shellfish transported from the beachfront. In addition, the presence of a partial grindstone (in addition to the large grindstone previously salvaged from A3) indicates that Aboriginal people were processing plant materials in this area. Grinding of plant resources is an activity that is not commonly identified within the archaeological record in this area and one that suggests longer-term occupation of this area. This is further supported by the presence of a probable hearth identified in the section of A3 to the north-east of the alternate haul route. This raises the possibility that datable materials (such as a hearth) may also be present within the portion of the site associated with the alternate haul route. Disturbance within the section of A3 within the alternate haul route was limited to vegetation clearance and livestock activity at two locations and vegetation clearance along an existing vehicle track, with the portion of the A3 outside this track containing mature native vegetation. On these grounds, A3 is assessed as having moderate to high archaeological significance in relation to its rarity, representativeness, integrity, connectedness and overall research potential.

#### 4.4.5.5 Alternate Haul Route

The landscape associated with the alternate haul route is located at the interface between stabilised dunes of Holocene age and the inter-barrier depression, an area that would have been regularly utilised by Aboriginal people to access the rich resource base. Sections of the alternate haul route outside the existing access track and other areas of disturbance contain vegetation communities and associated resources very similar to those that would have been

present during periods associated with the deposition of cultural materials. Sections of the alternate haul route therefore provide a cultural landscape within which the landscape history, flora, fauna and archaeological material associated with this portion of Stockton Bight can be experienced as a whole. However, the remaining sections of the alternate haul route have been significantly impacted by previous disturbance activities. Consequently, the alternate haul route has low to moderate significance as a landscape.

### 4.4.6 Potential Impacts

The construction of the alternate haul route will require the establishment of a suitable level surface of approximately 8 metres in width along the length of the alternate haul route, with a turning bay of approximately 30 metres by 30 metres located in the area adjoining Lot 218 and an overall potential construction width of 10 metres. This will involve widening of the existing vehicle tracks (where present) to create a road that can sustain heavy traffic and considerable vegetation clearance to create the turning bay.

Where feasible (with reference to environmental constraints and construction requirements) the alternate haul route will be constructed by cutting and filling of areas to create a level surface adjoining the existing access track. This will require clearance of native vegetation and use of road base materials to create a stable surface.

In relation to site A3, the moderate to high level of significance of this site dictates that, where possible, every attempt should be made to mitigate impacts to this site. Consequently, Mackas Sand has indicated that except in areas where threatened orchids exist, the alternate haul route will extend from the existing fenceline in order to minimise the amount of additional vegetation clearance required. Furthermore, within A3, the alternate haul route will be constructed by laying geotextile material over the natural ground surface and introducing additional fill material over the geotextile to provide a suitable road surface. This will be done in a progressive fashion so that all heavy vehicle movement associated with road construction and subsequent use is confined to the area in which geotexile and fill have already been introduced. Consequently, it will not be necessary to undertake significant ground disturbance works within A3 and sub-surface deposits will be protected from impacts associated with construction and use of the alternate haul route. Given that Mackas Access 1 and the Transect 9 PAD have a moderate to low level of archaeological significance based on the potential for sub-surface deposits with some degree of integrity, Mackas Sand has indicated that the alternate haul route will be constructed using the low ground disturbance method described above within the area surrounding Mackas Access 1 and Transect 9.

Sites Mackas Access 2, 3 and 4 are located at the base of a steep to moderately inclined dune slope. In order for Mackas Sand to construct the alternate haul route within the designated easement, it will be necessary to cut the road into the dune slope containing these sites. This will involve impact to both the exposed artefacts within sites and the adjoining dune slope which was assessed as having the same potential to contain relatively low densities of additional cultural material. However, the cutting of the slope may also result in exposure of former stabilised soil surfaces at considerable depth.

### 4.4.7 Proposed Management and Mitigation Measures

#### 4.4.7.1 General Recommendations

1. Mackas Sand should ensure that its employees and contractors are aware that it is an offence under Section 90 of the *National Parks and Wildlife Act 1974* to knowingly impact an Aboriginal object without the consent of the Director-General of DECCW or

unless otherwise approved under Part 3A of the *Environmental Planning and Assessment Act 1979*.

2. If Project Approval 08_0142 is modified to incorporate the alternate haul route, the Mackas Sand ACHMP should also be modified to include the alternate haul route, with all recommendations included in this assessment to be incorporated into the revised ACHMP and the provisions of the ACHMP will apply to the alternate haul route.

3. All further investigations (surface collection, test excavation or salvage excavation) will be conducted in accordance with the approved methodologies provided in the Mackas Sand ACHMP (Umwelt, 2009c: Appendix 2).

4. Any Aboriginal objects (such as stone artefacts or shell fragments) salvaged will be subject to analysis and interpretation in accordance with the methodology provided in Section 5.10 of the Mackas Sand ACHMP (Umwelt, 2009c).

5. The arrangements for care and control of any salvaged Aboriginal objects will be as specified in Section 5.11 of the Mackas Sand ACHMP.

6. Should any unexpected sub-surface deposits (other than human skeletal material) be identified during construction and use of the alternate haul route, they will be managed in accordance with Section 5.8 of the Mackas Sand ACHMP (Umwelt, 2009c).

7. Should human/possible human skeletal material be identified during construction and use of the alternate haul route, it will be managed in accordance with Section 5.9 of the Mackas Sand ACHMP (Umwelt, 2009c).

#### 4.4.7.2 Mackas Access 2, 3 and 4

8. In consultation with the AHMG (as established under the Mackas Sand ACHMP), Mackas Sand should demarcate the road boundary prior to road construction and any surface artefacts within demarcated area should be collected in consultation with the AHMG.

9. Vegetation clearance within the dune slope bordering these sites will occur as a staged process in accordance with the following methodology:

    - understorey vegetation and all trees smaller than approximately 50 centimetres diameter at chest height will be removed by earth-moving equipment or similar and placed outside the newly cleared area so that all of the newly cleared area is visible. At this stage, the AHMG will be invited to undertake an inspection of the newly cleared area;
    - following the initial inspection, the remaining large trees will be cleared by machinery (in accordance with ecological tree clearance procedures) and the AHMG will be invited to inspect the additional area of ground disturbance resulting from large tree clearance at a time determined in consultation with the AHMG; and
    - during vegetation clearance inspections (as discussed above), any Aboriginal objects such as stone artefacts and shell will be collected.

10. In recognition of the potential for stabilised soil surfaces to be present at depth, it is recommended that the AHMG be provided with the opportunity to monitor cutting of the dune slope. If high densities of shell, bone fragments or a stabilised soil surface are exposed during this process, the AHMG may request test excavation be undertaken in accordance with the approved methodology.

11. It is noted that the additional recommendations regarding this activity were provided by Aboriginal party representatives.

#### 4.4.7.3 Mackas Access 1, A3 and Transect 9 PAD

12. Prior to the commencement of haul route construction, the boundaries of the road within Mackas Access 1 and A3 should be clearly demarcated in order to prevent accidental impacts outside the road corridor. Demarcation should be undertaken in consultation with the AHMG and during demarcation any Aboriginal objects present within the demarcated area will be subject to surface collection.

13. Vegetation clearance within A3 and Mackas Access 1 (if required) will occur as a staged process in accordance with the following methodology:

    - understorey vegetation and all trees smaller than approximately 50 centimetres diameter at chest height will be removed by earth-moving equipment or similar and placed outside the newly cleared area so that all of the newly cleared area is visible. At this stage, the AHMG will be invited to undertake an inspection of the newly cleared area;
    - following the initial inspection, the remaining large trees will be cleared by machinery (in accordance with ecological tree clearance procedures) and the AHMG will be invited to inspect the additional area of ground disturbance resulting from large tree clearance at a time determined in consultation with the AHMG; and
    - during vegetation clearance inspections (as discussed above), any Aboriginal objects such as stone artefacts and shell will be collected in accordance with the approved methodology incorporated in the ACHMP (Umwelt, 2009c: Appendix 2, Attachment 3).

14. Following vegetation clearance, construction of the alternate haul route within A3 and Mackas Access 1 will proceed in accordance with the description provided in Section 8 of **Appendix 4**.

### 4.4.8 Aboriginal Party Consultation

The following Aboriginal parties that were previously involved in the assessment of Lot 220 were consulted in regard to the proposed alternate haul route:

1. Worimi LALC;
2. Nur-Run-Gee Pty Ltd (Nur-Run-Gee);
3. Worimi Traditional Aboriginal Elders and Owners Group;
4. Mur-Roo-Ma Incorporated (Mur-Roo-Ma); and
5. Maaiangal Aboriginal Heritage Co-operative (Maaiangal).

Following archaeological survey and review of the final draft archaeological assessment (including the alterations to the proposed haul route), the Aboriginal parties made the following recommendations:

1. WLALC identified that the recommendations provided in Section 10 are ‘a true and accurate record of the outcomes and findings of the Assessment Report’.

2. Nur-Run-Gee recommended that existing infrastructure on Lot 218 should be utilised and did not support the proposed haul route modification on the grounds that it will result in additional impacts to cultural items. However, provided that no other alternative to construction of the alternate haul route is available, Nur-Run-Gee agreed with the recommendations provided in Section 9 and the associated research design and methodology. Nur-Run-Gee also recommended that culverts should be put in place in sections of access road constructed on geotextile. These culverts should be put in locations where natural watercourses occur so that the flow of water is not blocked by the alternate haul route.

3. Mur-Roo-Ma recommended that the previously approved access to the sand extraction face should be utilised and the alternate haul route should not be approved as it results in additional impacts to Aboriginal heritage, flora and fauna. However, on the understanding that this recommendation may not be followed, Mur-Roo-Ma also supported the recommendations and associated research design and methodology.

4. During in-field inspection of the proposed haul route modification, representatives of WLALC, Nur-Run-Gee and Mur-Roo-Ma made additional recommendations regarding salvage requirements for impacts in the vicinity of Mackas Access 2, 3 and 4.

5. Both Maaiangal and Viola Brown recommended that the proposed modification is not approved because of its impacts on Aboriginal cultural heritage and the cultural landscape, including flora and fauna.

## 4.5 Historical Heritage

A review of the Australian Heritage Database maintained by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), the State Heritage Register (SHR) and State Heritage Inventory maintained by the NSW Heritage Council, the Register of the National Trust (NSW) and the Port Stephens LEP was undertaken in May 2011. There are no items of European heritage listed along the alignment of the alternate access road.

A Non-Indigenous Heritage Management Plan has been prepared and approved for sand extraction operations on Lot 218 and Lot 220. A copy of this plan can be found on the Mackas Sand website www.mackassand.com.au.

## 4.6 Traffic and Access

A detailed traffic assessment was undertaken as part of the EA for the approved development (Umwelt, 2009a). There are no proposed changes to the use of the public road network from that addressed in the EA (Umwelt, 2009a) other than in regard to the use of the realigned section of Stockton Bight Track.

The alternate haul route will be constructed within the realigned and gazetted 20 metre wide public road reserve through Pt 76, Pt 101 and Pt 13 of DP 753192 and part Lot 2 DP 916061 (see **Figure 1.2**). Prior to use, this section of road will be constructed with an 8 metre wide formation and to a public road standard in accordance with the requirements of Port Stephens Council (see **Section 2.1.2**).

The minimum turning radius along the realigned road alignment is approximately 30 metres which is well in excess of minimum turning circle requirements for semi-trailers of 19 metres

and will provide adequate space for two semi-trailers or smaller vehicles to safely pass at any location along the public road alignment.

As part of upgrading Stockton Bight Track, Council requires that the first 100 metres of Stockton Bight Track adjacent to Lavis Lane is sealed to minimise dust and to provide a safe braking surface. The remainder of Stockton Bight Track will initially be constructed with a gravel surface. Within 6 months of the commencement of haulage from Lot 218 the most western 650 metres of Stockton Bight Track and the remaining unsealed section of Lavis Lane will be sealed in accordance with the requirements of Condition 31 of Schedule 3 of Major Project Approval 08_0142.

Stockton Bight Track is a public road under the control of Port Stephens Council. Mackas Sand will maintain the alternate haul route section of Stockton Bight Track for the life of sand extraction operations on Lot 218 and will make a contribution to the maintenance and upkeep of Lavis Lane in accordance with Condition 13 of Schedule 2 of Major Project Approval 08_0142.

As shown on **Figure 1.2**, the alternate haul route will leave Stockton Bight Track on Lot 2 DP 916061 will then travel across Lot 2 DP 916061 and Lot 122 DP 753192, Salt Ash which are owned by B & R B Mackenzie FT Pty Ltd and then via Lot 218 to the approved extraction area. This section of the road will have signs at the entrance stating that it is a private haul road. The private haul road will be constructed with an 8 metre wide gravel surface where possible but may be narrowed to a minimum of 6 metre width in places to avoid disturbing vulnerable plant species or minimise potential impact on archaeological sites.

The preferred alternate haul route into Lot 218 is depicted as 'Route A' on **Figure 1.2**. Realignment and construction of Stockton Bight Track will increase the length of Stockton Bight Track being used from approximately 650 metres to approximately 1580 metres with the remaining 570 metres being private haul road.

## 4.7 Noise

The proposed modification to use the alternate haul road alignment will not result in any additional noise impacts from those set out in the EA (Umwelt, 2009a).

Received noise levels at the closest residences to extraction operations on Lot 218 (Ford residence (R4) and Towers residence (R3) as shown on **Figure 1.4**), will be lower than previously predicted due to the initial extraction face being approximately 600 metres further to the east and shielded by the mobile sand dunes which are elevated to over 30 metres above the extraction floor.

Analysis indicates that truck traffic noise levels at the Towers (R4) and Ford (R3) residences which are adjacent to the Lavis Lane haul route, will remain within acceptable levels provided truck movements do not exceed 7 laden trucks (i.e. 14 trucks movements) per hour before 7.00 am (night time) and 19 laden trucks (i.e. 38 trucks movements) per hour after 7.00 am (daytime and evening).

A Noise Management Plan (Umwelt, 2009b) has been prepared for sand extraction operations on Lot 218 and Lot 220 and associated product transport. Key operational features relevant to the Noise Management Plan are:

- The approved hours of extraction being 24 hours a day 7 days a week except for operations within 250 metres of the Hufnagl Residence (R27) (see **Figure 1.4**) when

operations are limited to 7.00 am to 6.00 pm Monday to Friday with no operations within 250 metres of R27 outside these times.

- Transportation of sand from Lot 220 along Oakvale Drive between 5 am and 10 pm Monday to Saturday and 8.00 am to 12.00 pm Sundays and Public Holidays in accordance with provisions of Condition 9 (b) of Schedule 3 of Project Approval 08_0142 as Mackas Sand has an agreement with the owners of residences off Oakvale Drive. A copy of this agreement has been provided to DP&I and occupiers.

- Transportation of sand from Lot 218 along Lavis Lane in accordance with the provisions of Condition 9 of Schedule 3 of Project Approval 08_0142 between:

  - 6.00 am and 6.00 pm (EST) Monday to Friday;
  - 6.00 am and 7.00 pm (DST) Monday to Friday;
  - 7.00 am to 4.00 pm Saturdays; and
  - No transport on Sundays or public holidays.

## 4.8 Air Quality

The proposed modification to use the alternate haul route to Lot 218 will not increase air quality impacts on properties from those set out in the EA (Umwelt, 2009a) and approved under Major Project Approval 08_0142 other than on Lot 2 DP 916061 and Lot 122 DP 753192 which are associated with the development. Construction of the alternate haul route will result in the 100 metres of Stockton Bight Track adjacent to Towers residence (R3) being sealed prior to commencement of haulage rather than within six months of haulage commencing as is currently required by the Project Approval 08_0142.

As stated in the EA (Umwelt, 2009a), the major source of potential dust generation is from the use of unsealed access roads. The principal measure used to control dust will be dust suppression on the gravel sections of haul roads. This will be achieved initially using a contract water cart to keep roads moist during periods of product transport.

As discussed in **Section 4.6**, the most western 100 metres of Stockton Bight Track adjacent to Towers residence (R4) will be sealed as part of upgrading the road prior to the commencement of haulage of sand from Lot 218. Within six months of commencing haulage of sand from Lot 218, the gravel section of Lavis Lane and the 650 metre section of Stockton Bight Track over Pt 76 DP 753192 will be sealed to a minimum width of 6 metres in accordance with the provisions of Condition 31 of Schedule 3 of Project Approval 08_0142.

In addition, dust control will be achieved by ongoing rehabilitation of parts of the extraction areas that were vegetated prior to extraction occurring.

Sand extraction operations at Lot 218 will be located within the mobile dune field and will initially be approximately 1700 metres from the nearest residence.

An Air Quality Monitoring Program (Umwelt, 2011a) has been developed for operations on Lot 218 and Lot 220. Three dust deposition gauges have been established to monitor dust deposition levels as shown on **Figure 1.1**. One gauge (DDG1) is located to the north of the access road and approved extraction area on Lot 220. Two additional dust deposition gauges are located adjacent to the alternate haul route to Lot 218 (DDG2) and Lavis Lane (DDG3).

Baseline dust deposition monitoring levels (Umwelt, 2011a) indicate high levels of airborne sand being present due to the natural windblown movement of the dunes on Lot 218. Deposition levels at monitoring site DDG2 vary significantly and have on several occasions exceeded 4 g/m$^2$/month.

The section of Stockton Bight Track adjacent to Towers Residence (R3) which is the only residence adjacent to the alternate haul route will be sealed prior to commencement of haulage with the adjoining sections of Stockton Bight Track on Pt 76 DP 753192 and remaining unsealed section of Lavis Lane being sealed within six months of commencing haulage from Lot 218. It is envisaged that over this period while sand extraction operations are being established that production levels will be significantly lower than the permitted maximum extraction rate from Lot 218 of 1 million tonnes per year.

As set out in the Air Quality Monitoring Program (Umwelt, 2011a), dust emissions as a result of the use of Stockton Bight Track for haulage of sand product from Lot 218 will be monitored using dust deposition gauges and regular visual inspection. In addition, a High Volume Air Sampler (HVAS) will be established adjacent to residence R3 (Towers) at the commencement of construction of the alternate haul route.

If monitoring or visual inspection indicates that the use of a water cart as proposed for the unsealed sections of Stockton Bight Track is not adequately controlling dust emission levels at Towers residence (R3) the rate of water application will be increased and consideration will be given to bringing forward sealing of the section of Stockton Bight Track on Pt 76 DP 753192 and to sealing further sections of Stockton Bight Track. It is envisaged that over time that all of the alternate haul route will be sealed to minimise dust emissions and water usage.

## 4.9 Water Resources

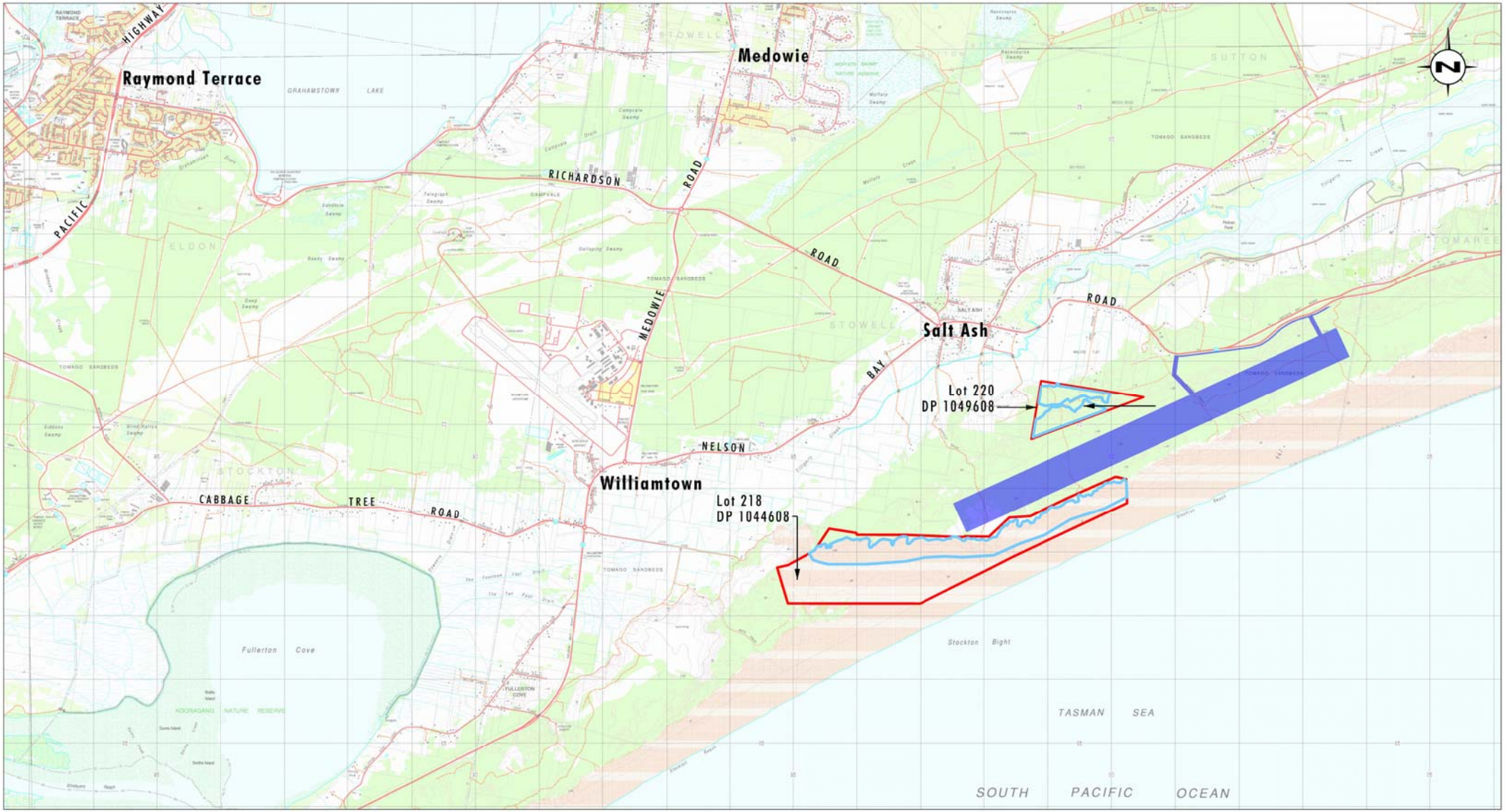
### 4.9.1 Surface Water Resources

The alternate haul route for which modification is sought is predominantly located along the seaward edge of the inter-barrier depression which separates the Inner Barrier Pleistocene dune system from the Outer Barrier Holocene dune system. Due to the high infiltration capacity of the underlying dunes and the relatively flat topography of the inter-barrier depression, there are no natural surface drainage features in the area of the alternate haul route. There are however several man-made drains that have been constructed across the inter-barrier depression that drain westward to the Tilligerry Creek system and south-westward to the 14 Foot Drain and Fullerton Cove.

### 4.9.2 Groundwater Resources

The alternate haul route and Lot 218 and Lot 220 approved extraction areas are located on the Stockton Sandbeds which form part of the Tomago-Tomaree-Stockton groundwater resource (shown in **Figure 4.6**). The groundwater resource is managed in accordance with the Hunter Water (Special Areas) Regulation 2003, Tomago-Tomaree-Stockton Groundwater Management Plan 1996 and Water Sharing Plan for the Tomago-Tomaree-Stockton Groundwater Source 2003 (refer to **Sections 3.3.3.1**).

The Tomago-Tomaree-Stockton Sandbeds cover an area of approximately 275 square kilometres along a coastal strip 10 to 15 kilometres wide, extending from the Hunter estuary in the south to Port Stephens in the north and Raymond Terrace to the west. The sandbeds occur on porous sandy soils lying over deep porous sands. The porosity of the sand allows for significant infiltration of rainfall and storage of large quantities of water.




**Source:** Department of Lands, 2006

0 1 2 4 km
1:85 000

**Legend**

- Lot Boundaries (218 & 220)
- Approved Areas
- HWC Emergency Borefield Easement

FIGURE 4.6

**Water Reserves and Easements**

The Tomago-Tomaree-Stockton Sandbeds form an integral part of HWC's bulk water supply by augmenting surface water supplies and providing a backup water supply during periods of drought. The sandbeds consist of three main zones which contain distinct groundwater systems:

- The Tomago Sandbeds cover an area of approximately 150 square kilometres and occur between the outer dune barrier and a Palaeozoic rock outcrop on the landward side of Stockton Bight. This aquifer has been used to supply Newcastle with potable water since the 1930s and currently supplies approximately 20% of the water provided by HWC. The total capacity of this aquifer is estimated to be 100,000 ML, of which approximately 60,000 ML can be accessed with existing infrastructure. The Tomago Sandbeds are located to the west of the approved extraction areas and alternate haul route.

- The Tomaree Sandbeds include the Anna Bay, Glovers Hill and Nelson Bay Sandbeds and occupy an area of approximately 70 square kilometres at the northern tip of the Tomaree Peninsula. These aquifers are used to supply water to townships along the Tomaree and Tilligerry Peninsulas, and Karuah. The Tomaree Sandbeds are located to the north of the approved extraction areas and alternate haul route.

- The Stockton Sandbeds on which the approved extraction areas and alternate haul route are located cover an area of approximately 80 square kilometres along the coastline between Newcastle and Port Stephens. The Stockton Sandbeds occur in the outer dune barrier of Stockton Bight and overlie the eastern extremity of the Tomago Sandbeds. This aquifer has not been developed for groundwater use, although it has been identified by HWC as a potential water reserve that may be used in drought conditions.

The Tomago Sandbeds are much older than the Stockton Sandbeds, with sand deposits accumulating during the Pleistocene period, approximately 250,000 to 10,000 years ago. In contrast, the Stockton Sandbeds accumulated during the Holocene, in the last 10,000 years.

HWC has obtained an easement over part of WR 57573, extending in a north-east to south-west direction to the north-east of Lot 218 on land owned by Worimi LALC (refer to **Figure 4.6**). It is understood (Rhys Blackmore HWC pers comm. October 2011) that a borefield may be developed in this easement in the future for use during periods of drought however is more likely that this borefield may be developed in a location immediately to the west of the easement shown on **Figure 4.6** .

The HWC easement is located entirely within vegetated sand dunes and is approximately 200 metres north of the approved extraction area on Lot 218. The alternate haul route to Lot 218 is located approximately 1.6 kilometres west of the HWC easement.

The Water Sharing Plan for the Tomago-Tomaree-Stockton Groundwater Source 2003 indicates that long term average extraction limit for Stockton aquifer as 14,000 ML/year of which 2000 ML/year can be extracted under domestic and stock rights with an additional 3100 ML/year being identified in 2003 as required for extraction under existing access licences.

There is currently an embargo on granting new licences to utilise the groundwater in the Stockton aquifer and as a result it is not possible to use this groundwater resource at this time as a source of water for dust suppression.

### 4.9.3 Soil and Water Management

A detailed Soil and Water Management Plan (SWMP) (Umwelt, 2011a) has been prepared for operations on Lot 218 and Lot 220 in accordance with the requirements of Condition 18 Schedule 3 of Project Approval 08_0142:

> The proponent shall prepare and implement a Soil and Water Management Plan for the project to the satisfaction of the Director-General. This plan must:
> (a) be prepared in consultation with DECCW, OOW and HWC, and be submitted to the Director General for approval within 3 months of the date of this approval; and
> (b) include a:
> - Site Water Balance;
> - Erosion and Sediment Control Plan
> - Groundwater Monitoring Program; and
> - Surface Water Monitoring Program

The SWMP has been revised to take into account the construction and use of the alternate haul route. Key aspects of the SWMP are outlined in **Sections 4.9.3.1** to **4.9.3.4**.

#### 4.9.3.1 Site Water Balance

There are no proposed changes to the site water balance for operations on Lot 220.

Use of the alternate haul route to Lot 218 will increase the length of haul route initially requiring watering for dust suppression from approximately 2.1 kilometres to 2.85 kilometres. This includes approximately 700 metres of Lavis Lane that is currently unsealed.

In accordance with the requirements of Condition 31 of Schedule 3 of Project Approval 08_0142, the unsealed section of Lavis Lane that will be used by the quarry and approximately 650 metres of Stockton Bight Track are to be sealed within 6 months of commencing extraction on Lot 218.

Estimated annual water demand for dust suppression on unsealed sections of Lavis Lane and the Lot 218 haul route are provided in **Table 4.1**. In determining annual water demand for Lot 218 it has been assumed that 70% of operation days are fine and that 80% of daily evaporation occurs during the period when product is transported on the haul route.

**Table 4.1 – Estimated Water Demand for Dust Suppression for Lot 218 Product Haulage**

| | Road Length (m) | Watered Road Width (m) | Days of Product Haulage per year | Average Daily Evaporation (mm) | Annual Water Demand for Dust Suppression (ML) |
|---|---|---|---|---|---|
| **Approved Haul Route** | | | | | |
| Lavis Lane | 700 | 8 | 295 | 3.8 | 3.5 |
| Stockton Bight Track 1 | 650 | 6 | 295 | 3.8 | 2.4 |
| Approved Access | 850 | 6 | 295 | 3.8 | 3.2 |
| **Total** | **2200** | | | | **9.2** |

**Table 4.1 – Estimated Water Demand for Dust Suppression for Lot 218 Product Haulage (cont)**

| | Road Length (m) | Watered Road Width (m) | Days of Product Haulage per year | Average Daily Evaporation (mm) | Annual Water Demand for Dust Suppression (ML) |
|---|---|---|---|---|---|
| **Alternate Haul Route** | | | | | |
| Lavis Lane | 700 | 8 | 295 | 3.8 | 3.5 |
| Stockton Bight Track 1 | 650 | 6 | 295 | 3.8 | 2.4 |
| Stockton Bight Track 2 and Private Haul Route | 1530 | 6 | 295 | 3.8 | 5.8 |
| **Total** | **2880** | | | | **11.7** |

On this basis it is estimated that using the approved access approximately 4.6 ML of water will be required for haul road dust suppression for the first 6 months of operations until Lavis Lane and 650 metres of Stockton Bight Track are sealed. Use of the alternate haul route would increase water demand in the first six months to approximately 5.9 ML.

After required sections of Lavis Lane and Stockton Bight Track are sealed, it is estimated that annual water demand for dust suppression would be 3.2 ML/year for the approved access and 5.8 ML/year for the alternate haul route. This water will be provided from off-site by a contract water cart or similar.

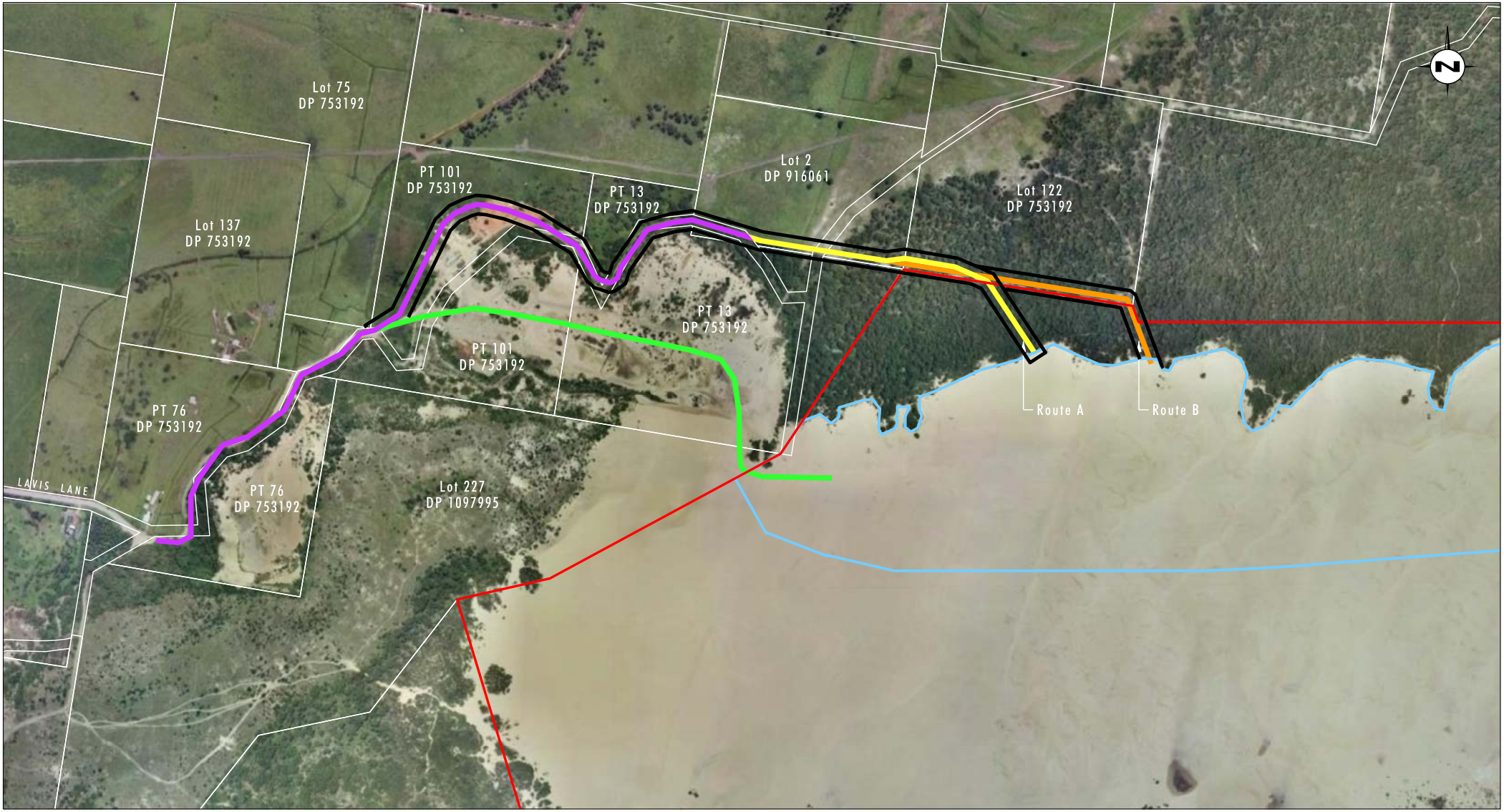
Further reductions in water usage at Lot 218 could be achieved through sealing additional sections of the public and private haul road between Lavis Lane and Lot 218 extraction area.

#### 4.9.3.2 Sediment and Erosion Control

The extraction area on Lot 218 comprises highly permeable sand. There are no surface drainage features within the extraction area and no specific requirements for sediment and erosion control.

Both the approved and alternate haul routes to the Lot 218 extraction area off Lavis Lane traverse relatively flat land that has high infiltration capacity. As a result, surface run-off is not generated in significant quantities, even during significant rainfall events. This is demonstrated by the lack of natural surface drainage paths within and surrounding the study area. Establishment of the alternate haul route will create localised areas of low permeability along the road surface. Small quantities of surface run-off will be generated from these areas and will be readily managed through the use of silt fences that will be established along the edge of the haul route. During the construction phase silt fences will be maintained and remain in position until a suitable vegetative cover is established adjacent to the alternate haul route.

Construction of haul routes require no special water management controls as the underlying sand and adjoining landform has sufficient infiltration and detention capacity to adequately dissipate runoff from the flat haul road. Sections of the alternate haul route traverse low-lying areas that will initially be built up with windblown sand prior to placement of road base material. In areas where vegetation is to be cleared along the alignment of the alternate haul route, it will windrowed along the edge of the cleared area. Silt fence will be erected between the windrowed areas and the road construction area as shown on **Figure 4.7**.




**Source:** Aerial: Google Earth, 2008

0 100 250 500m
1:10 000

## Legend

- Lot 218 Boundary
- Lot 218 Approval Extraction Area
- Stockton Bight Track
- Previously Approved Access Route
- Alternate Route A
- Alternate Route B
- Location of Silt Fence

FIGURE 4.7

Lot 218 Silt Fence Locations

**File Name (A4):** R30_V2/1646_288.dgn

#### 4.9.3.3 Groundwater Monitoring

Condition 22 of Major Project Approval 08_0142 states that the Groundwater Monitoring program shall include:

(a) detailed baseline data on groundwater levels and quality, based on statistical analysis (including available HWC data)
(b) groundwater impact assessment criteria; including trigger levels for investigating any potentially adverse groundwater impacts;
(c) a program to monitor groundwater levels and quality;
(d) a protocol for further groundwater modelling to confirm the limits to excavation depth across the site permitted in accordance with condition 7 of schedule 2; and
(e) a protocol for the investigation, notification and mitigation of identified exceedances of the groundwater impact assessment criteria.

In accordance with the Groundwater Monitoring Program (Umwelt, 2011a) groundwater levels are monitored monthly and groundwater quality is monitored quarterly at the six monitoring bore locations (SP1 to SP6/BL158) shown on **Figure 1.4**. It is proposed to install additional groundwater monitoring bores within the Lot 218 and Lot 220 extraction areas to enable groundwater level and quality to be monitored with monitoring to be undertaken at the same time as for bores SP1 to SP6/BL158.

Groundwater quality is monitored quarterly for the life of the operation for the following groundwater quality parameters:

- pH (Lab);
- conductivity (µS/cm);
- arsenic;
- iron;
- manganese; and
- turbidity.

Quarterly results will be compiled and analysed to check for unforeseen impacts or unacceptable trends in groundwater quality. A short report will be prepared quarterly and provided to the Quarry Manager who will implement any necessary changes or controls that may be required.

Groundwater quality results will be analysed quarterly and reported annually. If any unexpected trends in groundwater quality are observed, the reason for the unexpected trends or exceedances will be explored, potential contingency measures will be developed and a report will be prepared and submitted to the DP&I, NOW and OEH.

#### 4.9.3.4 Surface Water Monitoring

There are no surface flow or drainage lines on either Lot 218 or Lot 220 due to the high permeability of the underlying sand other than the man-made shallow drainage channels that drain groundwater in an east to west direction along the northern boundary of Lot 220 and to the north and north-west of Lot 218.

As a result there is no surface water that can be monitored to establish baseline conditions other than in low-lying areas that may intermittently be inundated when the groundwater level is high. As this water is intermittent and directly connected to the groundwater, it is

considered that these areas would have water quality that is consistent with that recorded in the groundwater of the site as discussed in **Section 4.9.3.3**.

### 4.9.4 Groundwater Modelling

A detailed groundwater model (Umwelt, 2011a) has been developed for the project and includes the surrounding area of Stockton Sandbeds. The groundwater modelling has been undertaken to determine average (see **Figure 4.8**) and maximum predicted (see **Figure 4.9**) groundwater levels within the extraction area to enable the maximum extraction depth to be determined in accordance with the requirements of Conditions 7a and 7b of Major Project Approval 08_0142.

As shown on **Figure 4.8**, modelled average groundwater levels within the approved extraction area on Lot 218 range from approximately 1.75 mAHD along the south-eastern edge of the extraction area to 2.50 mAHD in the south-western edge of the extraction area.

As shown on **Figure 4.9**, maximum predicted groundwater levels in the approved extraction area on Lot 218 range from approximately 2.75 mAHD along the south-eastern edge of the extraction area and 3.5 mAHD along the north-western edge of the extraction area to approximately 4.0 mAHD in the south-western edge of the extraction area.

As shown on **Figure 4.8**, modelled average groundwater levels within Extraction Area 1 on Lot 220 range from 0.75 mAHD in the north-western corner to approximately 2.25 mAHD at the south-eastern boundary of Extraction Area 1. Modelled average groundwater levels within Extraction Area 2 on Lot 220 range from approximately 2.0 mAHD along the northern edge to approximately 2.50 mAHD at the southern edge of Extraction Area 2.

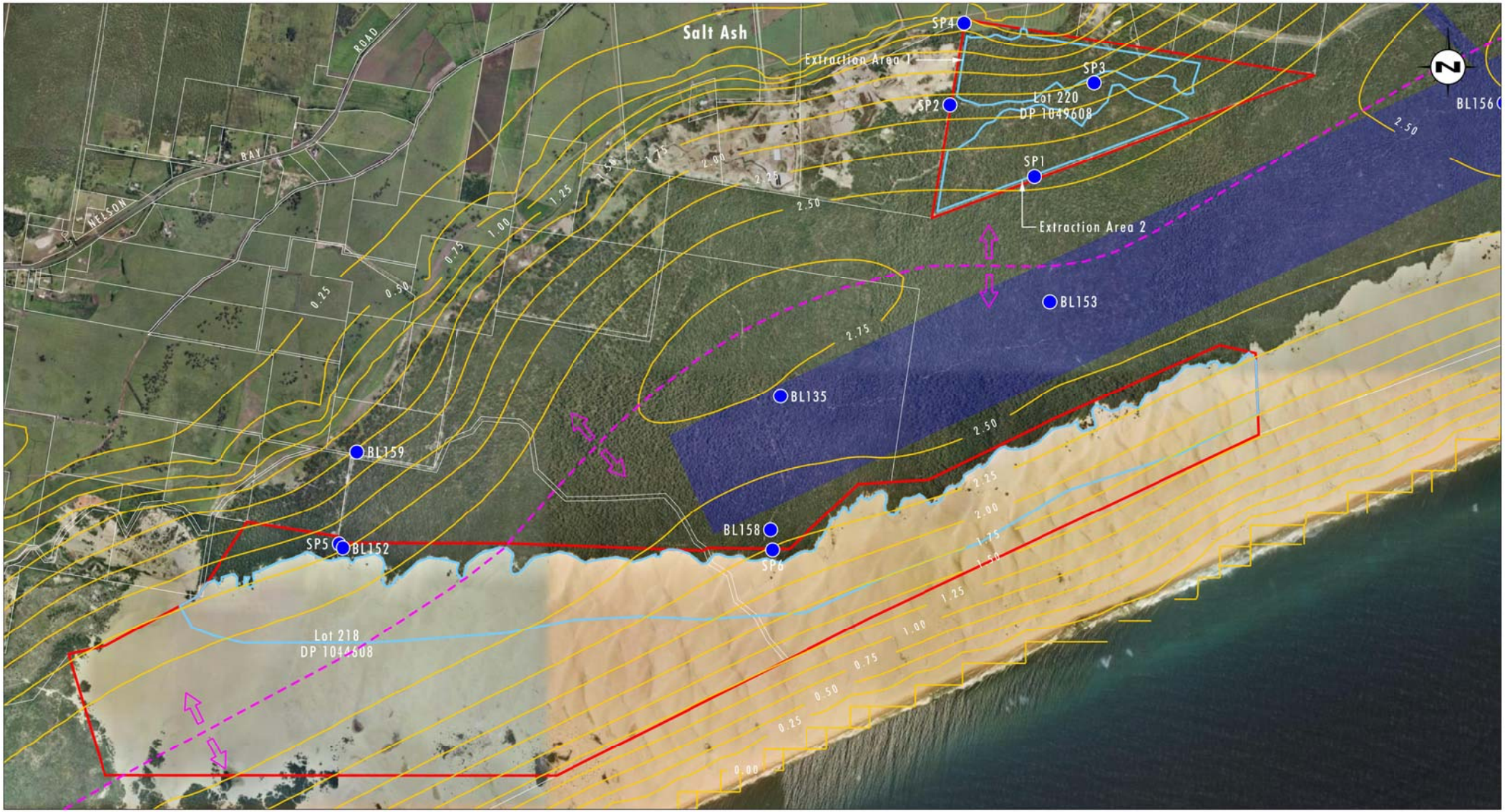
As shown on **Figure 4.9**, maximum predicted groundwater levels within Extraction Area 1 on Lot 220 range from approximately 1.25 mAHD in the north-western corner of the land parcel to approximately 3.4 mAHD at the south-eastern edge of Extraction Area 1. Maximum predicted groundwater levels in Extraction Area 2 on Lot 220 range from approximately 2.75 mAHD at the northern edge to approximately 3.8 mAHD at the southern corner of Extraction Area 2.

As shown on **Figures 4.8** and **4.9**, modelling indicates that groundwater from the Stockton Sandbeds generally drains in a south-easterly direction to the Pacific Ocean and in a north-westerly direction towards Tilligerry Creek and Fullerton Cove with the groundwater divide being approximately parallel to the coast and located approximately 1.3 to 2.0 kilometres inland from the coast.

As shown on **Figure 4.9** groundwater from approximately the most western 1 kilometre of Lot 218 extraction area drains in a north-westerly direction towards Fullerton Cove and away from HWC groundwater easement. Groundwater from the remainder of the Lot 218 extraction area also drains away from the HWC groundwater easement towards the Pacific Ocean. Groundwater from Lot 220 also drains away from HWC groundwater easement towards Tilligerry Creek. As a result, operations on Lot 218 and Lot 220 have negligible potential to adversely impact on groundwater within or adjacent to the HWC groundwater easement.

### 4.9.5 Maximum Extraction Depth

Using the groundwater modelling results shown in **Figures 4.8** and **4.9**, the maximum extraction depth for operations on Lot 218 and Lot 220 has been determined in accordance with the requirements of Conditions 7a and 7b of Major Project Approval 08_0142 and are shown on **Figure 2.1**.




**Source:** Aerial: Google Earth 2008, Cadastral: Department of Lands, 2003

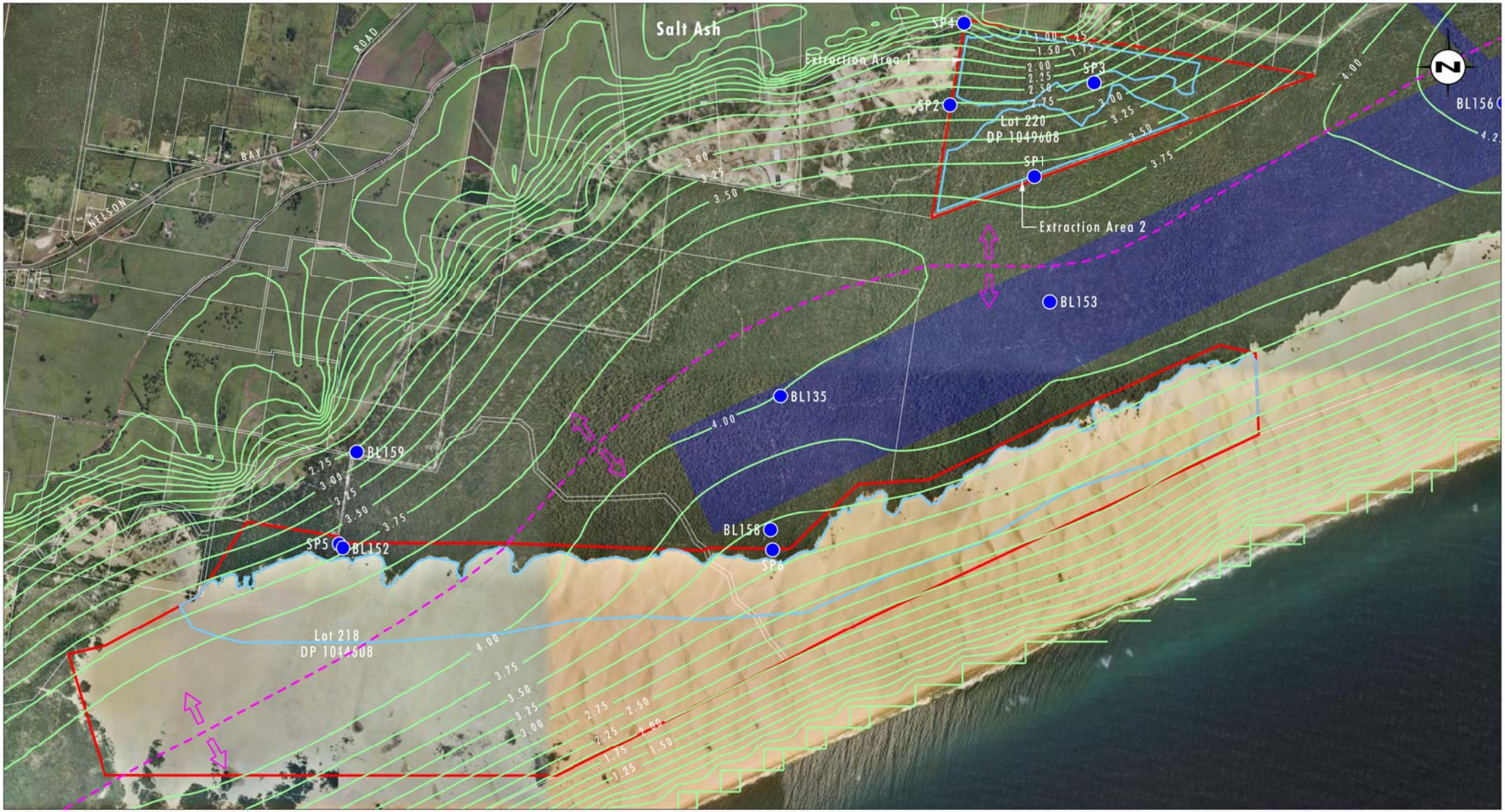
0 0.5 1 1.25km
1:25 000

**Legend**

- Lot Boundaries (218 & 220)
- Approved Extraction Area
- HWC Emergency Borefield Easement
- Modelled Groundwater Level - Average
- Groundwater Monitoring Bore Location
- Groundwater Divide

FIGURE 4.8

## Predicted Average Groundwater Levels for Lot 218 and Lot 220




**Source:** Aerial: Google Earth 2008, Cadastral: Department of Lands, 2003

0 0.5 1 1.25km
1:25 000

**Legend**

- Lot Boundaries (218 & 220)
- Approved Extraction Area
- HWC Emergency Borefield Easement
- Modelled Groundwater Level - Maximum Predicted
- Groundwater Monitoring Bore Location
- Groundwater Divide

FIGURE 4.9

**Predicted Maximum Groundwater Levels for Lot 218 and Lot 220**

As can be seen from **Figure 2.1**, the maximum depth to which extraction can occur on Lot 218 varies from approximately 3.75 mAHD along the south-eastern boundary of the approved extraction area to approximately 5.0 mAHD at the south-western end of the approved extraction area.

As can be seen from **Figure 2.1**, the maximum depth to which extraction can occur on Lot 220 in accordance with current approval conditions varies from approximately 2.75 mAHD at the north-western edge of Extraction Area 1 to approximately 4.25 mAHD at the south-eastern boundary of Extraction Area 1.

The maximum depth to which extraction can currently take place in Extraction Area 2 on Lot 220 ranges from approximately 4.0 mAHD along the northern boundary of the area to approximately 5.0 mAHD along the southern boundary and is reasonably consistent for both the 2 metres above average groundwater level and 1 metre above maximum predicted criteria set out in Conditions 7a and 7b of Major Project Approval 08_0142.

### 4.9.6 Temporary Variation to Extraction Depth

In previous consultation in regard to maximum depths of extraction, NOW representatives have indicated that extraction to a depth 0.7 metres above the maximum predicted groundwater level may be accepted provided that the final landform for the site was reshaped to provide a minimum of 1 metre of sand above the maximum predicted groundwater level. This requirement has been approved for Unimin's sand extraction operations which are located immediately to the west of Mackas Sand operations on Lot 220.

Operations at the Unimin site adjacent to Lot 220 have shown that the ability to extract to within 0.7 metres of the maximum predicted groundwater level improves the efficiency of extraction operations significantly. Efficiency is improved through increased trafficability of the exposed sand surface due to the greater moisture content increasing the stability and bearing capacity of the sand. The greater bearing capacity means that the amount of energy required to operate front-end loaders and dump trucks on the sand, travel times and wear and tear on equipment are significantly reduced.

Mackas Sand has requested that similar provisions allowing extraction to within 0.7 metres of the maximum predicted groundwater level provided that at least 1 metre depth of sand above maximum predicted groundwater level is achieved as part of the final landform be considered for sand extraction on Lot 218 and Lot 220.

## 4.10 Rehabilitation

Rehabilitation of Lot 218 and 220 extraction areas will be undertaken in accordance with the approved Landscape Management Plan (Umwelt 2009d). The proposal to temporarily allow extraction to within 0.7 metres of the maximum predicted groundwater level will not alter the final landform for Lot 218 and Lot 220. The final landform for the extraction areas within Lot 218 and Lot 220 will be at least 2 metres above the average groundwater level, and 1 metre above the maximum predicted groundwater level shown on **Figure 4.9**, as discussed within the Mackas Sand Environmental Management Strategy and associated management plans (Umwelt, 2011a). The height of the final landform will be verified by topographic survey.

On completion of sand extraction works, if the proposed access track is no longer functional, its rehabilitation should be integrated with that of the quarry, in accordance with the

rehabilitation principles outlined in the approved Landscape Management Plan (Umwelt, 2009d).

Broadly, rehabilitation of the alternate haul route if required will aim to re-establish the native vegetation communities that existed prior to clearing for its construction. Revegetation of disturbed areas will utilise locally-occurring plant species in a composition that closely resembles that of the pre-development vegetation communities. Monitoring of any revegetated areas along the alternate haul route will be integrated with any monitoring program for the sand extraction areas as described in the approved Landscape Management Plan (Umwelt, 2009d).

## 4.11 Surrounding Land Use

The alternate access for which approval is sought will not increase impacts in terms of dust, noise, traffic movements and visual on surrounding non-project related properties beyond levels of impact approved as part of Major Project Approval 08_0142.

The alternate haul route which is proposed to be used by Mackas Sand to access the approved extraction area on Lot 218 will utilise Stockton Bight Track which is under the control of Port Stephens Council. As land owners, Port Stephens Council has agreed to the use of Stockton Bight Track by quarry traffic provided that Mackas Sand undertakes to construct the section of Stockton Bight Track that will be used by quarry traffic and maintain this section of road over the life of the operations.

Stockton Bight Track easement is adjoined by land owned by members of the Towers family and B & R B Mackenzie FT Pty Ltd. Towers family land has historically been used for quarry purposes by Quality Sands & Ceramics Pty Ltd. The alternate haul route will also utilise a private haul road which traverses land owned by B & R B Mackenzie FT Pty Ltd and Worimi LALC. B & R B Mackenzie FT Pty Ltd and Worimi LALC are both associated with the quarry development.

Approval for Worimi LALC's land dealings associated with the proposed modification to Major Project Approval 08_0142 was granted by NSW Aboriginal Land Council at its meeting on 28 September 2011.

Realignment of Stockton Bight Track to provide physical access to Lot 2 DP 916061 and Lot 122 DP 753192 was undertaken by Port Stephens Council in consultation with the Towers family. Realignment of the road within Pt 101 DP 753192 was required as structures had been built over the former public road reserve preventing the movement of traffic along the former road reserve. The road was also realigned within Pt 13 DP 753192 to remove a tight bend in the road. The realignment of Stockton Bight Track was gazetted on 1 September 2011.

Use of the alternate haul route and extraction area access site will increase the location of the initial quarry face from being approximately 1100 metres from the nearest residence (Towers residence R3 on **Figure 1.4**) to being approximately 1700 metres away reducing interaction between surrounding residences and extraction operations. Use of the route will also potentially generate noise and dust impacts principally at Towers residence (R3 on **Figure 1.4**), however with appropriate controls such as limiting truck movements and sealing the adjacent 100 metres of Stockton Bight Track initially and an additional 550 metres within six months of commencing haulage from Lot 218 as discussed above, these are not predicted to exceed acceptable levels.

## 4.12 Unexploded Ordinance

An Unexploded Ordnance (UXO) assessment was undertaken as part of the EA (Umwelt, 2009a) and identified that there was potential for UXO to occur within the western part of the approved Lot 218 extraction area as result of WWII use of the area as a bombing range and for explosives testing. This potential for UXO to occur is limited to the undisturbed sections landform that existed prior to approximately 1950.

The majority of the sand that will be removed from the approved Lot 218 extraction area will be windblown sand that has been deposited above the ground surface that existed prior to 1950. This material has negligible potential to contain UXO.

An Unexploded Ordnance Management Plan (UXOMP) (see **Appendix 5**) has been prepared for operations within Lot 218. The UXOMP has identified that there is a possibility of UXO and related debris existing within the Danger Zone (see **Figure 4.10**) which includes the western 1.5 kilometres of the approved extraction area in Lot 218 and the southern sections of Route A and Route B as shown on **Figure 4.10**.

The UXOMP found that there is a low probability of UXO being encountered provided that any excavation within this area does not go below the stabilised ground surface as it existed prior to 1950. The UXOMP recommends that if excavation or works are likely to occur below the 1950 stabilised ground surface an UXO survey should be undertaken by suitably qualified specialists.

Any extraction within the approved extraction area on Lot 218 that is within Danger Zone will be restricted to being above the 1950 stabilised surface unless UXO surveys are undertaken by suitably qualified specialists and any identified UXO is cleared prior to extraction occurring.

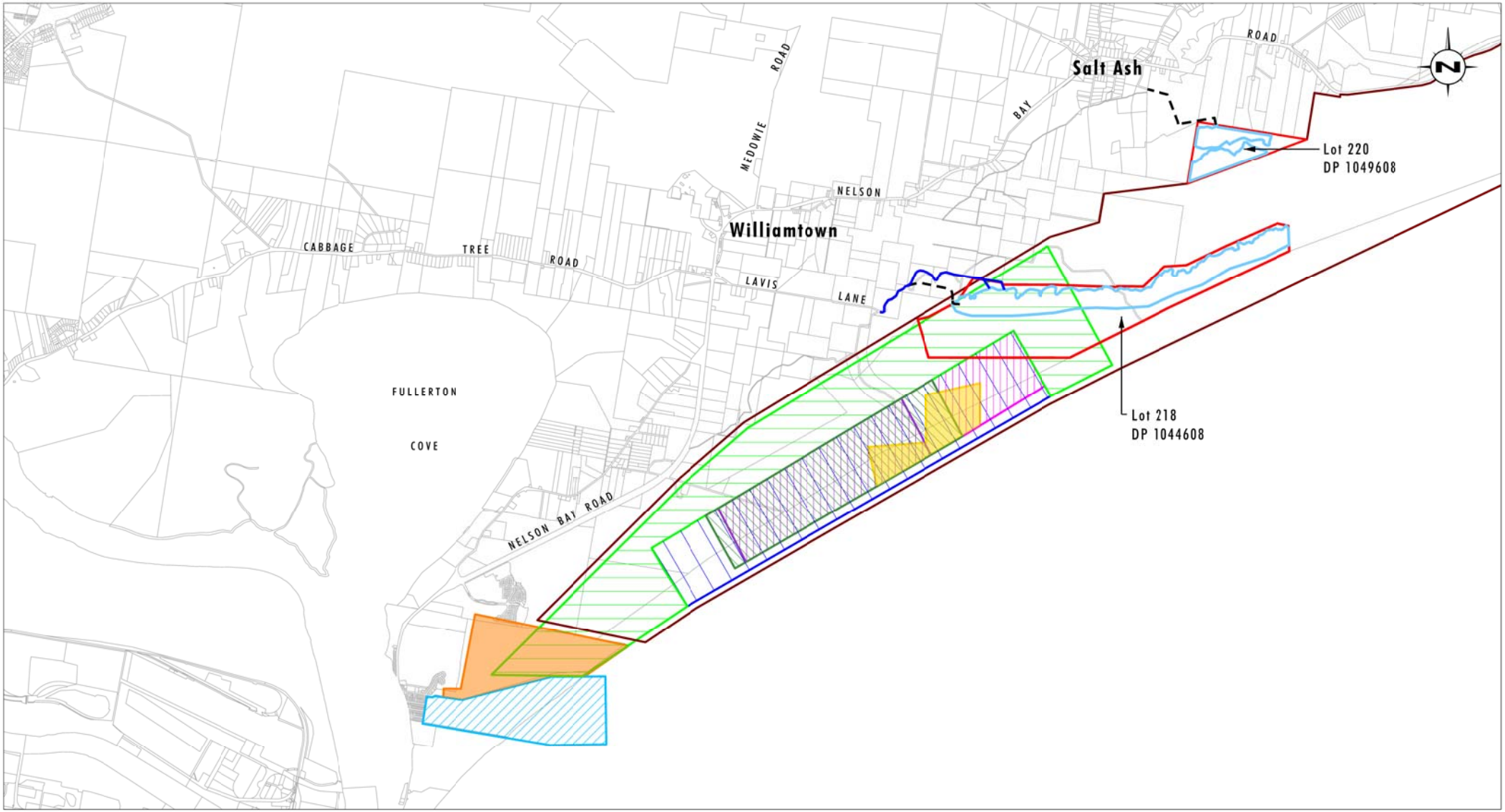
An assessment of whether archaeological subsurface testing may be required within the Danger Zone (see **Figure 4.10**) will also be undertaken once UXO survey and clearance is undertaken and prior to excavation below the 1950 stabilised ground surface occurring.

To minimise potential UXO impacts, it is proposed to construct that section of the alternate haul route that is within Danger Zone by filling above the 1950 stabilised landform. This can be readily achieved as the section of alternate haul route that is located within Danger Zone traverses a low-lying section of the terrain that is naturally prone to waterlogging. Along this section of the alternate haul route, vegetation will be cleared and windrowed along the edges of the haul road, geotextile with then be placed over the cleared ground surface and sand and road-base material will then be placed over the geotextile ensuring that excavation does not occur below the 1950 stabilised surface.

All personnel working on Lot 218 will be informed on the dangers of UXO and given training in identification of UXO and procedures to be followed should any UXO be located as part of the inductions.

## 4.13 Greenhouse Gas and Energy

A detailed greenhouse gas assessment was prepared for the development (Umwelt, 2009a) to determine its predicted greenhouse emissions and potential areas for energy efficiency.




**Source:** Department of Lands (2003)

0 1.0 2.0 4.0km
1:80 000

## Legend

- Lot Boundary
- Approval Extraction Areas
- Approved Access Roads
- Alternate Haul Route (A & B)
- Artillery Proof Impact Area
- Fern Bay Armour Plate Proof Range
- High Explosives Target Area
- Likely Area for UXO From Mortar Blinds Firing From Macs Track
- Danger Area
- Proof Range
- Stockton Beach Artillery Proof Range
- Stockton Rifle Range
- Likely live-fire manouevre area - Infantry (20 Garrison Bn) and supporting elements

FIGURE 4.10

**Unexploded Ordnance Plan**
**Mackas Sand**

**File Name (A4):** R30_V1/1646_289.dgn

It was estimated that the development would contribute an estimated 0.016% to yearly national greenhouse emissions and an estimated 0.000219% to yearly international greenhouse gas emissions.

The proposed modification to the sand extraction to enable extraction to occur within 0.7 metres of the predicted maximum groundwater level will reduce energy requirements and greenhouse gas emissions from those estimated in the original EA (Umwelt, 2009a).

## 4.14 Cumulative Impacts

The development and proposed modifications will have very limited cumulative interaction with surrounding developments and activities.

The development and proposed modifications will not result in a substantial overall increase in sand production in the Stockton Bight area, due to the diminishing capacity of most existing sand mining operations. There are no known proposed or approved developments within the vicinity of the alternate haul route to Lot 218 and a large proportion of the surrounding land is managed for conservation, thereby limiting the potential for future development in the area.

The development and proposed modification through providing access to the approved Lot 218 extraction area will act to off-set a significant decline in construction and industrial grade sand supplies for Sydney and Hunter regional markets which is being caused by diminishing availability to sand resources in the Newcastle and Sydney Regions.

# 5.0 Consolidated Statement of Commitments for Operations on Lot 218 and Lot 220

## 5.1 Operational Controls

5.1.1 All activities will be undertaken generally in accordance with the EA (Umwelt, 2009a) and the Modification EA (Umwelt, January 2012).

5.1.2 Sand extraction and processing activities at Lot 218 and Lot 220 may be undertaken 24 hours per day, seven days per week. No sand extraction operations will be undertaken within 250 metres of R27 (Hufnagl residence) between the hours of 6.00 pm and 7.00 am unless an agreement with the owner of R27 is obtained for extraction activities within these hours.

5.1.3 Transport of product from Lot 220 will be undertaken between 5.00 am and 10.00 pm, Monday to Saturday and 8.00 am to 12.00 pm on Sundays and Public Holidays.

5.1.4 Transport of product from Lot 218 will be undertaken between 6.00 am and 6.00 pm (EST) and 7.00 pm (DST) Monday to Friday and between 7.00 am and 4.00 pm on Saturdays. No transport of product will occur from Lot 218 on Sundays or Public Holidays.

5.1.5 A maximum of 1,000,000 tonnes per year of sand products will be extracted from Lot 218 and a maximum of 1,000,000 tonnes per year will be extracted from Lot 220. Annual sand production information will be provided to the Department of Planning and Infrastructure and the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS).

5.1.6 The final landform for the extraction areas within Lot 218 and Lot 220 will be at least 1 metre above the maximum predicted groundwater level as shown on **Figure 2.1** of the Modification EA. The height of the final landform will be verified by topographic survey.

## 5.2 Ecology

5.2.1 A Vegetation Clearance Management Plan will be developed prior to any vegetation clearing occurring for the proposal. This plan will be implemented for all vegetation clearing required as part of the proposal.

5.2.2 A comprehensive Biodiversity Monitoring Program will be developed prior to any vegetation clearing being undertaken for the proposal.

5.2.3 Clearing operations will be timed so that potential impacts on breeding species, particularly the squirrel glider and threatened micro-bats are avoided. Where possible, clearing will be avoided in winter months when micro-bats and the eastern pygmy possum are in a state of torpor and squirrel gliders begin to breed.

5.2.4 A Feral Animal Control Management Plan will be developed and implemented prior to any clearing activities being undertaken for the proposal.

5.2.5 A Weed Management Plan will be developed and implemented prior to any clearing activities being undertaken for the proposal.

5.2.6 A comprehensive Rehabilitation and Decommissioning Plan will be prepared to ensure rehabilitation objectives are achieved to a reasonable extent. The Plan will include:

- the rehabilitation program;
- native vegetation and fauna habitat management including provision of artificial hollows and nest boxes and fauna translocation procedures;
- feral animal control;
- fire management;
- weed management;
- minimisation of edge effects;
- stormwater control;
- fauna displacement measures including nest boxes and tree hollows;
- control of public access;
- monitoring; and
- funding.

5.2.7 The feasibility of establishing native vegetation at the western end of Lot 218 to create a link between adjoining vegetated areas following the completion of sand extraction in this area will be investigated within 5 years of operations commencing on Lot 218 and, if feasible, the Rehabilitation and Decommissioning Plan will be revised to include vegetation of this area.

## 5.3 Aboriginal Heritage

5.3.1 An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed in consultation with the relevant Aboriginal stakeholders and OEH prior to the commencement of any clearing activities. The ACHMP will include:

- a protocol to assess significance of Aboriginal objects;
- appropriate remedial actions etc. at end of life of operations. These will be drawn from the Rehabilitation and Decommissioning Plan;
- identification of an 'in perpetuity' keeping place with the requirement for 'in perpetuity' being resolved with the Aboriginal community;
- establishment of a Management Group that includes an invitation to all stakeholders and an archaeologist;
- a commitment to lodging site cards for any Aboriginal objects identified;
- a skeletal material protocol. Relevant legislation requires that if Aboriginal skeletal material is found, the proponent will need to obtain approval in writing from OEH and Police before work resumes;

- development of an Aboriginal Cultural Education program for use as part of the induction for workers; and

- protocols for extraction of sand on Lot 218 from below the 1950 land surface including test pitting procedures as set out in the EA and survey and clearance of unexploded ordnance (UXO) should UXO be identified in the extraction area.

5.3.2 An Aboriginal Cultural Heritage Management Group will be established prior to commencement of the proposal to manage matters relating to Aboriginal cultural heritage within the study area.

5.3.3 The Aboriginal Cultural Heritage Management Group will conduct a monitoring visit to the Lot 218 proposal area on a monthly basis for the first 12 months of operation, with subsequent inspection intervals to be determined as part of the ACHMP.

5.3.4 The Aboriginal Cultural Heritage Management Group will conduct a monitoring visit to the Lot 220 operational area on a twice yearly basis for 12 months, with subsequent inspection intervals to be determined as part of the ACHMP.

5.3.5 A sample of reject material from the screening operations on Lot 220 will be taken each day, where sufficient material is present. The samples will be provided to the Aboriginal Cultural Heritage Management Group on a monthly basis.

## 5.4 Historic Heritage

5.4.1 Prior to disturbance of any tank traps at either Lot 218 or Lot 220, the location of the tank traps will be surveyed and a photographic record made in accordance with Heritage Council of NSW requirements for archival recording. The survey data and photographic recording will be forwarded to the Heritage Branch of the Department of Planning and Infrastructure.

5.4.2 Any disturbed tank traps will be replaced along the original alignment of the Northern Defence Line once extraction and rehabilitation works along this alignment have been completed.

## 5.5 Traffic and Access

5.5.1 Mackas Sand will pay for the construction and upgrading of Stockton Bight Track between Lavis Lane and the private haul road on Lot 2 DP 916061 and Lot 122 DP 753192 and will be responsible for the maintenance of this section of Stockton Bight Track for the life of the sand extraction operations on Lot 218. Upgrading of Stockton Bight Track will be undertaken in accordance with Port Stephens Council requirements and will include sealing of 100 metres of the most western section of Stockton Bight Track.

5.5.2 Mackas Sand will upgrade Lavis Lane and the western 650 metres of Stockton Bight Track to provide a minimum 6 metre wide sealed carriageway, to the satisfaction of Council, within 6 months of the commencement of quarrying operations on Lot 218, unless otherwise agreed by the Director-General.

5.5.3 Mackas Sand will make a contribution to Council for maintenance of Lavis Lane and Oakvale Drive in accordance with the *Port Stephens Section 94 Development Contributions Plan 2007*, as may be updated from time to time, to the satisfaction of the Director-General.

## 5.6 Noise

5.6.1 An Operational Noise Management Plan will be developed for the proposal and implemented prior to sand extraction commencing. The plan will incorporate a noise monitoring program to monitor noise emissions and determine compliance with the project specific noise goals. The plan will include quarterly monitoring for a 12 month period and specific measures to monitor and address potential noise impacts at residential receiver R27 (Hufnagl Residence).

5.6.2 No sand extraction will be undertaken within 250 metres of receiver R27 during evening and night periods unless agreement is reached with the landholder.

5.6.3 A Traffic Noise Management Plan will be developed and implemented for truck movements on the private haul road from Lot 220 unless a written agreement exists between Mackas Sand and occupiers of residents adjacent to the private haul road and Oakvale Drive. The Plan will focus on but not be limited to truck movements between the hours of 5.00 am and 7.00 pm. (Note: Mackas Sand has a written agreement with occupiers of residences adjacent to Oakvale Drive and copies of these have been provided to DP&I).

## 5.7 Air Quality

5.7.1 Dust suppression activities, such as spraying a suitable dust suppressant, will be undertaken on all unsealed access roads used to transport product from Lot 218 and Lot 220 so that at least a 75% reduction in dust generation is achieved.

5.7.2 To minimise dust generation, the western 100 metres of Stockton Bight Track will be sealed as part of road upgrading and an additional 550 metres at the western end of Stockton Bight Track will be sealed within 6 months of commencement of product haulage from Lot 218.

5.7.3 Air quality monitoring will be undertaken in accordance with the Air Quality Monitoring Program and will include monthly monitoring of dust deposition levels at DDG1, DDG2 and DDG3. In addition, a High Volume Air Sampler will be installed adjacent to Towers residence (R3) prior to commencement of haulage of sand from Lot 218.

## 5.8 Groundwater

5.8.1 A Groundwater Management Plan will be developed prior to any sand extraction activities to the satisfaction of the Department of Planning and Infrastructure in consultation with OEH. The Plan will include a groundwater monitoring program that includes quarterly monitoring of groundwater level and quality (electrical conductivity, pH, turbidity, arsenic, manganese and iron) at groundwater monitoring bores SP1 to SP6 (BL158) as shown on **Figure 1.4** of the Modification EA. The results of the monitoring are to be commented on and compiled into an annual report.

5.8.2 Any refuelling of equipment used for the proposal will be undertaken by a registered contractor to remove the need for on-site storage of fuels. No maintenance of equipment or storage of chemicals will occur at either site.

5.8.3 Prior to sand washing being undertaken on Lot 220, access to a suitable water supply will be obtained and evidence of this will be provided to the Department of Planning and Infrastructure. Prior to sand washing commencing, a detailed Water Management Plan for the sand washing operation will be prepared and provided to the Department of Planning and Infrastructure.

5.8.4 Additional groundwater monitoring bores will be established on the quarry floor of Lot 218 and Lot 220 once sufficient sand has been extracted to achieve quarry floor level and provide adequate space so that the bores do not impact on the movement of extraction equipment and haulage vehicles. Monitoring of these bores will be undertaken at the same time and in the same manner as monitoring bores SP1 to SP6/BL158.

## 5.9 Surface Water

5.9.1 Flow dissipation structures will be installed along on-site access roads as required in accordance with the Erosion and Sediment Control Regional Policy (Port Stephens Council, 2002) and the Code of Practice for Managing Urban Stormwater – Soils and Construction (Landcom, 2004).

5.9.2 Site Water Management Plans for operations on Lot 218 and Lot 220 will be submitted for approval to the DP&I in consultation with OEH prior to the commencement of sand extraction activities. The Plan will include details on the storage and handling of chemicals on the sites including refuelling of mobile equipment.

## 5.10 Public Safety

5.10.1 High visibility fencing with appropriate set back from the extraction face and signage will be erected on the seaward side of the Lot 218 operational area.

5.10.2 Any access tracks leading into either Lot 218 or Lot 220 other than those used for product haulage will be blocked from recreational vehicle use with boulders or other suitable methods.

5.10.3 Inspections of high visibility fencing and any structures built to control public access to the sites will be undertaken every week. Maintenance or repair of any fences and structures will occur within this timeframe, as required.

5.10.4 Stockton Bight Track will be constructed in accordance with PSC requirements and maintained by Mackas Sand for the life of operations on Lot 218.

## 5.11 Visual

5.11.1 A 30 metre vegetated buffer will be maintained along the northern boundary of Lot 220, except where the access road will be constructed into the site. Buffer areas of 20 metres will be maintained along the other boundaries of the site. In-fill planting will be undertaken in buffer areas as required to ensure a sufficient visual screening is in place around the site.

5.11.2 Extensive supplementary planting of suitable screening species will be undertaken in the Lot 220 northern boundary buffer area within 50 metres of the Hufnagl residence.

## 5.12 Greenhouse Gases

5.12.1 Mackas Sand will seek to achieve continuous improvement in energy efficiency in sand extraction and processing operations.

## 5.13 Environmental Management, Monitoring and Auditing

5.13.1 Mackas Sand will obtain an Environmental Protection Licence for the proposal in accordance with the *Protection of the Environment Operations Act 1997*.

5.13.2 Three years after the commencement of the proposal, and every four years thereafter, Mackas Sand will commission and pay the full cost of an Independent Environmental Audit of the proposal.

5.13.3 Within 7 days of detecting an exceedance of the limits/performance criteria in this approval or an incident causing (or threatening to cause) material harm to the environment, Mackas Sand shall report the exceedance/incident to OEH and any relevant agency. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

5.13.4 Prior to the commencement of any operations, Mackas Sand will implement, publicise and list with a telephone company a contact phone number, which will enable the general public to reach a person who can arrange appropriate response action to the enquiry. Mackas Sand will maintain a register to record details of all enquiries received and actions undertaken in response. Mackas Sand will supply the OEH with a copy of the enquiries register on an annual basis.

# 6.0 Conclusion and Justification

## 6.1 Overview of Environmental Impacts

As detailed in **Section 4**, the environmental impacts of the proposed modifications to Major Project Approval 08_0142 have been identified and the subject of a detailed environmental assessment that has been based on:

- environmental risk assessment of proposed modifications;
- assessment of site characteristics (existing environment);
- consultation with government agencies;
- consultation with community and other stakeholders; and
- detailed environmental assessment.

The key issues identified, including those specified in the Director-General's Requirements (DGRs) for the EA, were the subject of comprehensive specialist assessments and review, which are detailed in **Section 4** and the appendices to this document.

Whilst there are many complex aspects which must be read in their entirety to fully understand these assessments, **Table 6.1** provides a broad overview of the key outcomes of the EA.

**Table 6.1 - Overview of Environmental and Social Impacts**

| Environmental/Social Issue | Overview of Key Outcomes (After proposed Management and Mitigation) |
|---|---|
| Temporarily Increasing Maximum Extraction Depth | • The temporary increase in maximum extraction depth to be 0.7 metres above the maximum predicted groundwater level will enable sand to be extracted more efficiently reducing energy usage, travel times and wear and tear on excavation equipment. The final landform will be shaped to ensure that there is at least 1 metre of sand and soil above the maximum predicted extraction level. The temporary lowering of the maximum extraction depth can be undertaken in a manner that has no adverse social or environmental consequences and has been permitted at similar sand extraction operations previously. |
| Water Usage | • Adoption of the proposed alternate haul route will increase the travel length outside Lot 218 extraction area by approximately 680 metres and will require additional water for dust suppression on this route. This increase in water usage will be offset by a decrease in fuel usage both in extracting and hauling product. Mackas Sand proposes to seal additional sections of the alternate haul route which will over time reduce water demand for dust suppression. |
| Public Safety | • The alternate haul route will be constructed in accordance with PSC requirements and maintained throughout the life of the operation. The road design will provide for safe use by the public. |
| Noise | • Noise assessment indicates that, with appropriate controls including limiting truck speed and truck movements per hour, activities on the proposed alternate haul route can be undertaken without having a significant adverse impact on the surrounding area. |

## Table 6.1 - Overview of Environmental and Social Impacts (cont)

| Environmental/Social Issue | Overview of Key Outcomes (After proposed Management and Mitigation) |
|---|---|
| Air Quality | • It is proposed that the most western 100 metres of Stockton Bight Track adjacent to the Towers residence will be sealed as part of the upgrade of Stockton Bight Track. Sealing of this section of road will minimise the potential for adverse dust impacts on this residence. Within six months of commencing product haulage from Lot 218, an additional 550 metres of Stockton Bight Track adjacent to the Towers Residence will also be sealed.<br>• There are no other residences that could be subject to adverse air quality impacts as a result of the use of the alternate haul route. |
| Bio-Diversity | • Removal of 8 *Angophora inopina*/*floribunda* hybrids, 8 to 10 specimens of *Diuris praecox* and 1 to 2 specimens of the *Diuris arenaria* to facilitate construction of the alternate haul route is not expected to significantly impact on any of these vegetation communities. The alignment of the alternate haul route was modified to minimise impact on these species.<br>• Construction of the access road between Lot 122 and Lot 218 will require the removal of approximately 0.51 hectares of Swamp Mahogany – Paperbark and Coastal Sand Apple – Blackbutt forest communities. The loss of this small area of forest community will be offset by sand extraction reducing the rate at which the mobile sand dune system moves landward and smothers existing vegetation. |
| Aboriginal Archaeology | • Five archaeological sites have been identified along the alignment of the proposed route. Those being:<br>▪ Mackas Access 1 – Midden;<br>▪ Mackas Access 2 – Artefact Scatter;<br>▪ Mackas Access 3 – Artefact Scatter;<br>▪ Mackas Access 4 – Artefact Scatter;<br>▪ A3 – Midden Material, Artefact Scatter and Associated PAD.<br>In addition, the alignment of Route A between Lot 122 and the extraction area on Lot 218 (Transect 9) has been identified as a PAD.<br>• Surface artefacts from these sites will be collected in consultation with the Aboriginal Heritage Management Group prior to commencing construction of the alternate haul route at these sites. Following collection of the artefacts, geotextile will be placed over Mackas Access 1 and the PAD sites along the haul route to prevent further disturbance of subsurface material.<br>• Road construction has been designed to utilise fill material as far as possible with limited excavation to minimise disturbance to subsurface materials. Due to the location of the gazetted road easement, excavation of a section of dune will be required in the vicinity of Mackas Access 1 to 4. Representative of the Aboriginal Heritage Management Group will have the opportunity to be on-site during excavation to observe excavated material. A series of procedures have been developed should any archaeological material be found during excavation. |

**Table 6.1 - Overview of Environmental and Social Impacts (cont)**

| Environmental/Social Issue | Overview of Key Outcomes (After proposed Management and Mitigation) |
|---|---|
| Interaction with surrounding landholders | • The alternate haul route will utilise Stockton Bight Track which is a gazetted public road and land owned by B & R B Mackenzie FT Pty Ltd which is associated with the development.<br>• The alternate access for which approval is sought will not increase impacts in terms of dust, noise, traffic movements and visual on surrounding non-project related properties beyond levels of impact approved as part of Major Project Approval 08_0142. |

The impacts of the proposal have been minimised through:

- obtaining a detailed understanding of the issues and impacts by scientific evaluation;
- developing proactive and appropriate strategies to avoid, minimise and mitigate or manage; and
- implementation of commitments as set out in the Consolidated Statement of Commitments (refer to **Section 5**).

## 6.2 Suitability of the Site

The proposed alternate haul route will allow for efficient transportation of sand from Lot 218. The proposed minor changes to maximum extraction depth at Lot 218 and Lot 220 will also facilitate improved extraction efficiency and reduced energy usage with minimal environmental impact.

## 6.3 Benefits of the Proposed Modifications

Approval of the alternate haul route will provide certainty of access to the approved Lot 218 extraction area. By facilitating the extraction of sand from Lot 218, the current proposal enables the creation of a number of additional benefits for the local community as assessed for the approved project (Umwelt, 2009a) through direct means such as employment and wages, and indirect processes such as spending and use of services.

The alternate access to Lot 218 will create a number of benefits for Worimi LALC including direct income that will enable implementation of a cultural development programme, employment opportunities, training and university scholarships that will be provided as part of a commercial arrangement that has been established between Mackas Sand and Worimi LALC. It will also enable the Worimi Sand Dune Adventures to continue to use an elevated knoll at the western end of Lot 218 extraction area that would have been removed as part of haul route construction if the approved access to Lot 218 extraction area was utilised.

The extraction of sand from Lot 218 will also create benefits for local, state and national governments through land tax, rates, GST, fuel excise and other taxes.

The proposal will provide access to sand within Lot 218 and create a long term and potentially indefinite supply of construction sand and at least 20 years supply of industrial grade sand for the Sydney and Hunter regional markets. It is anticipated that these markets

will require up to 3.0 million tonnes of sand per year by 2015, if additional resources do not become available.

## 6.4 Alternatives to the Proposed Modifications

A range of alternatives were considered in developing the proposed modifications to Major Project Approval 08_0142. These included:

- Not seek to establish an alternate haul route to the approved extraction area. This alternative is not preferred due to the uncertainty about obtaining access of the private section of the approved haul road and the ongoing ability to maintain this access over time. The alternate haul route will utilise Stockton Bight Track which is a public road and then traverse via Lot 2 DP 916061 and Lot 122 DP 753192. Lot 2 DP 916061 and Lot 122 DP 753192 are owned by B & R B Mackenzie FT Pty Ltd which is associated with Mackas Sand. Mackas Sand has agreed with Port Stephens Council to construct and maintain the section of Stockton Bight Track that forms part of the alternate haul route and has long term certainty in regard to access to the haul route.

- Several alignments of the realigned section of Stockton Bight Track were considered prior to the road being gazetted on 1 September 2011 with the gazetted alignment being the alignment that was acceptable to the Towers family. This alignment was not the preferred alignment from a haulage route perspective which was for the route to travel in a relatively straight line from the eastern boundary of Pt 101 DP753192 to the south-western corner of Pt 13 DP 753192.

- Two alignments for the private section of the alternate haul route along the southern boundary of Lot 122 DP 753192 and to the approved extraction area on Lot 218 were considered being Route A and Route B. Route B required less vegetation clearing but disturbed a greater area of Potential Archaeological Deposit and would have required the removal of many threatened ground orchids (*Diuris praecox* and *Diuris arenaria*). Route A was selected to minimise disturbance to the identified threatened ground orchids and the Potential Archaeological Deposit. At a meeting of the Worimi LALC on 14 September 2011, it was agreed unanimously that Route A was the preferred route.

- The alternative of not seeking to temporarily reduce the maximum extraction depth to 0.7 metres above the maximum predicted groundwater level was also considered. This is not preferred as reducing the maximum extraction depth to 0.7 metres above the maximum predicted groundwater level allows sand to be extracted more efficiently through reducing travel times, fuel usage and wear and tear on the extraction and haulage equipment.

## 6.5 Ecologically Sustainable Development

One of the objectives of the EP&A Act is *'To encourage ecologically sustainable development'*. The definition of Ecologically Sustainable Development (ESD) adopted by the EP&A Act is detailed in Section 6(2) of the *Protection of the Environment Administration Act 1991*. The four principles of ESD defined under this Act are:

- the precautionary principle – if there are any threats of serious or irreversible environmental damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

- inter-generational equity – the present generation should ensure the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations;

- conservation of biological diversity and ecological integrity – this is a fundamental consideration; and

- improved valuation, pricing and incentive mechanisms – environmental factors should be included in the valuation of assets and services.

**Table 6.2** outlines the ways these principles have been considered for the proposal.

**Table 6.2 – Incorporation of the Principles of Ecologically Sustainable Development**

| ESD principle | Relationship to the proposal |
|---|---|
| Precautionary principle | • a detailed analysis of available scientific information has been undertaken for the EA and consideration has been given to the extent of scientific certainty relating to any potential impacts;<br>• an assessment of alternatives that could be used to replace or supplement the proposal has been undertaken;<br>• potential threats of serious or irreversible environmental damage were identified by a risk assessment undertaken for the initial stages of the EA process. This risk analysis was revised as a greater understanding of the proposal and its potential impacts developed through the EA. Any potential impacts are identified and assessed through the EA (refer to **Section 4**); and<br>• measures to mitigate potential impacts associated with the proposal have been developed and are discussed in **Section 4**. |
| Inter-generational equity | • a number of mitigation measures will be implemented to minimise any potential impacts to the local community (refer to **Section 4**);<br>• the proposal will not sterilise any land from any potential future land uses;<br>• the proposal will assist in addressing industrial and construction grade sand supply limitations to the Hunter and Sydney regional markets;<br>• the proposal will create a potentially indefinite source of construction grade sand supplies for future generations through utilisation of naturally replenishing sand resources at Lot 218;<br>• the utilisation of sand resources at Lots 218 and 220 were key elements in the dedication of the Worimi Conservation Lands by Worimi LALC. These lands will preserve a 4438 hectare section of Stockton Bight for future generations; and<br>• the proposal will create a number of ongoing benefits for Worimi people, local and wider communities. |

**Table 6.2 – Incorporation of the Principles of Ecologically Sustainable Development (cont)**

| ESD principle | Relationship to the proposal |
|---|---|
| Conservation of biological diversity and ecological integrity | • potential impacts to flora and fauna species and vegetation communities of local, regional, state and national significance were identified and mitigation measures developed to minimise any potential impacts as discussed in **Section 4.3**;<br>• the species, communities and habitats present in the proposed operational areas of the proposal are extensively represented and conserved in the surrounding area (refer to **Section 4.3**);<br>• the extraction of sand resources at Lot 218 will prevent sand dunes encroaching on and smothering on average approximately 2.6 hectares of native forest per year; and<br>• the utilisation of sand resources as part of the proposal was a key element in the dedication of the Worimi Conservation Lands by Worimi LALC. These lands preserve a 4438 hectare part of Stockton Bight, including approximately 2180 hectares of Coastal Sand Apple – Blackbutt Forest. |
| Improved valuation, pricing and incentive mechanisms | • providing access to Lot 218 will allow for the extraction of fine grade natural sand. Such sand is an essential resource for many construction and industrial products and processes. Currently, no man-made products are available as supplements to this type of sand. Alternative products are available to medium and coarse grade construction sand, although the use of these products is currently constrained by high processing and transport costs and limited availability. |

# 7.0 Checklist of EA Requirements

The DGRs are included in full in **Appendix 1** and a checklist of where each requirement is addressed in the EA, is provided below.

| Requirement | Section of EA |
|---|---|
| ***General Requirements*** | |
| The Environmental Assessment must include | |
| • an executive summary | **Executive Summary** |
| • a detailed description of the project including the: | |
| ▪ need for the project; | **Section 2** |
| ▪ various components and stages of the project; and | **Section 2.1**<br>**Section 2.2** |
| ▪ alternatives considered | **Section 6.4** |
| ▪ likely inter-relationship between the proposed operations and existing sand extraction operations; | **Original EA** |
| ▪ plans of any proposed building works | **Original EA** |
| • a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment | **Section 4.2** |
| • a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: | **Section 4** |
| ▪ a description of the existing environment, using sufficient baseline data; | **Original EA**<br>**Section 4** |
| ▪ an assessment of the potential impacts of all stages of the project including any cumulative impacts, taking into consideration any relevant guidelines, policies, plans and statutory provisions (see below); | **Original EA**<br>**Section 4** |
| ▪ a description of the measures that would be implemented to avoid, minimise, mitigate, rehabilitate/remediate, monitor and/or offset the potential impacts of the project, including detailed contingency plans for managing any significant risks to the environment; | **Original EA**<br>**Section 4** |
| • a statement of commitments, outlining all the proposed environmental management and monitoring measures; | **Section 5** |
| • a conclusion justifying the project on economic, social and environmental grounds, taking into consideration whether the project is consistent with the objects of the *Environmental Planning and Assessment Act 1979*; | **Section 6** |
| • a signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading. | **Appendix 2** |
| ***Key Issues*** | |
| • **Biodiversity** – including:<br>▪ accurate estimates of any vegetation clearing associated with the project;<br>▪ a detailed assessment of the potential impacts of the project on threatened species, populations, ecological communities or their habitat, and the surrounding National Park Estate and Worimi Conservation Lands; and<br>▪ a description of any measures that would be implemented to maintain or improve biodiversity values in the region; | **Section 4.3** |

| Requirement | Section of EA |
|---|---|
| • **Soil & Water –** paying particular attention to:<br>▪ any potential impacts due to acid-sulphate soils;<br>▪ the requirements of the *Hunter Water (Special Areas) Regulation 2003* and *Tomago-Tomaree-Stockton Groundwater Sharing Plan;* | **Original EA Section 4.9** |
| • **Noise;** | **Section 4.7** |
| • **Air Quality;** | **Section 4.8** |
| • **Heritage** – both Aboriginal and non-Aboriginal heritage; | **Section 4.4, Section 4.5** |
| • **Visual**; and | **Original EA** |
| • **Rehabilitation and Final Land Form** – including a detailed description of the:<br>▪ proposed rehabilitation strategy for the project (including detailed plans of the proposed final landform), taking into consideration any relevant strategic land use planning or resource management plans or policies; and<br>▪ financial assurances that would be put in place to ensure that this strategy is implemented properly; and | **Section 4.10** |
| • **Social & Economic** | **Section 6** |
| ***References***<br>The environmental assessment of 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 project. | **Section 9** |
| ***Consultation***<br>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.<br>In particular, you should consult with:<br>• Department of Environment and Climate Change (now Office of Environment and Heritage);<br>• Department of Water and Energy (now NSW Office of Water);<br>• Hunter Water Corporation;<br>• Department of Primary Industries (Minerals)(now Department of Trade Investment Regional Infrastructure and Services);<br>• Roads and Traffic Authority; and<br>• Port Stephen's Council.<br>The consultation process and the issues raised must be described in the Environmental Assessment. | **Section 1.3** |

# 8.0 Abbreviations

| | |
|---|---|
| ACHMP | Aboriginal Cultural Heritage Management Plan |
| AEMR | Annual Environmental Management Report |
| AHD | Australian Height Datum |
| AHMG | Aboriginal Heritage Management Group |
| ANEF | Australian Noise Exposure Forecast |
| CCC | Community Consultative Committee |
| CKPoM | Comprehensive Koala Plan of Management |
| CMA | Catchment Management Authority |
| DCP | Development Control Plan |
| DGRs | Director-General's Requirements |
| DoP | Department of Planning (now Department of Planning & Infrastructure) |
| DP&I | Department of Planning and Infrastructure |
| DSEWPC | Department of Sustainability, Environment, Water, Population and Communities |
| DTIRIS | Department of Trade and Investment, Regional Infrastructure and Services |
| EA | Environmental Assessment |
| EARs | Environmental Assessment Requirements |
| EP&A Act | Environment Planning and Assessment Act 1979 |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 |
| ESD | Ecological Sustainable Development |
| HVAS | High Volume Air Sampler |
| HWC | Hunter Water Corporation |
| LALC | Local Aboriginal Land Council |
| LEP | Local Environment Plan |
| LGA | Local Government Area |
| Mackas Sand | Mackas Sand Pty Ltd |

| | |
|---|---|
| ML | Megalitres |
| NOW | NSW Office of Water |
| OEH | Office of Environment and Heritage |
| PAD | Potential Archaeological Deposits |
| PSC | Port Stephens Council |
| SHR | State Heritage Register |
| SWMP | Soil and Water Management Plan |
| TSC Act | Threatened Species Conservation Act 1995 |
| Umwelt | Umwelt (Australia) Pty Limited |
| UXO | Unexploded Ordnance |
| UXOMP | Unexploded Ordnance Management Plan |
| WR | Water Reserve |

# 9.0 References

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