



APPENDIX 10

Aboriginal Cultural Heritage and Archaeological Assessment

LYNWOOD QUARRY EXTRACTION AREA MODIFICATION

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Archaeological Assessment

November 2015



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Aboriginal Cultural Heritage and Archaeological
Assessment

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Holcim Australia (Australia) Pty Limited

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Acknowledgement

Holcim Australia and Umwelt would like to acknowledge the Traditional Custodians of the Lynwood Quarry Granite Pit Area – the Gundungurra Peoples – and pay respect to their cultural heritage, beliefs and continuing relationship with the land.

Holcim Australia and Umwelt would also like to acknowledge the post-contact experiences of Aboriginal peoples who have attachment to the Lynwood Quarry Granite Pit Area.

We pay our respect to the Elders – past, present and future – for they hold the memories, traditions, culture and hopes of Aboriginal Peoples in the area.

Holcim Australia and Umwelt thank the registered Aboriginal parties for their participation in this project and for their valuable contribution to the assessment report which has been enriched by their willingness to share valuable aspects of their cultural knowledge.

Statements of Aboriginal Cultural Significance

This preface to the report will provide 'Statements of Aboriginal Cultural Significance' which will be prepared by the registered Aboriginal parties participating in this assessment following the review of the draft Aboriginal Cultural Heritage and Archaeological Assessment. The 'Statements of Aboriginal Cultural Significance' will be included to ensure all readers recognise the cultural heritage value and importance of the proposed Granite Pit Area at Lynwood Quarry and its environs. Holcim (Australia) Pty Limited and Umwelt (Australia) Pty Limited recognise the primary role of the registered Aboriginal parties participating in this assessment to affirm the Aboriginal cultural significance of the Granite Pit Area and the Aboriginal sites and values and potential archaeological deposits it contains.

Gundungurra Tribal Council Aboriginal Corporation

*The Project site lies within the area inhabited by the Gundungurra Aboriginal Nation and administered as such by the Gundungurra Tribal Council, Pejar Local Aboriginal Land Council and Gundungurra Aboriginal Heritage Association. The people of the Gundungurra Aboriginal nation are the pre-eminent stakeholders in the conduct of this field study. They are represented by the Gundungurra Tribal Council Aboriginal Corporation. Aboriginal cultural significance or more specific Gundungurra cultural significance can only be assessed by representatives of the relevant Aboriginal community groups and often varies from that of archaeological significance. **GTCAC consider the whole of the project area to be "a highly significant place."***

Overall, the cultural assessment identified a number of sites of cultural significance which will increase the number of known sites within the project area. ... The results strongly indicate that Aboriginal sites occur in all landform categories identified and a relationship between Aboriginal sites and watered localities was established and recorded within the Lynwood Quarry Expansion Project Area.

Surveying effort in the vicinity of the Project Site ... should be viewed from a holistic perspective (inter-related) in respect to the value; relationship and connection of Gundungurra cultural heritage and landform categories pertaining to our traditional, cultural practices and not as individual isolated sites. It is paramount that consideration is given to the inter-relationship between cultural and heritage significant to these sites and their meanings and uses for Gundungurra people (Sharon Brown Gundungurra - Tribal Council Aboriginal Corporation 2 October 2015).

Gundungurra Aboriginal Heritage Assoc Inc.

It's hard to express connection to a place. It's happy and sad for me. Gundungurra People have walked the land here for thousands of years before me. Now we are here walking, as I know Gundungurra People did. We are not here in the proposed Lynwood Quarry Extraction Area to live in our traditional ways. Instead we are helping to record our past and work out a way to protect what is very important to Gundungurra families.

To my family, it's all about not losing anymore of our past history and looking after what is still out there in our Traditional Lands. The only way to do this is to record all of the sites so that we can manage and preserve the sites for future generations or where this is not possible, to ensure that they are salvaged in a way that the information they contain is recorded for the future. We also want to ensure that the artefacts and sites such as scarred trees which are salvaged are cared for and conserved.

As Gundungurra People the Lynwood Quarry Extraction Area at Marulan, as well as the surrounding District, is of great significance to members of GAHAI. This area is part of our Traditional Country and we have the responsibility to care for it for present and future generations of Gundungurra Peoples. This responsibility comes down to us from our ancestors and through our heritage and connection to our Traditional Country and through our stories from the Dreaming Time of how the water ways and surrounding mountains were created thousands of years ago before our human like form.

GAHAI has been involved in the Lynwood Quarry project for about 10 years now and this has given us an insight to our peoples movements in this area even though the landscape has been changed due to Colonisation, clearing of our land for Old Marulan Town and farming. Gundungurra Aboriginal Heritage has survived and it is our place to keep on protecting and managing our Heritage and Country from impacts from development and use for its minerals and water (Sharyn Halls GAHAI 2 October 2015).

Abbreviations

ACHAA	Aboriginal Cultural Heritage and Archaeological Assessment
AHIP	Aboriginal Heritage Impact Permit
AHMP	Aboriginal Heritage Management Plan
Approved Project Area	Lynwood Quarry project area as approved under DA 128-5-2005 (as modified) as shown on Figure 1.2 .
ATU	Archaeological Terrain Unit
Bindook Porphyry Complex	Within this report the term Bindook Porphyry incorporates the Barralier Ignimbrite and the Joaramin Ignimbrite
CHMZ	Cultural Heritage Management Zone
DEC	Department of Environment and Conservation (previously the NSW EPA and the NPWS) and now OEH
DECC	Department of Environment and Climate Change (previously DEC) and now OEH
DECCW	Department of Environment Climate Change and Water (previously DECC) and now OEH
DP&E	Department of Planning and Environment (previously DoP)
DoP	Department of Planning
EP&A Act	Environmental Planning and Assessment Act 1979
GAHAI	Gundungurra Aboriginal Heritage Association Inc.
Granite Pit Area	The proposed modified extraction area (the Granite Pit) plus the area required for associated haul roads, emplacement areas, amenity bund and water management structures on Lot 2 DP 1107232 located to the west of the existing Approved Lynwood Quarry as shown on Figure 1.3 .
GTCAC	Gundungurra Tribal Council Aboriginal Corporation
Holcim Australia	Holcim Australia (Australia) Pty Limited
Modification Project	The Proposed Extraction Area Modification, which includes the proposed development of an additional quarry resource to the west of the currently approved quarry area and associated components
NPW Act	National Parks and Wildlife Act (1974)
NPWS	National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
PFC	Peter Falk Consultancy
PLALC	Pejar Local Aboriginal Land Council
s.87/90	Section 87/Section 90
Umwelt	Umwelt (Australia) Pty Limited

Executive Summary

Lynwood Quarry is located west of Marulan, in the Southern Highlands region of NSW, approximately 160 kilometres south-west of Sydney and approximately 27 kilometres north-east of Goulburn, NSW (refer to **Figure 1.1**). Marulan is located within the traditional Country of the Gundungurra¹ People (Tindale 1974, Smith n.d.) and within the Pejar Local Aboriginal Land Council (PLALC) boundary. The Marulan area is of high cultural heritage significance to the Gundungurra People and Aboriginal people that have historic and contemporary association with the Country of the Gundungurra.

Holcim Australia has development consent (DA 128-5-2005) to construct and operate Lynwood Quarry to produce up to 5 million tonnes per annum (Mtpa) of quarry product until 1 January 2038 (the Approved Operations). Lynwood Quarry includes a processing plant, road and rail loading facility and is approved to transport up to 1.5 Mtpa of product by truck and up to 5 Mtpa by rail (refer **Figure 1.2**). DA 128-5-2005 was most recently modified in 2011, to provide for reconfiguration of the rail line from a balloon loop to a rail spur and associated changes to the infrastructure layout.

Holcim Australia commenced operational readiness works in the approved quarry pit or extraction area (an ignimbrite resource) in 2012 as part of the construction works, with operations commencing in late 2015. Material extracted from the approved Lynwood Quarry pit (the Approved Pit) was used in the onsite civil works and to prepare the quarry pit for operation (e.g. removing overburden to expose the ignimbrite resource).

During the operational readiness works, further drilling and material testing has revealed that the resource in the Approved Pit is more variable than anticipated and substantial areas are characterised by more significant concentrations of intense fracturing, alteration, clay, or a combination of these characteristics, than was detected during the earlier resource assessment investigations. The variability and complexity of the approved Lynwood Quarry resource will challenge Holcim Australia's ability to consistently supply in-specification products from Lynwood Quarry to the market.

Holcim Australia is therefore seeking approval to extract quarry resources on an adjacent parcel of Holcim Australia-owned land to the west of the Approved Pit. The proposed extraction area modification (the Modification Project) is a granite resource and has different properties and mineralogy to the currently approved ignimbrite resource in the Approved Pit. Extensive drilling and testing of the granite resource has revealed that it is homogeneous, relatively unaltered and unfractured. The proposed Granite Pit will enable Holcim Australia to consistently produce and supply in-specification products to the local, regional and Sydney markets.

The planning approach for the Modification Project is to modify the existing consent under Section 75W of the EP&A Act. Umwelt (Australia) Pty Limited (Umwelt) has prepared this Aboriginal Cultural Heritage and Archaeological Assessment (ACHAA) as part of the broader Environmental Assessment (EA) for the Modification Project on behalf of Holcim Australia to assess the potential Aboriginal cultural and archaeological impacts of the Modification Project.

¹ This is the preferred spelling of the Registered Gundungurra Aboriginal Parties for this project. Often spelt Gandangara (Tindale 1974).

Extraction Area Modification

The proposed Modification Project comprises development of the following key features:

- a modified extraction area (to include the Granite Pit) to the west of the existing Approved Pit
- reduction of the Approved Pit to reflect limitations within the ignimbrite resource
- revised overburden emplacement areas
- haul roads and water management system structures
- additional visual bund and vegetative screen.

These features are shown in **Figures 1.3a to 1.3c**, which indicate various stages of the development of the Modification Project. Other than the proposed changes to the layout or footprint of the development, the Lynwood Quarry project, from an operational perspective, will be largely unchanged from the currently approved operations.

Potential Impact of the Project

The development of the new Granite Pit (quarry), haul road, overburden emplacement area, amenity bund and surface water features will result in the removal of all potential artefact bearing deposits and other forms of Aboriginal archaeological sites within the area proposed for impact. Thus the Modification Project has the potential to destroy any Aboriginal archaeological evidence/sites located within the proposed disturbance footprint (refer to **Figures 1.3a, 1.3b and 1.3c**).

Agency Consultation

Meetings were held with Department of Planning and Environment (DP&E) on 15 May 2015 and the Office of Environment and Heritage (OEH) on 11 June 2015 to determine the appropriate methodology for the Aboriginal consultation process for the ACHAA and to determine whether it was appropriate to undertake any requisite archaeological subsurface testing and salvage (if required) post approval as a staged program under a variation to Holcim Australia's existing combined s.87/90 Aboriginal Heritage Impact Permit (AHIP) #1100264 (refer to **Appendix A**).

Both DP&E and OEH supported the continuation of consultation with the existing registered Aboriginal parties as this was for a modification and not for a new project and there had been ongoing consultation with the registered Aboriginal parties for the quarry. In relation to obtaining a variation to the existing s.87/90 AHIP #1100264, OEH understood the rationale for this approach (having a single management strategy across both the Approved Project Area and the Granite Pit Area) and was supportive, providing a full ACHAA was prepared to inform the modification application. It is proposed that all of the sites approved for impact within the Granite Pit Area would be subject to the conditions of s.87/90 AHIP #1100264 and would be fenced and subject to annual site monitoring in accordance with a revised version of the Lynwood Quarry Aboriginal Heritage Management Plan (AHMP – Umwelt 2011a) until such time as they were subsurface tested and salvaged (as/if required). The revised AHMP would ensure that Aboriginal cultural heritage management was consistent across both the Granite Pit Area and the Approved Project Area.

Registered Aboriginal Party Consultation and Participation

There are four registered Aboriginal parties for Lynwood Quarry. These include:

- Gundungurra Aboriginal Heritage Association Inc. (GAHAI)
- Gundungurra Tribal Council Aboriginal Corporation (GTCAC)
- Pejar Local Aboriginal Land Council (PLALC)
- Peter Falk Consultancy (PFC).

Holcim Australia has undertaken ongoing consultation with the registered Aboriginal parties since their initial date of registration in 2004. Consultation in relation to the Granite Pit Area commenced on 5 June 2015 and was continued via phone, email, two meetings and throughout the five day period of the survey (refer to **Appendix B**). Consultation included the provision of information in relation to the nature of the Modification Project and:

- the methodology proposed for undertaking the AACHA including the methodology for the consultation process
- the methodology proposed for the survey of the Granite Pit Area
- the survey timeframe
- Aboriginal cultural heritage values and significance of the Granite Pit Area and the sites/PADs it contains
- requirements for subsurface testing and the undertaking of subsurface testing post approval
- impact assessment
- management options and recommendations for all sites/potential archaeological deposits (PADs) and their associated archaeological terrain units (ATUs)
- applying for a variation to s.87/90 AHIP #1100264
- revisions to the AHMP (Umwelt 2011a) required to cover the management of Aboriginal cultural heritage and archaeological sites, PADs and their associated ATUs within the Granite Pit Area.

Throughout the consultation process the registered Aboriginal parties have endorsed all methodologies proposed and were fully supportive of Holcim Australia applying for a variation to s.87/90 AHIP #1100264. The application for a variation would include the Granite Pit Area and the sites and PADs it contains and with all subsurface testing required being undertaken as a staged process, post-approval.

The draft ACHAA was provided to the registered Aboriginal parties on 3 September 2015 and registered Aboriginal party responses in relation to the draft report were requested by 5 October 2015. All four registered Aboriginal parties provided a response and all were comfortable that they had been consulted adequately and all supported the management recommendations provided in the draft report (refer to **Section 2.3** and **Appendix B**).

Native Title Search

A Native Title search was undertaken on 24 June 2015 for the Goulburn/Mulwaree local government area (LGA). The Native Title search indicated that there were no listed Native Title claims or Native Title registrations within the LGA. There was, however, one registered Indigenous Land Use Agreement (ILUA) for the Goulburn/Mulwaree LGA. This was on behalf of the Gundungurra Tribal Council Aboriginal Corporation #6 (NNT number: NI2104/001). The ILUA relates to an agreement between GTCAC and the Blue Mountains City Council, City of Lithgow, Goulburn/Mulwaree Council, Oberon Council, Penrith City Council, Upper Lachlan Shire Council, Wingecarribee Shire Council, and Wollondilly Shire Council. The ILUA area includes a small section of the Approved Project Area but does not extend into the Granite Pit Area (refer to **Figure 2.1** and **Appendix C**).

Aboriginal Cultural Context

Background research was undertaken in relation to the Aboriginal cultural context of the Granite Pit Area and its surrounds. This research drew on ethnographic records and the known oral history provided by the registered Aboriginal parties during the investigation of the Approved Project Area. Implications for the likelihood of site location, likely site type, site contents and site integrity were drawn from the information gathered. The implications were as follows:

- if mature trees remain in the area culturally modified trees (scarred trees) may have survived that reflect the practice of bark/heartwood removal for the manufacture of wooden bowls, shields, spear throwers and/or boomerangs
- camp sites represented by stone artefact scatters are likely to occur in the area
- stone artefacts used for the processing of food plants and the hunting, skinning and butchery of mammals for their meat and skin are likely to be found within the artefact scatters within some camp sites (tools manufactured from wood or bone are unlikely to have survived)
- stone tools used for the working of skins and for piercing skins so that they could be sewn together to make cloaks may be found in artefact scatters within some camp sites
- other site types such as butchery sites may also be located within the Granite Pit Area
- some camp sites may be related to Aboriginal people moving through the area to attend ceremony within the ceremonial precinct in the Approved Project Area
- lost or discarded stone hatchets are likely to be rare and not likely to found in the Granite Pit Area.

Environmental Context

The decisions that people make regarding such things as where they live, the range of resources they use and other aspects of daily life may be influenced by the environment in which they live. The preservation and visibility of sites is also affected by environmental factors such as vegetation cover, past land-use practices and disturbance. A review of the environmental context of the Granite Pit Area is therefore integral to considerations of the Aboriginal archaeological material likely to be located in the area and its integrity. In order to understand the environmental context information was considered in relation to the climate, topography, hydrology, geology, soils, geomorphology, flora, fauna and European land use practices. Implications for the Granite Pit Area in relation to the likelihood of site location, site type, site contents and site integrity were drawn from the information gathered. These implications were as follows:

- the Granite Pit Area was likely to have been relatively dry, with a warm summer (with temperatures that could vary widely within a single day), a relatively cool to cold spring and autumn and a very cold, windy and overcast winter. Based on the climatic data it can be assessed that:

- since the mid-Holocene (5000 years ago to the present) the most comfortable times of the year for Aboriginal occupation within the Granite Pit Area may have been late spring, summer and early autumn
- the cold south-westerly winds would drastically reduce temperatures and in autumn, winter and early spring may have seen Aboriginal people move out of the area or at least seeking shelter from the wind when camping overnight or stopping to undertake short-term activities related to hunting and gathering activities. Whilst in the hottest part of summer, they may have chosen to camp in areas where the south-westerly winds brought respite from the heat
- camping activity of any length within the Granite Pit Area was most likely to occur in the November through to March period when rainfall was the highest and the climate more amenable
- in terms of the location of the camp sites, the overall rainfall for the area is not high and the ephemeral tributaries would only have retained water for a very short period after rain. As water availability is a known determining factor in the location of Aboriginal camp sites, it can be assumed that the main camp sites within the Granite Pit Area, and thus the areas where the majority of artefactual material would have been discarded, would be in proximity to the creek channels with flow entering from outside the Granite Pit Area. The location of a spring in the channel of the most northerly tributary further suggests that this area would be a likely location for a camp site
- taking into account the cold west and south-westerly winds it was likely that preferred camping location within the Granite Pit Area in spring, autumn and winter would be in the valleys on the northern side of the main spur that trends generally from east to west and which would have provided some protection from the elements. In summer, the reverse may have been the case with Aboriginal people seeking respite from heat by camping in areas with a south-westerly aspect to the south of this spur or on the broad spur crest (refer to **Figure 3.2** and **Section 3.2.2**)
- lack of water would restrict the time Aboriginal people could stay in all but the south-easterly corner and in proximity to the most northerly tributary within the Granite Pit Area and thus if there are sites away from these locations they are generally likely to be small and reflect transient use of the area.
- it is unlikely that locally outcropping stone (if any) would have been used for stone implement manufacture. It is far more likely that raw material suitable for stone implement manufacture would be imported into the area (refer to **Section 3.3.3** for further discussion)
- there would have been sufficient flora and fauna to support small groups of Aboriginal people for short stays in the warmer months, however, in the cool to cold months animal and plant foods would be unlikely to provide sufficient calories/nutrition to allow Aboriginal people to camp in the area for any length of time
- ecotones should be present along the boundary between the Bindook Porphyry Complex (including the Joaramin Ignimbrite and the Barralier Ignimbrite) and the Lockyersleigh Granite and between the Lockyersleigh Granite and the area of exposed Deep Sands in the north-west of the Granite Pit Area. Of these areas the ecotone related to the Deep Sands in the Lockyersleigh Granite and the ecotone near the Bindook Porphyry Complex and the Lockyersleigh Granite in proximity to the northern tributary of Lockyersleigh Creek are the most likely to have been attractive to Aboriginal people and to prey species as they were also in proximity to what appears to have been the most reliable water source
- prior land-use practices in the general area are likely to have resulted in the following:
 - the removal of the majority of scarred and/or carved trees during land clearance
 - the removal of plant species that were valued economic resources for Aboriginal people

- o competition for prey species
- o the introduction of non-endemic flora and fauna that out-competed native flora and fauna
- o a change in the hydrology of the creeks and thus in their morphology and endemic flora and fauna
- o an increase in the downslope movement of the sandy soils and any artefacts they may have contained
- o the mixing and reburial of artefacts from different sites and of different ages in areas where colluvium has aggraded
- o damage/destruction by stock trampling of sites such as bora rings and stone arrangements (if they were present).

Archaeological Context

The known archaeological context of the general Marulan area, the adjacent Approved Project Area and the Granite Pit Area was also analysed. Implications for the broader Marulan area in relation to the likelihood of site location, site type, site contents and site integrity were drawn from the information gathered. These implications were as follows:

- artefact scatter and isolated finds were the most common site types located
- isolated finds that were not associated with PAD have been located in almost all landform contexts
- isolated finds associated with PAD were nearly always located close to watercourses
- artefact scatters that were not associated with PAD have been located in almost all landform contexts;
- artefact scatters associated with PAD were also located in almost all landform contexts, however, there was a dominance of sites on lower slopes and close to watercourses assessed/found to have PAD
- overall the majority of isolated find and artefact scatter sites were located on lower slopes and adjacent to watercourses, sometimes on benches above the watercourse
- isolated finds and artefact scatters were also commonly found on spur crests/spur crests and associated slopes that lead down to a watercourse
- all but two of the artefact scatter sites with more than 50 artefacts were located on low spurs and associated slopes leading down to a watercourse or on lower slopes close to watercourses
- scarred trees are moderately rare site types
- scarred trees are not often associated artefacts or with PAD
- grinding bowls are extremely rare site types within what is generally a granitic geological area
- scarred trees were most often located in landforms away from the lower slopes and watercourses on the midslopes, spur crests and in saddles
- stone arrangements are extremely rare site types

- the stone arrangements were not associated with PAD and as there is only two and they are in different landforms there is no discernible pattern for their position in the landscape. It is noted, however, that their uses were very different. One was a burial and it was on a crest, the other was part of a ceremonial ground and it was in a hidden valley on the lower slope.

The archaeological context drawn from the results of prior survey and subsurface investigations also indicated that:

- there are two known sites within the proposed quarry within the Granite Pit Area. These are LA31 (#51-6-0386) a small artefact scatter and LA32 (#51-6-0387) an isolated find
- LA33 (#51-6-0388) an isolated find is outside the area proposed for impact within the Granite Pit Area
- there is a known artefact scatter (MRN25) within the haul road footprint for the Granite Pit Area but within the Approved Project Area
- the camp site/possible campsite site distribution pattern within the Approved Project Area was assessed as likely to reflect movement into the area from the north-west, west and south to attend ceremony. As the Granite Pit Area is to the north-west it can be expected that it may contain sites related to Aboriginal people moving south-east to attend ceremony
- flakes, broken flakes and flaked pieces were the dominant artefact types recorded with smaller numbers of retouched flakes and cores. Implement types such as stone axes and hammerstones were rare
- quartz and silcrete were the dominant raw materials used for artefact manufacture with other raw materials such as quartzite, chert, dolerite, hornfels, volcanic, petrified wood, chalcedony, ignimbrite, granite and aplite also present but forming a minor proportion of the assemblage
- the source of the majority of the raw materials is likely to be at a distance from the Granite Pit Area with the exception of dolerite, aplite, ignimbrite and granite which would be available either within the Granite Pit Area (ignimbrite, aplite and granite) or in areas adjacent to the Granite Pit Area. However, these generally inferior raw materials will always form a minor proportion of any assemblage
- the locally available raw materials are highly unlikely to have been quarried, but rather just picked up off the ground, flaked and used expediently
- sites with low numbers of surface artefacts generally also had low numbers of subsurface artefacts with the exception of sites located on spur crests and adjoining short, low gradient slopes down to creeklines and thus in proximity to a water source
- the high number of isolated finds and small artefact scatters represents a general low density background scatter of artefacts that most likely reflects transient use of the landscape rather than periods of camping with just a few locations with large assemblages being used for camping
- due to the intensity of European land-use practices and the sandy nature of the soils, stratigraphic integrity of site soil profile is highly unlikely, though some spatial integrity may remain in those sites/PADs with relatively deep A1/A2 soil horizons

- from the available literature it appears that within the broader Marulan area 81 sites (10 scarred trees, 25 isolated finds, 44 artefact scatters, one stone arrangement and a boulder containing a grinding bowl) have been proposed for conservation. Six of the artefact scatters, one isolated find and one scarred tree were in the Lockyersleigh Granite and were assessed as having moderate to high or high likelihood of PAD, one artefact scatter was described as in deposits on a creek margin and was assessed as having moderate to high likelihood of PAD. Of the remaining sites, 49 were in the Bindook Porphyry Complex and were assessed as having from low to a high likelihood of PAD (refer to **Section 8.0** for further details and **Table 2** in **Appendix E** for a summary of sites proposed for conservation). It is noted that the sites proposed for conservation within the Lockyersleigh Granite (Saunders 2005) have at the time of writing not been placed into conservation corridors as the proposed development did not proceed. It is further noted that of the 81 sites proposed for conservation 66 are in the Approved Project Area.

Predictive Model for the Granite Pit Area

The following predictive model for the Granite Pit Area is based on the implications drawn from the Aboriginal cultural, environmental and archaeological context discussed throughout **Sections 3.1 to 3.3**.

Sites Likely to Occur in the Granite Pit Area

For the Granite Pit Area it can be predicted that:

- artefact scatters and isolated finds will be the most likely site types (it is noted that two isolated finds and one artefact scatter are already known within the Granite Pit Area and one artefact scatter is known within the Approved Project Area where impact is proposed from haul road construction)
- artefact scatters and isolated find sites will occur in most landform contexts, however, they are most likely to be located in association with the tributaries of Lockyersleigh Creek, on benches near creeklines and on the spur crests
- artefact scatters and isolated finds with PAD are most likely to be located in association with the tributaries of Lockyersleigh Creek that carry flow from outside the Granite Pit Area, on benches near the creeklines and on the spur crests (if there is sufficient soil depth) and their associated low gradient slopes leading down to a watercourse that has at least semi-permanent water
- if a major camp site is located within the Granite Pit Area it is most likely to be located in an area with a reliable source of water and with access to sufficient plant and animal foods to sustain a small group of people for several days
- scarred trees are likely if mature trees remain
- the scarred trees are most likely to be located on spur crests and on midslopes.

Sites Not Likely to Occur in the Granite Pit Area

For the Granite Pit Area it can be predicted that:

- grinding grooves used for the sharpening of axes, hatchets, chisels and/or fire hardened wooden or bone spear points will not occur due to the lack of sandstone geology
- rockshelters with PAD or art are unlikely due to the nature of the geology
- stone arrangements and burials are extremely rare site types and are unlikely to be located
- grinding bowls are also extremely rare site types in the geology and are unlikely to be located

- carved trees associated with ceremony and burials are rare site types and unlikely to be located
- quarries for the extraction of stone for stone implement manufacture are unlikely due to the poor knapping quality of the local raw materials.

Site Contents

For the Granite Pit Area it can be predicted that:

- flakes, broken flakes and flaked pieces will be the dominant artefact types located within sites/PADs with smaller numbers of retouched flakes and cores. Implement types such as stone axes and hammerstones are unlikely
- quartz and silcrete will be the dominant raw materials used for artefact manufacture with other raw materials such as quartzite, chert, dolerite, hornfels, volcanic, petrified wood, chalcedony, ignimbrite, granite and aplite forming a minor proportion of any assemblages
- the source of the majority of the raw materials is likely to be at a distance from the Granite Pit Area with the exception of dolerite, aplite, ignimbrite and granite which would be available either within the Granite Pit Area (ignimbrite, aplite and granite) or in areas adjacent to the Granite Pit Area (dolerite). If the local raw materials (aplite, granite, ignimbrite) are found as outcrops in the Granite Pit Area it is unlikely that they will have been quarried and that any local material used would have just been picked up from the surface, flaked and used expediently.

Soil Profile Integrity

It can be predicted that due to 187 years of agricultural practices and erosion and downslope movement of the sandy soils that the majority of sites and areas of PAD (if any) located within the Granite Pit Area are unlikely to have soil profiles that retain stratigraphic integrity. Though some spatial integrity is possible in sites/PADs with relatively deep A1/A2 soil horizons.

Archaeological Terrain Units (ATUs)

ATUs are designated based on a combination of factors. For the Lynwood Quarry Project Area (the Approved Project Area), OEH (then DECC) requested that the area be divided into ATUs specifically to form the basis of the subsurface testing program (Umwelt 2007a). The Approved Project Area was subsequently subdivided into ATUs based on:

- stream order
- geology and soils
- topography - landform element and gradient (following McDonald, Isbell, Speight, Walker and Hopkins (1990))
- Aboriginal cultural context (ethnography and Aboriginal oral history).

Thus the ATUs took into account both the environmental and Aboriginal cultural context of the Approved Project Area. The implications of these contexts for the Granite Pit Area are discussed in **Sections 3.1.3, 3.2.6 and 3.3.4.**

Rationale for Use of Archaeological Terrain Units for the Granite Pit Area

It was assessed that the most appropriate way in which to design the survey strategy for the Granite Pit Area and to analyse the results of the survey, was to divide the area into ATUs so that direct comparisons could be made between the Granite Pit Area and the adjacent Approved Project Area. It was also proposed that this would enable any requisite subsurface testing program/salvage program to be undertaken post approval in a comparable manner and utilising a variation to the existing s.87/90 AHIP #1100264. In this way the Research Design and Methodology prepared for the Approved Project Area could also be used for the Granite Pit Area and earlier conclusions in relation to Aboriginal use of the landscape could be analysed, revised as required and built upon.

Figure 4.1 shows the Granite Pit Area divided into ATUs using the same criteria as used for the Approved Project Area. A total of nine ATUs have been identified using topographic mapping with two metre contour intervals and later adjusted based on the results of the survey. The ATUs include:

- 2BP – High Point on Rocky Spur Crest in Bindook Porphyry Complex
- 2LG - High Point on Rocky Spur Crest in Lockyersleigh Granite
- 4BP – Spur Crest in Bindook Porphyry Complex
- 4LG – Spur Crest in Lockyersleigh Granite
- 6BP – Gentle Slope in Bindook Porphyry Complex
- 6LG – Gentle Slope in Lockyersleigh Granite
- R6BP – Gentle Slope in Riparian Corridor in Bindook Porphyry Complex
- R6LG – Gentle Slope in Riparian Corridor in Lockyersleigh Granite
- R6DS – Gentle Slope in Riparian Corridor in Deep Sand.

Aboriginal Archaeological Sites Predicted within the Archaeological Terrain Units

ATU2BP and ATU2LG – High Point on Rocky Spur Crest

Only isolated finds and small to moderate artefact scatters are likely. PAD is unlikely unless rock outcrop prevents the downslope movement of artefacts and/or is of sufficient height to provide shelter from the wind or sun. Fragmented rock exposed on the surface may be used for expedient implement manufacture.

ATU4BP and ATU4LG – Spur Crest

Isolated finds and small to large artefact scatters are likely – especially on benches in proximity to a creekline. Some isolated finds and artefact scatters may have PAD if topsoil is of sufficient depth. It is also possible that scarred trees may occur where mature trees remain. Fragmented rock exposed on the surface may be used for expedient implement manufacture.

ATU6BP and ATU6LG – Gentle Slopes

Isolated finds are likely in any landform. Small to medium sized artefact scatters are likely up to 100 metres from creeklines. PAD is only likely on the lower slope and especially on benches. Scarred trees are likely on midslopes if mature trees remain but these will not be directly associated with artefacts or PAD.

ATUR6BP and ATUR6LG – Gentle Slope in Riparian Corridor

Isolated finds and small to large artefact scatters are likely for those areas where the creeklines carry flow from outside the Granite Pit Area. PADs are possible in these ATUs in areas of gentle gradient and on elevated benches.

ATUR6DS – Gentle Slope in Deep Sand

There is only one small area represented by this ATU and it is on a second order tributary of Lockyersleigh Creek in the north of the Granite Pit Area. There is a previously recorded small artefact scatter site in this location (LA31) and it is likely that this site will be associated with PAD incorporating moderately high numbers of subsurface artefacts.

Survey Methodology

The survey methodology was prepared taking into account the following requirements:

- to survey an adequate sample of all of the ATUs present in the Granite Pit Area
- to survey an adequate sample of those areas proposed for impact for the quarry pit, bund, overburden emplacement area, water infrastructure and the haul road
- to afford the opportunity for the registered Aboriginal parties to visit the three sites previously recorded by Saunders within the Granite Pit Area and the additional five sites located during the preliminary inspection
- to revisit MRN25 (within the Approved Project Area) to discuss site management
- to ensure that the registered Aboriginal parties were comfortable with the survey effort.

Figure 5.2 indicates the survey transects endorsed by the registered Aboriginal parties and subject to pedestrian survey over the period 29 June 2015 to 3 July 2015. In general each transect was walked with the survey participants at roughly 10 to 20 metre intervals. The riparian corridors were subject to pedestrian transects each side of the creekline and covering an area of approximately 50 metres from the banks of the creeklines. The Track transects covered the width of the track and approximately 5 metres either side of the track. The remainder of the survey transects were approximately 50 metres in width.

Survey Results

Figure 5.3 shows the location of the sites and the areas of PAD recorded during both a preliminary inspection in November 2014 and the full survey of the Granite Pit Area undertaken with the registered Aboriginal parties in June and July 2015. The figure also indicates the locations of the previously recorded sites. The survey results were as follows:

- there was a total of 14 pedestrian transects across the ATUs, eight pedestrian transects associated with each side of the tributaries of Lockyersleigh Creek and three transects that followed existing tracks across multiple ATUs. The track transects provided far better ground surface visibility
- in general ground surface visibility was poor across the Granite Pit Area due to thick grass cover
- there were isolated mature eucalypts and patches of mature eucalypts across the Granite Pit Area, however, in general it had been heavily cleared and subject to downslope movement of the sandy soils

- rabbit and wombat warrens were common across the Granite Pit Area which while causing ground disturbance also allowed for the exposure of artefacts which would otherwise have not been visible
- a total of five isolated finds were recorded in the Granite Pit Area. Two of these were the previously recorded LA32 and LA33 (Saunders 2005). The artefacts previously recorded at these two isolated find locations could not be found despite relatively good visibility in the areas inspected
- a total of eight artefact scatters were recorded in the Granite Pit Area including the previously recorded LA31 site (and not including the previously recorded MRN25 site within the Approved Project Area)
- a total of six PADs were identified and recorded across the Granite Pit Area. Two of the PADs (PAD1 (incorporating PAD1E and PAD1W) and PAD3) were within site areas assessed as likely to have further subsurface archaeological material (LA31 and LKAS1), three PADs were within proximity of a site/sites and assessed as likely to have subsurface archaeological material (PAD4, PAD5 and PAD6) and one was in a location chosen for its Aboriginal cultural values, outlook and likelihood of subsurface archaeological material (PAD2)
- a seventh PAD was associated with the MRN25 site in the Approved Project Area and within the proposed haul road footprint for the Granite Pit
- there were two scarred trees recorded and their cultural origin has been confirmed by an arborist (UTM 2015)
- the majority of the isolated finds and artefact scatters were located in association with the tributaries of Lockyersleigh Creek that flowed from outside the Granite Pit Area and which were more reliable water sources (e.g. the tributary in the north and the tributary in the south-east of the Granite Pit Area)
- the most extensive artefact scatter and PAD area was at the previously recorded LA31 site in the north of the Granite Pit Area. However, during the survey it was found that the site area was far more extensive than previously recorded by Saunders in 2005 and that artefacts were more abundant. The site/PAD area extended to the north and south of the Saunders site recording and onto the eastern side of the tributary
- the second most extensive site and PAD area was the MRN25 artefact scatter which while being in the Approved Project Area will be impacted by haul road construction for the modification. It is noted that the area of MRN25 is based on prior subsurface testing results (Umwelt 2009b)
- of the five isolated finds three will be impacted by the proposed modification (LKIF2, LKIF3 and LA32). LKIF1 and LA33 are outside the Granite Pit Area disturbance footprint
- of the nine artefact scatters seven will be impacted by the proposed modification (LKAS1, LKAS2, LKAS3, LKAS4, LA31W, LA31E and MRN25). LKAS5 and LKAS6 are outside the Granite Pit Area disturbance footprint
- all six PADs are within the Granite Pit Area (it is noted that no areas outside the Granite Pit Area disturbance footprint were assessed as having PAD apart from MRN25)
- both of the scarred trees are within the Granite Pit Area disturbance footprint
- the main raw materials used for artefact manufacture were quartz, silcrete, dolerite, quartzite and chert. There was also a single granite grindstone
- quartz pebbles and reef quartz that was not artefactual were exposed across the area by erosion.

Please refer to **Section 5.5** for detailed site and PAD descriptions.

AHIP Subsurface Testing Requirements of Sites and Archaeological Terrain Units

As part of the survey process the boundaries of the ATUs were refined and consideration was given to the area within each ATU that would be subsurface tested in accordance with the requirements of a variation to s.87/90 AHIP #1100264 (refer to **Appendix A** and **Appendix J**). Due to the limited number of ATUs (nine relative to the 34 within the Approved Project Area) it is possible to combine ATU testing with site and PAD testing as indicated in **Table 1**. It is noted that some site/PAD areas actually crossed ATU boundaries.

Table 1 Sites and Archaeological Terrain Units Proposed for Subsurface Testing

Archaeological Terrain Unit	Site/Potential Archaeological Deposit
2LG - High Point on Rocky Spur Crest in Lockyersleigh Granite	PAD2 high point on low rocky spur crest PAD4 high point on high rocky spur crest
2BP – High Point on Rocky Spur Crest in Bindook Porphyry Complex	N/A The majority of the 2BP ATU is outside the Granite Pit Area disturbance footprint. There is only one area approximately 100 m x 10 m and this area is totally rock outcrop with almost no soil and therefore unsuitable for testing.
4BP – Spur Crest in Bindook Porphyry Complex	MRN25 and PAD (already subsurface tested and in Approved Project Area) LKAS1 and PAD3 (on a bench)
4LG – Spur Crest in Lockyersleigh Granite	PAD5 (on a bench)
6BP – Gentle Slope in Bindook Porphyry Complex	Part PAD6
6LG – Gentle Slope in Lockyersleigh Granite	LA31W and PAD1W Part of LA31E and PAD1E
R6BP – Gentle Slope in Riparian Corridor in Bindook Porphyry Complex	Part PAD6
R6LG – Gentle Slope in Riparian Corridor in Lockyersleigh Granite	Part LA31E and PAD1E
R6DS – Gentle Slope in Riparian Corridor in Deep Sand	Part LA31E and PAD1E

Those sites not listed in **Table 1** were assessed as unsuitable for subsurface testing due to their location within an area of dense wombat burrows (LKIF1, LKIF3), rabbit burrows (LKAS2), were on tracks where no topsoil was retained (LKIF2, LKAS4), could not be located and were within proximity to an area to be subsurface tested (LA32), or were outside the area to be impacted (LKAS5, LKAS6, LA33). In the case of the scarred trees (LKAS1 and LKAS2) neither was assessed as in an area likely to retain PAD due to topsoil loss and disturbance.

During the survey process and at a meeting held at the Lynwood Office Complex on 3 July 2015 the subsurface testing of the sites, PADs and ATUs was discussed with the participating registered Aboriginal parties. Endorsement of the subsurface testing program set out above was provided by all registered Aboriginal party participants.

Aboriginal Cultural Significance

The registered Aboriginal parties participating in the survey identified that all of the sites/PAD located were of high Aboriginal cultural heritage significance. The two scarred trees (LKST1 and LKST2) and the LA31E/PAD1E and LA31W/PAD1W combined site area and LKAS1/PAD3 were assessed as highly significant.

Archaeological Significance

The archaeological significance (research potential) of each of the sites and PADs was assessed on a local and regional level based on rarity, representativeness, connectedness, complexity, integrity and potential for archaeological deposit.

- no sites/PADs were assessed as having high archaeological significance
- MRN25 and PAD, LA31W/PAD1W and LA31E/PAD1E were assessed as having moderate to high archaeological significance
- LKST1, LKST2, LKAS1/PAD3 and PAD4 were assessed as having moderate archaeological significance
- PAD2, PAD5 and PAD6 were assessed as having the potential for low to moderate archaeological significance
- LA32, LA33, LKIF1, LKIF2, LKIF3, LKIF4, LKAS2, LKAS3, LKAS4 and LKAS5 were assessed as having low archaeological significance.

Sections 6.2.3.1 to 6.2.3.5 set out the justification for the archaeological significance assessments.

Impact Assessment

The impact assessment made the following conclusions (refer to **Figure 5.3** and **Figure 5.4**):

- almost all of the area of the Lockyersleigh Granite ATUs within the Granite Pit Area will be impacted in a manner that will cause the destruction/partial destruction of any sites or PADs they may contain
- only small areas of the Lockyersleigh Granite ATUs will not be impacted directly by proposed works including small areas of ATUs R6DS, 4LG, 6LG and R6LG that are on the far northern and far western perimeter of the Granite Pit Area
- only two of the known sites (LKAS5 in R6LG and LKAS6 in 6LG) can be managed for their conservation within these areas under the proposed quarry plan
- the small area mapped as Deep Sands (DS) in the Lockyersleigh Granite within the Granite Pit Area will be partially impacted (LA31W/PAD1W area) under the proposed quarry plan
- it is possible that parts of LA31E/PAD1E and LA31W/PAD1W could be conserved on the northern perimeter of the Granite Pit Area, however, this would be difficult to manage due to the proximity to the quarry pit boundary and due to proposed water management infrastructure and bund construction in this area
- all of ATU 2LG will be impacted
- almost all of the area of the Bindook Porphyry Complex ATUs are outside of Modification Project disturbance footprint

- only small areas of the Bindook Porphyry Complex ATUs will be impacted directly by proposed works including a tiny area of ATU 2BP (no sites or PADs), small areas of ATUs R6BP and 6BP in the south-east proposed for water management infrastructure which will impact LKAS3 and PAD6; an area of 6BP in the north-west proposed for the quarry and a dam and inundation from the dam, which will impact LKAS1/PAD3; and the haul road which will impact ATU 4BP in the area of MRN25 which is outside the Granite Pit Area
- three of the five isolated finds will be impacted (LKIF2, LKIF3 and LA32)
- two of the isolated finds are outside the Modification Project disturbance footprint (LKIF1, LA33) and can be managed for their conservation
- seven of the nine artefact scatters (LKAS1, LKAS2, LKAS3, LKAS4, LA31E, LA31W, MRN25) will be impacted and five of the impacted artefact scatter sites will be totally destroyed (LKAS1, LKAS2, LKAS3, LKAS4, MRN25) under the proposed quarry plan
- two of the artefact scatters (LKAS5, LKAS6) are outside the Granite Pit Area disturbance footprint and can be managed for their conservation
- one of the scarred trees (LKST2) is within the quarry footprint and will be impacted by blast vibration early in the quarry plan and eventually will be impacted and destroyed by quarrying unless it is removed
- one of the scarred trees (LKST1) is within the bund footprint. The bund cannot be redesigned to avoid impacting the scarred tree. The scarred tree if left would also be impacted by vibration from blasting which would increase in intensity as the quarry pit approaches the tree late in the life of the quarry and thus blast vibration would also have adverse affects to the tree and/or scar unless it is removed
- all of the six PADs will be impacted (it is noted that areas outside of the disturbance footprint of the Granite Pit Area but within the Granite Pit Area were assessed for PAD but none was identified due to high levels of topsoil loss and/or disturbance)
- all of the sites of moderate to high (LA31E, LA31W and MRN25) and moderate (LKAS1, LKST1 and LKST2) archaeological significance within the Granite Pit Area will be impacted
- all of the sites/PADs of very high Aboriginal cultural significance (LA31E/PAD1E, LA31W/PAD1W, LKAS1/PAD3, LKST1 and LKST2) within the Granite Pit Area will be impacted.

Overall impact of varying extent is proposed for 60 per cent of the isolated finds, 78 per cent of the artefact scatters and 100 per cent of the scarred trees and 100 per cent of the PADs within the Granite Pit Area (including MRN25 and PAD in the Approved Project Area to be impacted by the proposed haul road). Impact of varying extent is proposed for 100 per cent of the sites of moderate to high and moderate archaeological significance and of very high Aboriginal significance.

Overall impact of approximately 90 per cent of the Lockyersleigh Granite ATUs and 20 per cent of the Bindook Porphyry Complex ATUs is proposed within the Granite Pit Area.

Management Options

Conservation – Current Conservation Program in the Approved Project Area

An important aspect of the management of Aboriginal archaeological sites and ATUs within the Approved Project Area is the conservation of a representative sample of site types within the various ATUs present in that project area. Of the 34 ATUs identified within the Approved Project Area:

- 4 (4SD, R6AD, R7AD, 7AD) will be/have been impacted in total or will have only small areas remaining in association with active quarrying and infrastructure²
- 18 will be/have been partially impacted (i.e. only parts of the ATU will be impacted and/or at least one similar ATU will be conserved outside the disturbance footprint and within the broader Project Area and/or the Cultural Heritage Management Zone (CHMZ))
- 8 will be/have been subject to only minor impact (i.e. part of an ATU is crossed by a road or is peripheral to a disturbance area and other similar ATUs fall outside the disturbance footprint)
- 4 will not be impacted (S4DS, 7MG, R7PA, R7PAE).

Of the 100 known sites within the Approved Project Area:

- 34 will be/have been impacted by the currently approved Lynwood Quarry disturbance footprint including works associated with the Essential Energy infrastructure related to the Marulan Electricity Supply Upgrade
- 54 sites have been conserved *in-situ* and will continue to be managed for conservation during the 30 year life of the quarry
- 12 sites have been conserved long term within the CHMZ.

Proposed Additional Conservation and Management Measures for the Granite Pit Area

Archaeological Terrain Units

Nearly all of the ATUs within the Bindook Porphyry Complex currently proposed for partial impact within the Granite Pit Area are currently being managed for their long-term conservation in the Lynwood Quarry CHMZ (4BP, 6BP and R6BP) or for their conservation over the 30 year life of the quarry within the Approved Project Area (2BP, 4BP, 6BP and R6BP). Holcim Australia proposes to set aside additional areas of each of these ATUs (with the exception of ATU 2BP), plus ATUR7BP and the sites and PADs they contain in an extended CHMZ within the Approved Project Area to offset the additional impacts to these ATUs within the Granite Pit Area.

However, none of the ATUs associated with the Lockyersleigh Granite (2LG, 4LG, 6LG, R6LG) or in the Deep Sands (R6DS) in the Lockyersleigh Granite are being conserved within the Approved Project Area as the appropriate geology is not present. Thus there is currently no conservation outcome for the ATUs in the Lockyersleigh Granite and Deep Sands in the Lockyersleigh Granite, though it is noted that the Lockyersleigh Granite does extend outside the Granite Pit Area to the north, south and west and into areas that are currently used for agricultural purposes. Based on the lack of ATUs currently conserved in the Lockyersleigh Granite and the knowledge that they do currently exist and are not being impacted by development (other than ongoing agricultural processes), and on the inability of Holcim Australia to offset these ATUs, Holcim Australia has committed to:

² In relation to the three ATUs that will be totally or almost totally impacted, it should be noted that they only occur as restricted areas within the Approved Project Area and that these ATUs do re-occur outside the Approved Project Area.

- the fencing and signage of the sites and PADs within the Lockyersleigh Granite ATUs, monitoring in accordance with a variation to s.87/90 AHIP #1100264 and their active management until 12 months prior to their impact
- the subsurface testing and salvage (as required) of the sites and PADs within the Lockyersleigh Granite ATUs commencing 12 months prior to their proposed impact
- the long term conservation of additional ATUs and additional areas of ATUs within the CHMZ within the Approved Project Area as discussed above.

Sites and PADs

Two isolated finds, four artefact scatters, a stone arrangement and five scarred trees are currently conserved within the existing Lynwood Quarry CHMZ and thus have been afforded long term conservation. In addition, 19 isolated finds, 30 artefact scatters, one *in-situ* grinding bowl and four scarred trees are being managed for their conservation for the 30 year life of the quarry. Thus, a representative sample of the site types located within the Granite Pit Area disturbance footprint (including the haul road) and proposed for impact are already being conserved in the Approved Project Area, however, in the case of MRN25 and associated PAD and LA31E/PAD1E and LA31W/PAD1W and LKAS3/PAD3, no sites/PADs of similar size, complexity, integrity or research potential are being conserved long term within the Lynwood Quarry CHMZ. Therefore, an additional conservation outcome is proposed in order to offset the loss of these sites if the quarry plans cannot be modified to conserve the sites/PADs. As the modification of the quarry plan to allow the *in-situ* conservation of the sites is not seen as feasible due to the difficulty of managing accidental impact over the life of the quarry when they are in such close proximity to the disturbance footprint, an offset for their loss is proposed as appropriate.

As it is not possible to offset sites/PAD/ATUs within the Granite Pit Area that would act as an offset for impact to MRN25, LA31E/PAD1E, LA31W/PAD1W, LKAS1/PAD3 within the Granite Pit Area Holcim proposes to increase the area of the CHMZ in the Approved Project Area to incorporate the sites and PADs within the current Joarimin Creek Conservation Area (an area of approximately 1500 metres by 500 metres – and which incorporates a major camp site complex) and a corridor approximately 250 metres wide either side of the tributary of Joarimin Creek that will join the camp site complex to the CHMZ and incorporate it into the CHMZ. **Figure 8.1** shows the area of the proposed offset which Holcim Australia proposes as the enlarged CHMZ. The incorporation of this area into the CHMZ provides long term conservation of an additional 21 sites including three isolated finds, 17 artefact scatters, one boulder with a grinding bowl and five large areas previously identified as PAD. Overall the expanded CHMZ will incorporate 33 sites including a stone arrangement, five scarred trees, a grinding bowl, five isolated finds, 21 artefact scatters and five extensive areas of PAD.

The CHMZ is kept locked and is a protected area where access is not permitted to Holcim Australia employees without permission. The CHMZ is, however, available for access by the registered Aboriginal parties for visits and for teaching purposes. The CHMZ is also available for access for archaeological research purposes with approval of the registered Aboriginal parties on the Lynwood Aboriginal Heritage Management Committee. The Lynwood Aboriginal Heritage Management Committee includes representatives from GAHAI, GTCAC and PLALC and the committee is actively engaged in all aspects of CHMZ management.

This offset option was discussed with the registered Aboriginal parties participating in the survey on 29 June 2015 and again on 3 July 2015. It was agreed by all registered Aboriginal party participants at the July 2015 meeting that this conservation outcome would offset the loss of the isolated find and artefact scatter sites in the Granite Pit Area providing that adequate testing and salvage (as relevant) was still undertaken for the sites to be impacted. Holcim Australia has committed to this outcome.

In addition it is proposed to conserve for the remaining 23 year life of the Modification Project the LKIF1 and LA33 isolated find sites and the LKAS5 and LKAS6 artefact scatter sites that are outside the Granite Pit Area disturbance footprint. Holcim Australia has committed to this outcome and the sites will be fenced with appropriate signage and added to the annual site monitoring program.

Discussions were held with the registered Aboriginal parties during the survey and at the meeting on 3 July 2015 at the Lynwood Quarry Office Complex in relation to the removal of the scarred sections of LKST1 and LKST2 and their placement at the Holcim Australia site office complex with the MRN74 scarred tree. The participating registered Aboriginal parties endorsed the removal of the scarred section of the trees provided that they were actively conserved and that they were protected from the elements by a roof. The registered Aboriginal parties assessed that this was the best outcome for the ongoing conservation of the scarred sections of the trees.

In relation to both LKST1 and LKST2, discussion was undertaken on 10 June 2015 with an arborist, who is a scarred tree removal specialist to ascertain the feasibility of the removal of the scarred sections of the trees and their ongoing conservation at the Lynwood Office Complex. Danny Draper (UTM 10 June 2015) assessed that removal of the trees without damaging the scars was feasible.

Intergenerational Equity

In summary, it is assessed that the management outcomes proposed, when added to the existing Lynwood Quarry conservation strategy, met the requirements of Intergenerational Equity. This assessment was supported by the registered Aboriginal parties.

Cumulative Impact

Cumulative impact to the Aboriginal cultural heritage and archaeological resource in the general Marulan area is considered within this ACHAA from a number of perspectives including:

- impacts on sites and conservation outcomes related to local development (including the Granite Pit Area and the Approved Project Area)
- ongoing impacts from local agricultural activities outside areas of local development
- ongoing impacts from natural and feral biological agents (wombats and rabbits) and natural geomorphological process.

In light of the criteria above, it was found that in the Marulan area the only places where Aboriginal sites and PADs and the landscapes (ATUs) in which they are located are known to be being actively conserved, is in conservation zones in association with Lynwood Quarry and the Peppertree Quarry to the south-east. Taking this into account it is assessed that the development of the Granite Pit Area as a quarry will do little to add to the cumulative impact on Aboriginal sites and PADs in an area predominantly used for agricultural processes which act to destroy/damage sites and PADs. Furthermore, the additional conservation of sites and PADs within the Approved Project Area proposed as an offset for impact to sites and PADs and their associated ATUs within the Granite Pit Area, will provide for the ongoing preservation of a representative sample of sites and PADs and their associated ATUs, an outcome not assessed as possible by simply leaving the land for continued use for agricultural purposes.

Management Strategy

General Recommendations

The following general recommendations have been supported by all four registered Aboriginal parties and will be implemented by Holcim Australia as part of the Modification Project:

1. Holcim Australia to apply to the OEH for a variation to existing s.87/90 AHIP #1100264 to include the subsurface testing and salvage (as required) of the known sites and PADs, and subsequent impact to the known sites and PADs by works within the Granite Pit Area disturbance footprint.
2. Holcim Australia to apply for a variation to Care Permit #2761 (related to s.87/90 AHIP #1100264 and approved by OEH on 20 May 2009) to allow ongoing Care of any artefactual material recovered from the Granite Pit Area (refer to **Section 9.3** for details).
3. Holcim Australia to provide for all subsurface testing, salvage, artefact analysis and reporting to be undertaken in accordance with the Research Design and Methodology previously endorsed by the registered Aboriginal parties and OEH and in compliance with the variation to s.87/90 AHIP #1100264 (refer to **Section 9.4** and **Appendix J** for details).
4. Holcim Australia to set aside the extended CHMZ within the Approved Project Area as shown of **Figure 8.1**.
5. Holcim Australia to stage the subsurface testing and salvage program and scarred tree removal program for the Granite Pit Area so that these management measures are not implemented until 12 months prior to any proposed impact.
6. Holcim Australia to revise the existing AHMP (Umwelt 2011a) to include all the relevant management outcomes for known sites and PADs within the Granite Pit Area and to update the management outcomes for the known sites and PADs within the extended CHMZ in compliance with the variation to s.87/90 AHIP #1100264 (refer to **Section 9.4**).
7. Holcim Australia to make all relevant personnel and contractors aware of the requirements of s.87/90 AHIP #1100264 and the revised AHMP.
8. All Holcim Australia personnel and contractors working in the Granite Pit Area will undertake the Holcim Australia Aboriginal Cultural Heritage Awareness Training package that forms part of the Holcim Australia induction procedure.
9. All Holcim Australia personnel and contractors working in the Granite Pit Area will be made aware of the requirement to retain all works inside the approved and fenced disturbance boundary.
10. In compliance with the revised AHMP and s.87/90 AHIP #1100264, in the event that previously unknown artefactual material is uncovered during quarry development/quarry operations, ground disturbance works should cease and OEH and the registered Aboriginal parties should be contacted so that appropriate management strategies can be identified. Work may recommence at a distance approved by OEH and in consultation with the registered Aboriginal parties.
11. In the event that any skeletal material of possible human origin is uncovered during the proposed works, ground disturbance works should cease to allow management in accordance with the *Skeletal Remains – Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977* (NSW Heritage Office 1998) and the *NPW Act* (1974). This would first involve notification of local police and, for potential Aboriginal remains, the OEH Enviro Line and registered Aboriginal parties; followed by an inspection by a physical or forensic anthropologist/archaeologist to determine the ancestry and antiquity of the remains, on which basis appropriate management strategies will be identified. Work

may recommence at a distance approved by the OEH and in consultation with the registered Aboriginal parties.

Specific Recommendations

The management strategy includes specific recommendations relating to each of the sites, PADs and associated ATUs within the Granite Pit Area. The specific recommendations have been supported by all four registered Aboriginal parties.

Figure 9.1 indicates the locations of Aboriginal sites and areas identified as PADs, which have been colour coded to indicate the proposed management recommendations. **Table 2** provides the specific management recommendations and lists these relevant to the sites/PADs.

Table 2 Specific Management Recommendations

Management Recommendation	Sites/PADs/ATUs
Fence the site and PAD area until 12 months prior to impact. Monitor the site condition as required under the variation to s.87/90 AHIP #1100264. Prior to impact subsurface test the site/PAD/ATU area and undertake salvage (if required) following further consultation with OEH and the registered Aboriginal parties and as required by the variation to s.87/90 AHIP #1100264. Analyse artefacts and prepare a report that adds to the information presented in Umwelt 2013. Offset loss by the long term conservation of site/sites/ATU of similar Aboriginal cultural and archaeological value.	#51-6-0782 LA31E including PAD1E (ATU R6LG and 6LG) #51-6-0783 LA31W including PAD1W (ATU R6DS and ATU 6LG) #51-6-0784 LKAS1 and PAD3 (ATU 4BP)
Prior to impact undertake salvage of the site/ATU as required by the variation to s.87/90 AHIP #1100264. Analyse artefacts and prepare a report that adds to the information presented in Umwelt 2013. Offset loss by the long term conservation of site/sites/ATUs of similar Aboriginal cultural and archaeological value.	#51-6-0299 MRN25 and PAD (ATU 4BP)
Fence the site area until 12 months prior to impact. Monitor the site condition as required under the variation to s.87/90 AHIP #1100264. Surface Collection only. Analyse artefacts and prepare a report that adds to the information presented in Umwelt 2013. Offset loss by the long term conservation of site/sites/ATUs of similar Aboriginal cultural and archaeological value.	#51-6-0769 LKIF2 (ATU R6LG) #51-6-0771 LKIF3 (ATU 6BP) #51-6-0785 LKAS2 (ATU 6BP) #51-6-0779 LKAS3 (ATU R6BP) #51-6-0778 LKAS4 (ATU R6LG) #51-6-0387 LA32 (ATU4LG)

Management Recommendation	Sites/PADs/ATUs
Fence, sign and monitor as required under the variation to s.87/90 AHIP #1100264. Conserve <i>in-situ</i>.	#51-6-0769 LKIF1 (ATU R6BP) #51-6-0780 LKAS5 (ATU R6LG) #51-6-0781 LKAS6 (ATU 6LG) #51-6-0388 LA33 (ATU 4BP)
Fence the site until 12 months prior to impact. Monitor the site condition as required under the variation to s.87/90 AHIP #1100264. Prior to impact the scarred section of the tree will be removed by an expert arborist using a methodology endorsed by OEH and developed in consultation with the registered Aboriginal parties and Holcim Australia and transported to the Lynwood Office Complex and placed with the MRN74 scarred tree in a roofed enclosure where it will be subject to ongoing management for its conservation. Offset loss by the long term conservation of site/sites of similar Aboriginal cultural and archaeological value.	#51-6-0772 LKST1 (ATU 4LG) #51-6-0773 LKST2 (ATU 4LG)
Fence the PAD area until 12 months prior to impact. Monitor the PAD condition as required under the variation to s.87/90 AHIP #1100264. Prior to impact subsurface test the PAD/ATU area and undertake salvage (if required) following further consultation with OEH and the registered Aboriginal parties and as required by the variation to s.87/90 AHIP #1100264. Analyse artefacts and prepare a report that adds to the information presented in Umwelt 2013. Offset loss by the long term conservation of a PAD/ATU of similar Aboriginal cultural and archaeological value.	#51-6-0774 PAD2 (ATU 2LG – low spur) #51-6-0775 PAD4 (ATU 2LG - high spur) #51-6-0776 PAD5 (ATU 4LG) #51-6-0777 PAD6 (ATU R6BP and 6BP)

Care and Control

It is proposed that the care and control of all 'Aboriginal objects' (stone artefacts) recovered from the Granite Pit Area disturbance footprint will be undertaken in compliance with a variation to existing 'Care' Permit #2761 (related to s.87/90 AHIP #1100264 approved 20 May 2009). In line with the existing Care Permit until such time as the final artefact analysis and reporting are completed the artefacts recovered as part of the Granite Pit Area investigation will be temporarily stored in a secure location by the archaeologists undertaking the artefact analysis as per Schedule D of s.87/90 AHIP #1100264.

Following completion of all artefact analyses and reporting and in compliance with the existing Care Permit the artefacts will be returned to the Lynwood Office Complex within the Approved Project Area for ongoing safekeeping within a secure environment. Some artefactual material may be placed on display in a securely locked cabinet in consultation with the registered Aboriginal parties.

Revisions to the Aboriginal Heritage Management Plan

The current Lynwood Quarry AHMP (Umwelt 2011a) will require revision following Holcim Australia obtaining approval for the modification. The current AHMP is based on the conditions of s.87/90 AHIP #1100264 and has been approved by DP&E and OEH. The revisions will include adding the Granite Pit Area and the management recommendations specific to that area.

Research Design and Methodology and Reporting

All subsurface testing, salvage and artefact analysis has been undertaken throughout the life of the Approved Project Area using a consistent Research Design and Methodology (Umwelt 2007c, 2008d, 2008f, 2009a) and reporting process (Umwelt 2008a, 2008e, 2009b 2013). It is proposed that all post approval archaeological investigations for the Granite Pit Area will be undertaken using the same research design and methodology with the aim of obtaining comparable results that can be used to continue to refine interpretations of Aboriginal use of the Marulan landscape and to continue to refine answers to the research questions set by the registered Aboriginal parties and endorsed by OEH. Details of the Research Design and Methodology and reporting process are included in **Appendix J**.

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1.0 Introduction

Lynwood Quarry is located west of Marulan, in the Southern Highlands region of NSW, approximately 160 kilometres south-west of Sydney and approximately 27 kilometres north-east of Goulburn, NSW (refer to **Figure 1.1**). Marulan is located within the traditional Country of the Gundungurra³ People (Tindale 1974, Smith n.d.) and within the Pejar Local Aboriginal Land Council (PLALC) boundary. The Marulan area is of high cultural heritage significance to the Gundungurra People and Aboriginal people that have historic and contemporary association with the Country of the Gundungurra.

Holcim (Australia) Pty Ltd (Holcim Australia) was granted development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in December 2005 (DA 128-5-2005) by the [then] NSW Minister for Infrastructure and Planning to construct and operate Lynwood Quarry until 1 January 2038 (the Approved Operations). The Lynwood Quarry consent has an approved production rate of up to 5 million tonnes per annum (Mtpa), includes a processing plant, road and rail loading facility and is approved to transport up to 1.5 Mtpa of product by truck and up to 5 Mtpa by rail (refer **Figure 1.2**). DA 128-5-2005 was most recently modified in 2011, to provide for the reconfiguration of the rail line from a balloon loop to a rail spur and associated changes to the infrastructure layout.

Holcim Australia commenced operational readiness works in the approved quarry pit or extraction area (an ignimbrite resource) in 2012, with operations commencing in late 2015. Material extracted from the approved Lynwood Quarry pit (the Approved Pit) was used in the onsite civil works and to prepare the quarry pit for operation (e.g. removing overburden to expose the ignimbrite resource).

During the operational readiness works, further drilling and material testing has revealed that the resource in the Approved Pit is more variable than anticipated and substantial areas are characterised by more significant concentrations of intense fracturing, alteration, clay, or a combination of these characteristics, than was detected during the earlier resource assessment investigations. The variability and complexity of the approved Lynwood Quarry resource will challenge Holcim Australia's ability to consistently supply in-specification products from Lynwood Quarry to the market.

Holcim Australia is therefore seeking approval to extract quarry resources on an adjacent parcel of Holcim Australia-owned land to the west of the Approved Pit (refer to **Figure 1-3a**). The proposed extraction area (the Granite Pit) is a granite resource and has different properties and mineralogy to the currently approved ignimbrite resource. Extensive drilling and testing of the granite resource has revealed that it is homogeneous, relatively unaltered and unfractured. The proposed granite resource will enable Holcim Australia to consistently produce and supply in-specification products to the local, regional and Sydney markets.

The planning approach for the proposed Extraction Area Modification (the Modification Project) is to modify the existing consent under Section 75W of the EP&A Act. Umwelt (Australia) Pty Limited (Umwelt) has prepared this Aboriginal Cultural Heritage and Archaeological Assessment (ACHAA) as part of the broader Environmental Assessment (EA) for the Modification Project on behalf of Holcim Australia to assess the potential Aboriginal cultural and archaeological impacts of the Modification Project.

³ This is the preferred spelling of the Registered Gundungurra Aboriginal Parties for this project. Often spelt Gandangara (Tindale 1974).



FIGURE 1.1
Locality Plan

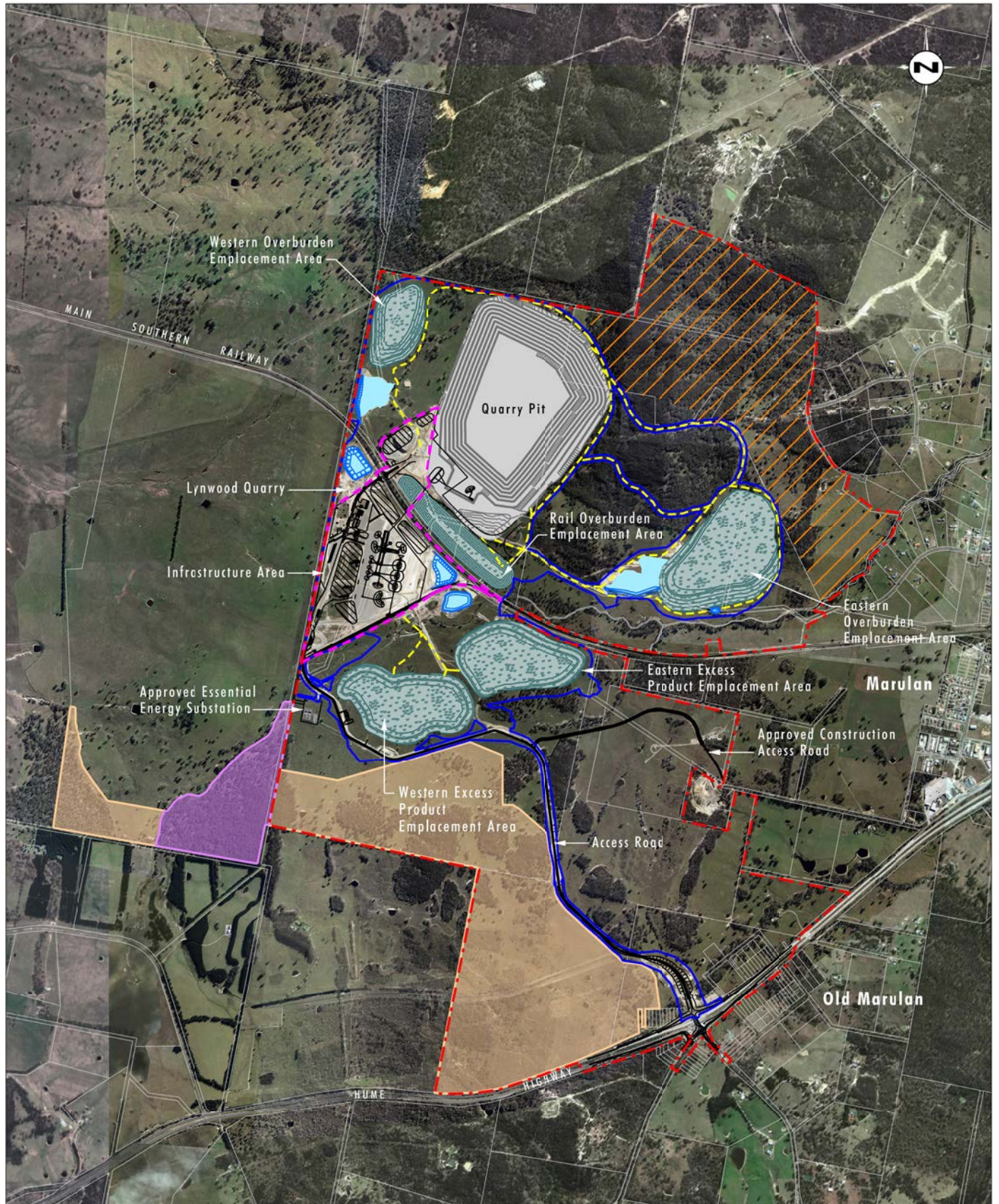


Image Source: Holcim Australia (Aerial Photo March 2012)
Data Source: LPI 2014

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Lynwood Infrastructure Facilities
- Haul Road
- Approved Disturbance Footprint
- Quarry Pit
- Rehabilitated Area
- Dam
- Existing Biodiversity Offset Area (EPBC)
- Existing Habitat Management Area (EPBC)
- Existing Habitat Management Area

File Name (A4): R05/3330_044.dgn
20151027 11.32

FIGURE 1.2

Approved Conceptual
Quarry Plan
(Year 30)

1.1 Extraction Area Modification

The proposed Modification Project comprises development of the following key features:

- a modified extraction area (to include the Granite Pit) to the west of the existing Approved Pit
- reduction of the Approved Pit to reflect limitations within the ignimbrite resource
- revised overburden emplacement areas
- haul roads and water management system structures
- a visual bund and vegetative screen.

These features are shown in **Figure 1.3a** to **1.3c**, which indicate various stages of the development of the Granite Pit. Other than the proposed changes to the layout or footprint of the development, the Lynwood Quarry project, from an operational perspective, will be largely unchanged from the currently approved operations. **Table 1.1** compares the proposed modified development to the existing approved operations.

Table 1.1 Comparisons of Approved Project and the Proposed Modification Project

Major Project Components/Aspects	Approved Project	Proposed Modification Project
Quarry Life	Quarry operations to cease on 1 January 2038	No change.
Limits on Production	5 Mtpa saleable product	No change.
Maximum Transportation of Product by Rail	5 Mtpa	No change.
Maximum Transportation of Product by Road	1.5 Mtpa	No change.
Maximum Transportation of Product by Road	1.5 Mtpa	No change.
Rail Facilities	Rail spur and loading facility as shown on Figure 1.2	No change.
Infrastructure (e.g. processing plant, rail infrastructure, truck loading infrastructure, workshop, offices etc.)	As shown on Figure 1.2	No change to approved infrastructure. Additional haul road to connect to new Granite Pit (refer to Figures 1.3a to 1.3c) and water management structures.

Major Project Components/Aspects	Approved Project	Proposed Modification Project
Hours of Operation	Topsoil / overburden removal / emplacement; drilling: • 7am to 6pm Blasting • Mon to Sat - 9am to 5pm • Sunday and public holidays – none Extraction • 7am to 10pm Processing, loading, delivery and distribution; maintenance • 24 hours per day	No change.
Employment	Employment at maximum production of approximately 115 people (including road transport drivers).	No change.
Quarry Footprint	As shown on Figure 1.2	Development of new Granite Pit to the west of the existing Approved Pit (refer to Figures 1.3a to 1.3c). Reduction of the Approved Pit footprint by approximately 55 ha.
Overburden and Excess Product Emplacement Areas	As shown on Figure 1.2	The approved Western and Eastern Overburden Emplacement Areas will no longer be required. Instead, emplacement areas to handle overburden from the Granite Pit, will include backfilling the Approved Pit (refer to Figures 1.3a to 1.3c), emplacement within part of the currently approved quarry limit, and a proposed emplacement area adjacent to the Granite Pit. A visual bund will also be developed to the west of Granite Pit (refer to Figures 1.3a to 1.3c).

Major Project Components/Aspects	Approved Project	Proposed Modification Project
Total Disturbance Footprint	As shown on Figure 1.2 (approximately 383 hectares)	The disturbance footprint will extend to the west to provide for the proposed Granite Pit and associated infrastructure and decrease in the east through a reduction in the Approved Pit disturbance footprint and associated overburden storage and haul roads to the east. Total disturbance footprint approximately 499 hectares.
Construction Phase	Largely completed, quarry currently in commissioning phase.	Construction limited to construction of haul road to proposed extraction area, visual bund and water management infrastructure.

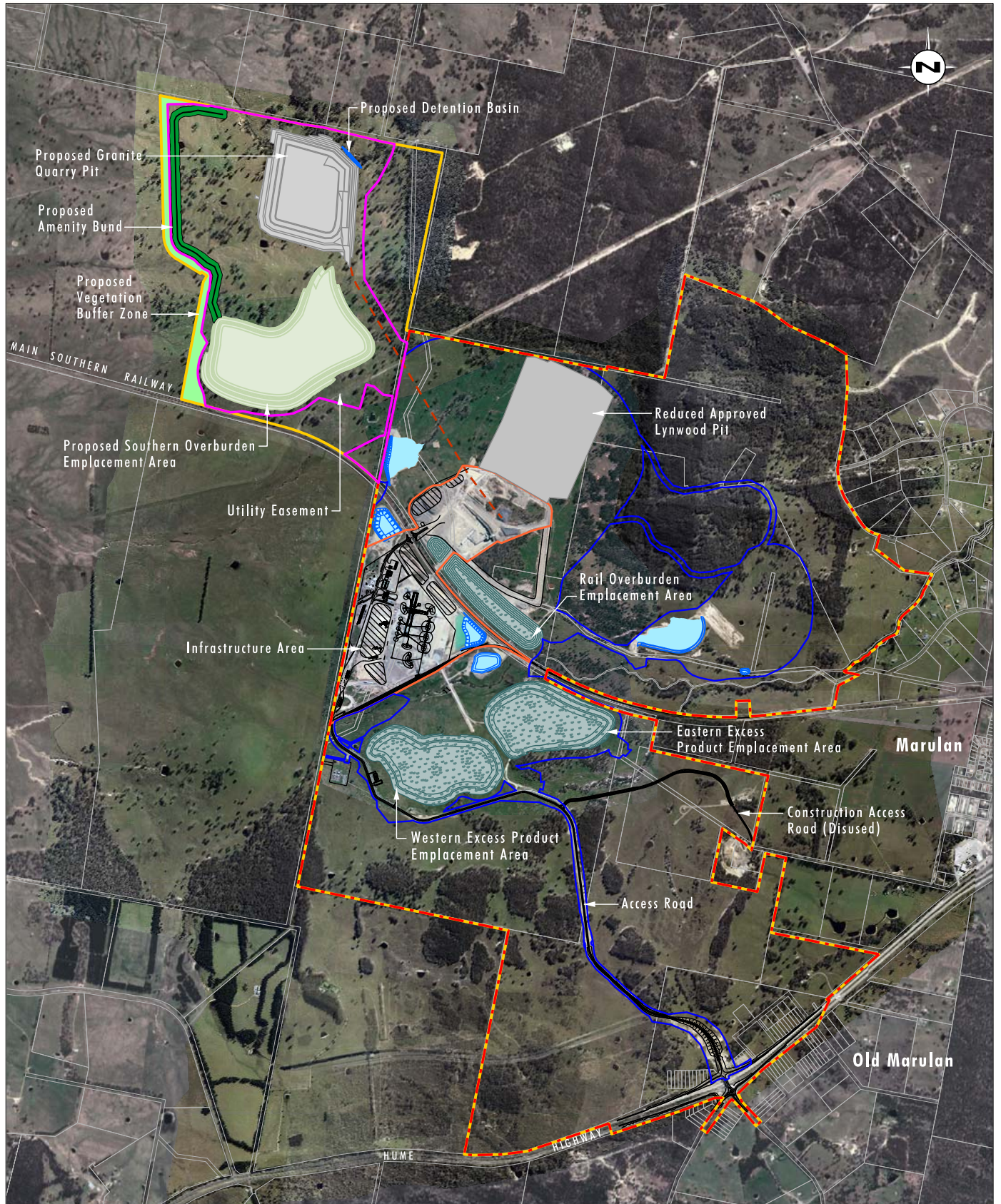


Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2015)

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Lynwood Infrastructure Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- Lynwood Infrastructure Layout

- Quarry Pit
- Emplacement Area
- Dam
- Proposed Overburden Emplacement Area
- Proposed Vegetation Buffer Zone
- Proposed Amenity Bund

- Proposed Haul Road

FIGURE 1.3a

Proposed Extraction Area
Modification Project
Conceptual Stage 1

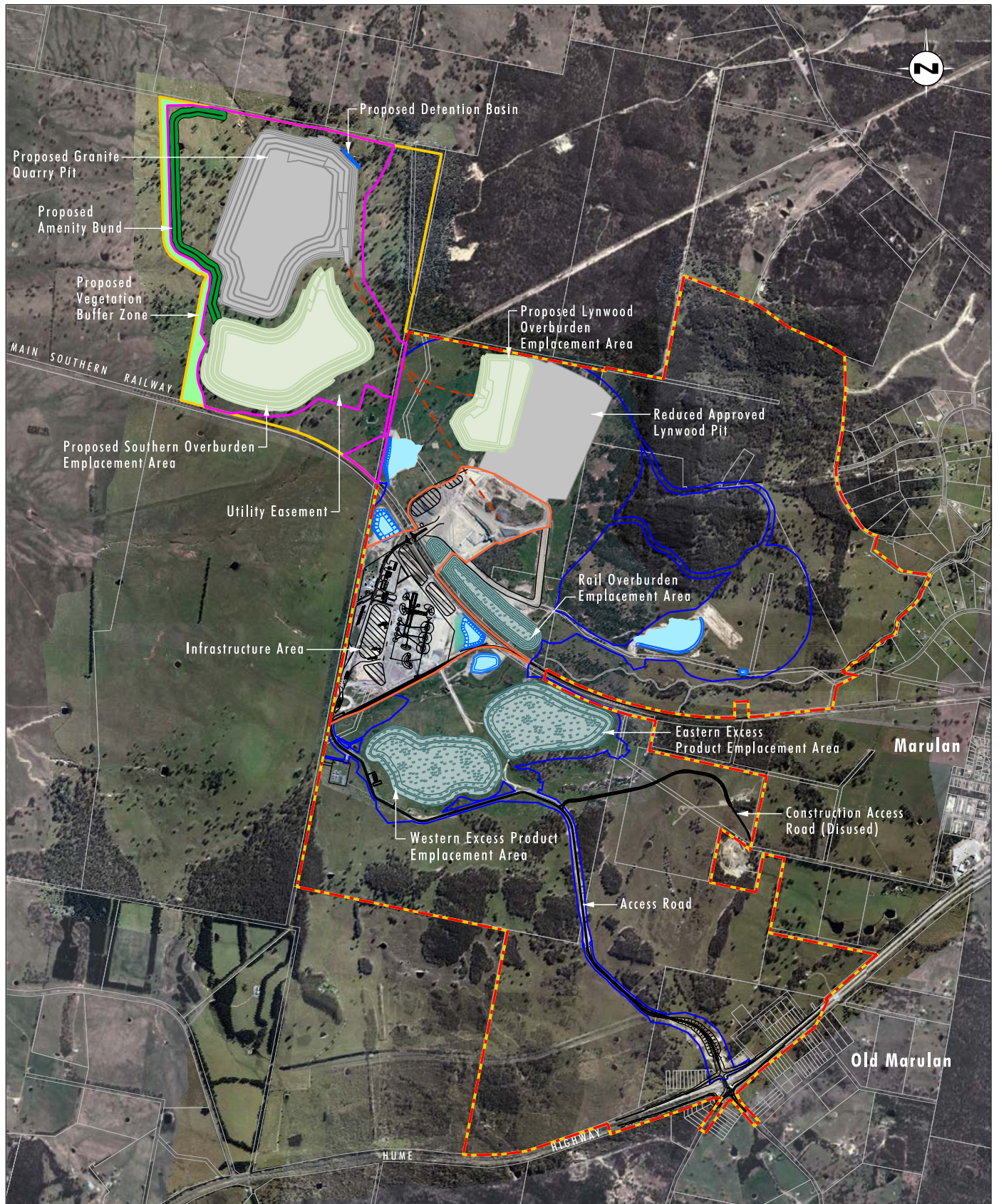


Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2015)

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Lynwood Infrastructure Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- Lynwood Infrastructure Layout

- Quarry Pit
- Emplacement Area
- Dam
- Proposed Overburden Emplacement Area
- Proposed Vegetation Buffer Zone
- Proposed Amenity Bund

- Proposed Haul Road

FIGURE 1.3b

Proposed Extraction Area
Modification Project
Conceptual Stage 3

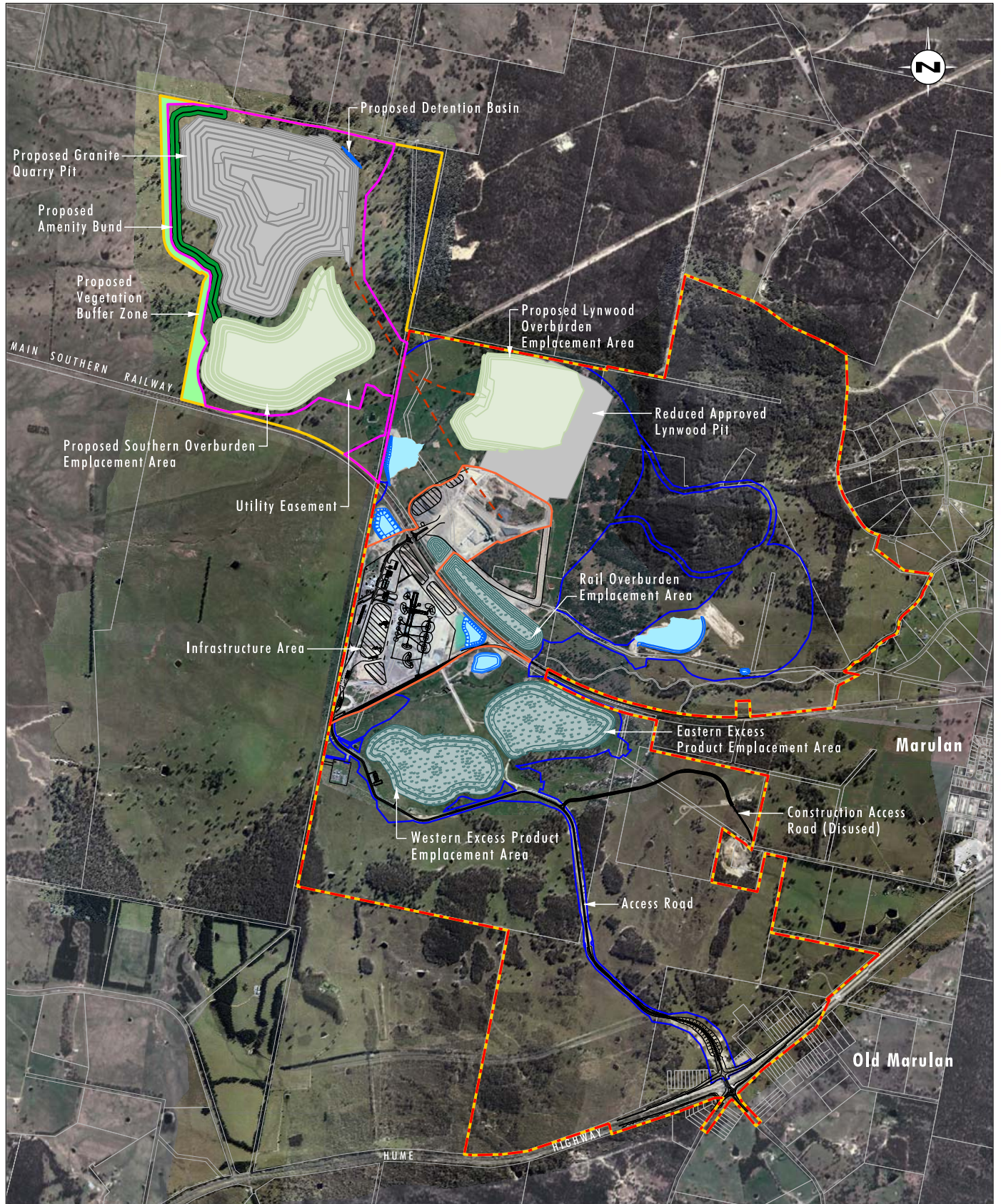


Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2015)

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Lynwood Infrastructure Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- Lynwood Infrastructure Layout

- Quarry Pit
- Emplacement Area
- Dam
- Proposed Overburden Emplacement Area
- Proposed Vegetation Buffer Zone
- Proposed Amenity Bund

- Proposed Haul Road

FIGURE 1.3c

**Proposed Extraction Area
Modification Project
Conceptual Stage 6 (Life of Project)**

1.2 Potential Impact of the Modification Project

Table 1.2 provides a description of the works proposed for each component of the Modification Project and identifies possible impacts.

Table 1.2 Components of the Modification Project/Potential Impacts to Aboriginal Cultural Heritage and Archaeological Values

Component of Modification Project	Potential Impact
Granite Pit	The development of the new Granite Pit to the west of the existing Approved Pit will result in the removal of all potential artefact bearing deposits and other Aboriginal archaeological sites within the area proposed for quarry development (refer to Figures 1.3a, 1.3b and 1.3c). Thus it has the potential to destroy any Aboriginal archaeological evidence/sites located within that area.
Haul Road	The additional haul road to connect the Granite Pit to an existing haul road within the Approved Project Area will impact a corridor within the Granite Pit Area of approximately 22,500m ² (refer to Figures 1.3a, 1.3b and 1.3c). The construction of the haul road and associated drainage and culverts has the potential to destroy any Aboriginal archaeological evidence/sites located within that area.
Overburden Emplacement Areas and Amenity Bund	A new overburden emplacement area will be developed to the south of the Granite Pit to handle overburden from Granite Pit. Overburden material from the Granite Pit area will be utilised to construct an amenity bund which will be developed to the west of the Granite Pit and be incorporated into the western edge of the emplacement area (refer to Figures 1.3a, 1.3b and 1.3c). Prior to the development of the emplacement area and amenity bund all vegetation and topsoil will be removed. Topsoil will be retained for rehabilitation of disturbed areas. The development of the emplacement area and amenity bund has the potential to destroy any Aboriginal archaeological evidence/sites located within those areas. There will also be some changes to the approved overburden emplacement areas at Lynwood Quarry with the Eastern and Western Overburden Emplacement Areas no longer planned to be used and instead, overburden emplaced back into the Approved Pit and its surrounds (refer to Figure 1.2).
Surface Water Features	Surface water management features will be required. The development of the surface water management features have the potential to destroy (or in the case of the dam shown in the north-eastern corner of the Granite Pit Area submerge) any Aboriginal archaeological evidence/sites located within that area (refer to Figures 1.3a, 1.3b and 1.3c).

1.3 Planning Considerations

1.3.1 Approval Pathway

As discussed in **Section 1.0**, it is proposed to modify the existing Lynwood Quarry Consent under Section 75W of the EP&A Act. Further details of this approval path are provided below.

The *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) clause 8J(8) prescribes how, in certain circumstances, a development consent can be modified under Section 75W of the EP&A Act. Clause 8J(8) relevantly provides:

- (8) *For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:*

...

- (c) *a development consent granted by the Minister under Part 4 of the Act (relating to State significant development) before 1 August 2005 or under clause 89 of Schedule 6 to the Act,*

...

The development consent, if so modified, does not become an approval under Part 3A of the Act.

The Existing Lynwood Consent was granted under Part 4 of the EP&A Act in December 2005 and was subject to the savings and transitional provisions contained in clause 89 of Schedule 6 of the EP&A Act. It is noted that a previous modification of the Lynwood Quarry Consent (Modification 2) was undertaken using Section 75W.

Part 3A of the EP&A Act has been repealed, however Schedule 6A, Clause 12 of the EP&A Act provides for the continued operation of Section 75W in relation to the modification of development consents referred to in Clause 8J(8) of the EP&A Regulation. Schedule 6A, Clause 12 of the EP&A Act states:

12 Continuing application of Part 3A to modifications of certain development consents

Section 75W of Part 3A continues to apply to modifications of the development consents referred to in clause 8J (8) of the Environmental Planning and Assessment Regulation 2000, and so applies whether an application for modification is made before or after the commencement of this clause.

Section 75W is therefore an appropriate approval pathway for the proposed modification.

1.3.2 NPW Act (1974)

OEH is primarily responsible for regulating the management of Aboriginal cultural heritage in New South Wales under the *National Parks and Wildlife Act 1974* (the NPW Act). The NPW Act is accompanied by the *National Parks and Wildlife Regulation 2009* (the Regulation), the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010a) and other industry-specific codes and guides.

The NPW Act defines an Aboriginal object as:

..any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales.

Under Section 84 of the NPW Act, an Aboriginal Place must be declared by the Minister as a place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture.

In accordance with Section 86(1) of the NPW Act, it is an offence to harm or desecrate a known Aboriginal object, whilst it is also an offence to harm an Aboriginal object under Section 86(2). Similarly, Section 86(4) states that a person must not harm or desecrate an Aboriginal place. Harm to an object or place is defined as any act or omission that:

- a) destroys, defaces or damages an object or place, or
- b) in relation to an object – moves the object from the land on which it had been situated, or
- c) is specified by the regulations, or
- d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c),

but does not include any act or omission that:

- e) desecrates the object or place, or
- f) is trivial or negligible, or
- g) is excluded from this definition by the regulations

Section 87(1) of the NPW Act specifies that it is a defence to prosecution under Section 86(1) and Section 86(2) if the harm or desecration of an Aboriginal object was authorised by an Aboriginal Heritage Impact Permit (AHIP) and the activities were carried out in accordance with that AHIP. Furthermore, Section 87(2, 4) establishes that it is a defence to prosecution under Section 86(2) if due diligence was exercised to reasonably determine that the activity or omission would not result in harm to an Aboriginal object or if the activity or omission constituting the offence is a low impact act or omission (as defined in Section 80B of the Regulation). The Regulation identifies that compliance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) is excluded from the definition of harm.

1.4 Agency Consultation

Meetings were held with the Department of Planning and Environment (DP&E) on 15 May 2015 and the Office of Environment and Heritage (OEH) on 11 June 2015 to determine the appropriate methodology for the Aboriginal consultation process for the ACHAA and to determine whether it was appropriate to undertake any requisite archaeological subsurface testing and salvage (if required) post approval under a variation to Holcim Australia's existing s.87/90 AHIP #1100264 (refer to **Appendix A**).

In relation to the consultation process both DP&E and OEH supported the continuation of consultation with the existing registered Aboriginal parties as this was for a modification and not for a new project. In relation to obtaining a variation to the existing s.87/90 AHIP #1100264, OEH understood the rationale for this approach (having a single management strategy across both the Approved Project Area and the Granite Pit Area) and was supportive, providing a full ACHAA was prepared to inform the variation application. It is proposed that all of the sites approved for impact within the Granite Pit Area would be subject to the conditions of s.87/90 AHIP #1100264 and would be fenced and subject to annual site monitoring in accordance with a revised version of the Lynwood Quarry Aboriginal Heritage Management Plan (AHMP – Umwelt 2011a) until such time as they were subsurface tested and salvaged (as/if required). As noted above, the revised AHMP would provide for Aboriginal cultural heritage management to be consistent across both the Granite Pit Area and the Approved Project Area.

1.5 Proposed Variation to Section 87/90 Aboriginal Heritage Impact Permit #1100264

As discussed in **Section 1.4**, Holcim Australia proposes (following development consent) to provide a request to OEH for a variation to the existing AHIP to revise the s.87/90 AHIP #1100264 boundary to include the Granite Pit Area and to incorporate any post approval subsurface investigation/salvage required under the conditions of this existing AHIP (refer to **Section 3.3.3.13** for further details of prior archaeological survey, assessment and investigation in the Approved Project Area under s.87/90 AHIP #1100264 (refer also to **Appendix A**)).

1.6 Report Authorship and Project Participation

This report was prepared by Jan Wilson (Manager of Cultural Heritage, Umwelt) and Kym McNamara (Senior Archaeologist, Umwelt). Kirwan Williams (Archaeologist, Umwelt) provided assistance with background research and reporting. Aboriginal consultation was undertaken by Jan Wilson and Kym McNamara. Kym McNamara, Jan Wilson and Kirwan Williams participated in the field inspection/survey.

Support prior to and during meetings and fieldwork was provided by Rachel Heath (Project Manager Holcim Australia) and Alana White (Environmental Officer Lynwood Quarry, Holcim Australia). Registered Aboriginal party participants in the consultation and fieldwork components of the project included Sharyn Halls and Kieran McNally from Gundungurra Aboriginal Heritage Association Inc. (GAHAI), Sharon Brown and Dawn Harris from Gundungurra Tribal Council Aboriginal Corporation (GTCAC), Peter Falk and Duncan Falk from Peter Falk Consultancy (PFC) and Delise Freeman and Justin Boney from Pejar Local Aboriginal Land Council (PLALC).

1.7 Structure of this Report

Section 2.0 of the report presents a summary of the registered Aboriginal party consultation and participation related to the ACHAA (refer also to **Appendix B**).

Section 3.0 describes the Aboriginal cultural, environmental and archaeological context of the Granite Pit Area and its surrounds. This section provides detailed information in relation to the methodology and results of prior archaeological investigations within the Approved Project Area and a summary of available information from ACHAAs in the broader Marulan area.

Section 4.0 analyses the information presented in **Section 3.0** to prepare a predictive model for likely site location, site type, contents and integrity for the Granite Pit Area. **Section 4.0** discusses the use of Archaeological Terrain Units (ATUs) as a basis for the survey methodology and subsequent analysis (as required by OEH for the investigations within the Approved Project Area).

Section 5.0 provides the results of a preliminary inspection of the Granite Pit Area to assist with early quarry planning and the subsequent survey of the Granite Pit Area with the registered Aboriginal parties. **Section 5.0** also provides descriptions of the sites and areas of potential archaeological deposit (PAD) and associated ATUs identified during the inspection and survey.

Section 6.0 discusses the Aboriginal cultural and archaeological significance of the Granite Pit Area and the sites/PADs and associated ATUs it contains.

Section 7.0 assesses the likely impacts to Aboriginal cultural and archaeological values arising from approval of the modification.

Section 8.0 initially provides information in relation to the Approved Project Area's cultural heritage and archaeological conservation management strategy which it is proposed can be extended to include the Granite Pit Area. The section then considers possible management options for the Aboriginal cultural heritage and archaeological sites/PADs/ATUs/values of the Granite Pit Area before setting out the preferred management outcomes for each of the known sites, PADs and their associated ATUs. The requirements of Intergenerational Equity and cumulative impact are also considered in this section in light of the preferred management outcomes.

Section 9.0 sets out the general and specific management recommendations assessed as appropriate from an Aboriginal cultural heritage and archaeological perspective. The management recommendations also take into account compliance with the conditions of s.87/90 AHIP #1100264. The section also includes guidance in relation to the ongoing care of any Aboriginal objects salvaged from the Granite Pit Area, the necessity for revisions to the AHMP (Umwelt 2011a) and information regarding the OEH approved research design and methodology which will be implemented to cover further archaeological investigations and proposed works under a variation to s.87/90 AHIP #1100264.

Section 10.0 lists references cited in the text.

2.0 Registered Aboriginal Party Consultation and Participation

This section of the report provides details of past and current registered Aboriginal party consultation and participation.

2.1 Prior Registered Aboriginal Party Consultation and Participation

Registered Aboriginal party consultation for prior projects commenced in 2004 and has continued on a regular basis since that time. There are four registered Aboriginal parties for the project. These include:

- Gundungurra Aboriginal Heritage Association Inc. (GAHAI)
- Gundungurra Tribal Council Aboriginal Corporation (GTCAC)
- Pejar Local Aboriginal Land Council (PLALC)
- Peter Falk Consultancy (PFC).

Ongoing registered Aboriginal party consultation is undertaken through a number of processes. This includes regular meetings of the Lynwood Quarry Aboriginal Cultural Heritage Management Committee which incorporates representatives of GAHAI, GTCAC and PLALC. The meetings are held to discuss upcoming tasks required under the conditions of the Lynwood Quarry Aboriginal Heritage Management Plan (AHMP) (Umwelt 2007, 2011a) and the current s.87/90 AHIP #1100264. Further consultation is also undertaken in relation to any matters related to Aboriginal cultural heritage that may arise between the Management Committee meetings (such as the organisation of the annual site monitoring or requirements for fencing, feral animal or noxious weed eradication etc.).

All reporting arising from any tasks required under the AHMP is also provided to PFC.

Regular newsletters are provided to the registered Aboriginal parties to ensure they are kept up to date with quarry developments.

GAHAI, GTCAC, PLALC and PFC have been involved in all consultation and survey, subsurface testing and salvage programs undertaken since their initial date of registration. Annual site monitoring has also been undertaken with GAHAI, GTCAC and PFC in 2007, 2011, 2012, 2013 and 2014 (Umwelt 2011, 2012, 2013, 2014). Copies of these reports are provided to PFC and to OEH.

2.2 Registered Aboriginal Party Consultation and Participation for the Current Project

Following consultation with DP&E and OEH ongoing consultation with the existing registered Aboriginal parties was supported. GAHAI, GTCAC, PFC and PLALC were therefore, consulted in relation to the following (refer to **Appendix B**):

- the methodology proposed for undertaking the AACHA including the methodology for the consultation process
- the methodology proposed for the survey of the Granite Pit Area

- the survey timeframe
- Aboriginal cultural heritage values and significance of the Granite Pit Area and the sites/PADs it contains
- requirements for subsurface testing and the undertaking of subsurface testing post approval
- impact assessment
- management options and recommendations for all sites/PADs and their associated ATUs
- applying for a variation to s.87/90 AHIP #1100264
- revisions to the AHMP (Umwelt 2011a) required to cover the management of Aboriginal cultural heritage and archaeological sites, PADs and their associated ATUs within the Granite Pit Area.

Consultation was undertaken over the period 5 June 2015 to 23 October 2015. Consultation was undertaken through a number of processes including written documentation, two formal meetings in June and July 2015, on-site discussions during the survey period and via phone and email. A full consultation log is included in **Appendix B**. Registered Aboriginal party participation in tasks involved in the ACHAA is discussed in the relevant sections of this report.

2.3 Draft Aboriginal Cultural Heritage and Archaeological Assessment

The draft ACHAA was provided to the registered Aboriginal parties on 3 September 2015. The registered Aboriginal parties were requested to review the documentation and to provide their response in relation to the following:

- Did the report provide a fair and accurate account of the ACHAA process?
- Did the registered Aboriginal party feel that they had been consulted adequately and that they had been heard and their opinions reported and addressed in the ACHAA?
- Did the registered Aboriginal parties wish to provide further information in relation to Aboriginal cultural values of the Granite Pit Area and the sites/PADs it contained?
- Did the registered Aboriginal parties support Holcim Australia applying to OEH for a variation to s.87/90 AHIP #1100264 to allow for subsurface testing and (as required) subsurface and surface salvage of any sites or PADS within the Granite Pit Area post approval?
- Did the registered Aboriginal parties agree with the management recommendations provided in the ACHAA?

The registered Aboriginal parties were also asked to provide any further information they felt was appropriate to inform the ACHAA. As in earlier reports prepared for the Lynwood Quarry project, the registered Aboriginal parties were also provided the opportunity to include a 'Statement of Aboriginal Cultural Significance' for inclusion in the preface of the ACHAA, so that all readers of the document were aware of the connection of the registered Aboriginal parties to the Granite Pit Area and the broader Marulan area. The registered Aboriginal party responses were due by 5 October 2015. Due to illness of the CEO the PLALC timeframe was extended until 23 October 2015.

Table 2.1 Registered Aboriginal Party Responses on the Draft Aboriginal Cultural Heritage and Archaeological Assessment

Date of Response	Respondee and Registered Aboriginal Party	Response
2 October 2015	Sharyn Halls on behalf of GAHAI	<i>GAHAI were happy with the consultation process for this project and feel that our cultural perspectives have been taken into account and that we had full input into the management recommendations. The draft report accurately reflects the consultation process.</i> <i>GAHAI confirm that the proposed Lynwood Quarry Extraction Area has high Aboriginal cultural value but also endorse the salvage of those sites that will be impacted if the project goes ahead. We note that currently those sites are being destroyed and/or damaged by agricultural practices and that unless they are salvaged any information they contain about our past as Gundungurra People will be lost.</i> <i>We support Holcim applying to OEH for a variation to the existing s.87/90 AHIP and that Aboriginal cultural heritage will be managed in future in accordance with a revision to the existing ACHMP. This will allow one set of rules for both the Lynwood Quarry and the area of the modification within the Lockyersleigh property. This will make management of Aboriginal cultural heritage across that area consistent and should assist with ensuring the ACHMP is implemented in a way that meets with the conditions of the s.87/90 AHIP.</i> <i>Our representative Keiren McNally confirms that the management recommendations within the draft report are those discussed at the meeting held at the Lynwood site office following the survey and that these are the management recommendations that were prepared in consultation with all of the registered Aboriginal parties and that were endorsed at that meeting.</i> <i>Finally GAHAI support the extension of the current Cultural Heritage Management Zone within the Lynwood project area to include more sites and to join the important sites up along Joarimin Creek. Conserving these related sites will ensure that both our camp sites and the ceremonial area surrounding the stone arrangement will be conserved for the future.</i>

Date of Response	Respondee and Registered Aboriginal Party	Response
14 August 2015	Sharon Brown on behalf of GTCAC	GTCAC provided a detailed report which is included in Appendix B. Following are the recommendations from that report. Recommendations: • <i>The potential impacts of the proposed development on places and sites of Aboriginal heritage significance has been well characterised in this assessment; no places, sites or items of significance were discussed during field study and these details will be included in the Umwelt Report. It is recommended that this report be read in conjunction with the completed Umwelt Report.</i> • <i>Adequate site management safeguards and cultural management strategies will be devised to account for any impacts on unknown places, sites or items.</i> • <i>The following general and specific site management safeguards have been devised to ensure that the objectives of this cultural heritage survey are preserved and conveyed throughout the project implementation. Based upon the information collated from previous heritage assessments and the field surveying effort, the following recommendations are provided:</i> • <i>The GTCAC are consulted if and when any changes are made to the project plans provided to date where heritage assessment activities are required;</i> • <i>Where changes are made to the project plans in regard to the survey disturbance corridor, further field based surveying is carried out prior to any development activities commencing.</i> • <i>If any potential places, sites or items of cultural significance are identified, all activities are to cease until such time as the appropriate representatives of the GTCAC have assessed the site and adequate site management have been devised.</i>

Date of Response	Respondee and Registered Aboriginal Party	Response
23 September 2015	Peter Falk and Duncan Falk on behalf of PFC	<i>Both Duncan Falk Consultancy and I agree that this report has shown that the consultation process has been fair and accurate in content and information.</i> <i>We both have been consulted way and above normal consultation, also the Umwelt staff on site were open to comments and suggestions at all times.</i> <i>The pit area has sites which need to be protected ie; Scarred Trees (2) there is a requirement to remove the trees in a careful manner without any damage, these trees are to be stored after being protected with preservative. The sites where artefacts have been found, then these sites must have the same attention as was done on the original Lynwood Quarry Site.</i> <i>As Holcim Australia is applying to OEH for variation to s.87/90 AHIP #1100264 for the subsurface testing, I will be supporting this application.</i> <i>The management recommendations in Sec 9.0 of the ACHAA have our approval for this Methodology.</i>
20 October 2015	Justin Boney (Sites Officer) on behalf of Delise Freeman and PLALC	<i>During the meetings and over the survey period I was consulted about what was to happen each day and when we located sites and potential archaeological deposits (PADs) my opinion was listened to about the Aboriginal significance of that site or PAD and what its management recommendations should</i> <i>The area proposed for the Granite Pit does contain many important sites and the report states accurately what was discussed about the importance of the sites when we were at the sites and later at the meeting with Holcim.</i> <i>PLALC does support Holcim applying for a variation to s.87/90 AHIP #1100264 so that we can be involved in the subsurface testing of sites and PADs and all the other salvage we discussed.</i> <i>PLALC also provided support for each of the general and specific management recommendations in the draft report.</i>

2.4 Variation to s.87/90 Aboriginal Heritage Impact Permit #1100264

The application to OEH to vary s.87/90 AHIP #1100264 was first discussed with the registered Aboriginal parties via phone on 5 June 2015 and then subsequently via email on 15 June 2015. It was further discussed at a meeting on 29 June 2015 and 3 July 2015 and also during the field survey period. The proposal to seek a variation to the AHIP was also detailed within the draft ACHAA. Throughout the consultation process the registered Aboriginal parties were supportive of the variation application (refer to **Appendix B**).

2.5 Native Title Search

A Native Title search was undertaken on 24 June 2015 for the Goulburn/Mulwaree local government area (LGA). The Native Title search indicated that there were no listed native title claims or native title registrations within the LGA. There was, however, one registered Indigenous Land Use Agreement (ILUA) for the Goulburn/Mulwaree LGA. This was on behalf of:

- Gundungurra Tribal Council Aboriginal Corporation #6 (NNT number: NI2104/001).

The ILUA relates to an agreement between GTCAC and the Blue Mountains City Council, City of Lithgow, Goulburn/Mulwaree Council, Oberon Council, Penrith City Council, Upper Lachlan Shire Council, Wingecarribee Shire Council, and Wollondilly Shire Council. The ILUA area includes a small section of the Approved Project Area but does not extend into the Granite Pit Area (refer to **Figure 2.1**).

GTCAC has been a registered Aboriginal party for Lynwood Quarry since 2004 and has been involved in all aspects of the ACHAA for the Granite Pit Area.

The full Native Title search results are included in **Appendix C**.

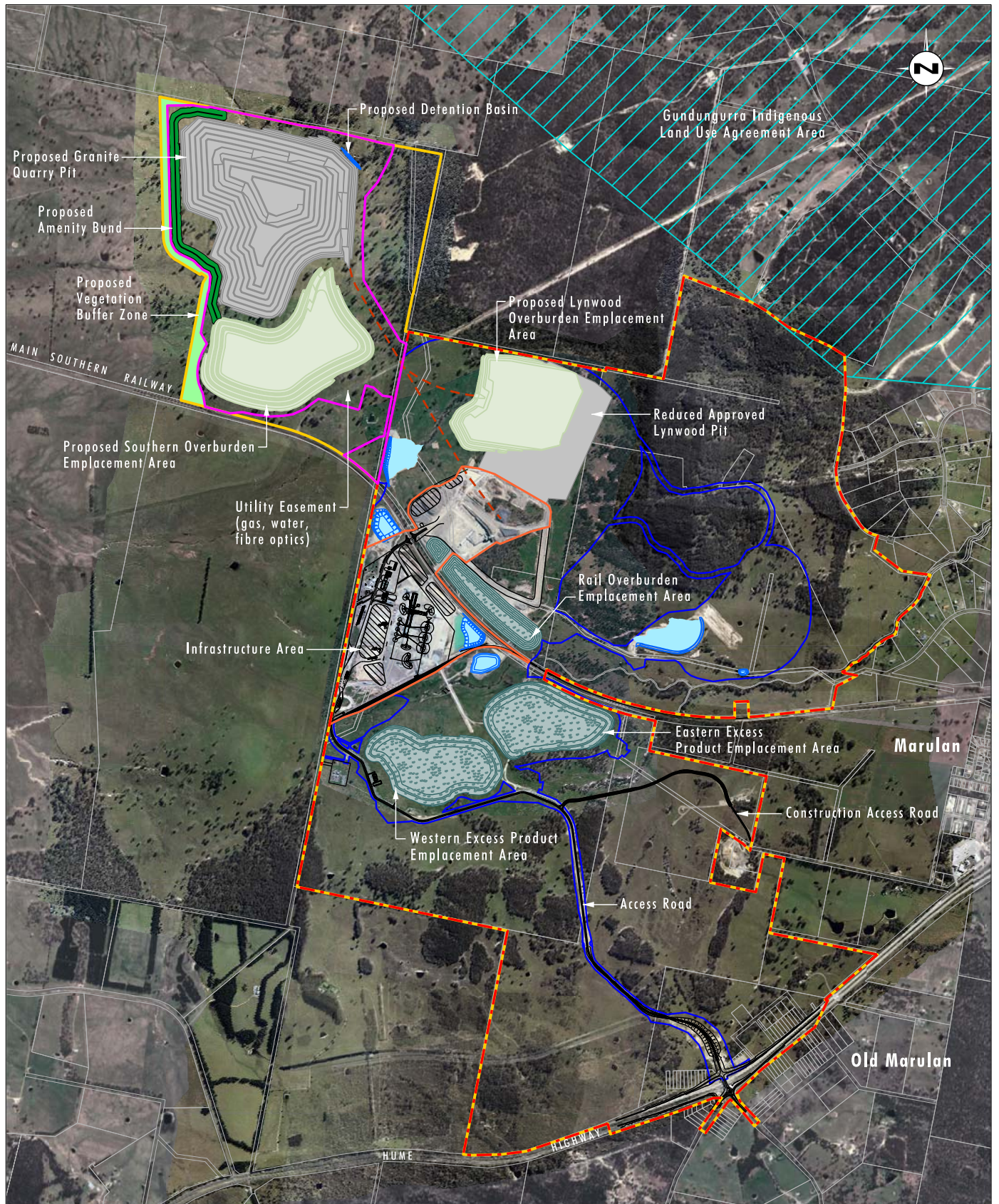


Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2015)

0 0.5 1.0 1.5 km
1:30 000

Legend

- | | | |
|--|--------------------------------------|-----------------------|
| Approved Project Area | Indigenous Land Use Agreement | Proposed Amenity Bund |
| Modification Project Area | Quarry Pit | Proposed Haul Road |
| Lynwood Infrastructure Facilities | Emplacement Area | |
| Approved Disturbance Footprint | Dam | |
| Proposed Granite Pit Disturbance Footprint | Proposed Overburden Emplacement Area | |
| Lynwood Infrastructure Layout | Proposed Vegetation Buffer Zone | |

FIGURE 2.1

Location of Gundungurra Indigenous Land Use Agreement Area

3.0 Aboriginal Cultural, Archaeological and Environmental Context

This section of the report provides information in relation to the known Aboriginal cultural, environmental and archaeological context of the Granite Pit Area. The information presented throughout this section of the ACHAA will be utilised to prepare a predictive model related to the likely location within the Granite Pit Area of previously unknown Aboriginal archaeological sites, their likely site type, contents, complexity and integrity. The predictive model will be presented in **Section 4.0**. The information will also be drawn upon to assist with the mapping of ATUs within the Granite Pit Area (refer to **Sections 4.4 to 4.6** for further details).

3.1 Aboriginal Cultural Context

The ethnographic and ethnohistoric record for Marulan and the broader Southern Tablelands was examined to extract information in relation to observations of Aboriginal people and how they utilised the landscape for the adjacent Approved Project Area (Umwelt 2005, 2007a) and this information has been reproduced below and has been supplemented by further references gathered since 2007.

It is noted that care must be taken with the use of ethnographic observations of Aboriginal people in the early contact period. The European surveyors and explorers who wrote the majority of the earliest recordings carried with them a notion of racial superiority which tainted their perspective. It must also be recognised that by the time of the first ethnographic observations the traditional Aboriginal ways of life had already been altered due to loss of territory and introduced disease. However, some useful information can still be gleaned from the ethnographic record to assist with the formulation of a predictive model for site type and location.

Eddie (1985) compiled a short chapter on the Aboriginal people of the Marulan area for inclusion in a book celebrating Marulan's 150th anniversary. Eddie (1985: 5) reports that:

Their main implements were spears with stone or bone points, woomeras, boomerangs, stone axes and stone skinning knives. Some of these, along with sharpening stones have variously been found in the district.

Drawing on research by Tindale (1974) in relation to tribal boundaries, Eddie (1985: 5) states that the Marulan area was at the junction of four major tribes. These were the:

- Ngunawal who inhabited the area from Canberra to Yass and north to Goulburn
- Wandandian who inhabited the area from Ulladulla to Nowra and west to the mountains
- Wodi Wodi who inhabited the area north of the Shoalhaven River to Wollongong
- Gandangara (alternatively spelt Gundungurra) who inhabited the area from Camden to just south of Marulan.

Smith (1992) also reports there were up to six bands belonging to the Gundungurra, with the band from the Marulan locality one of the larger bands known as the Parramarragoo (the Bungonia band).

Tindale (1974) drew his information from recordings made by early explorers and settlers. Early exploration of the area was begun in 1798 when an expedition by John Wilson reached Mt Towrang (about 9 kilometres northeast of Goulburn). Participants in the exploration team commented on the scarcity of Aboriginal people in the area and reported; ‘...we really believe that there never was a native in this part of the country’ (Collins 1798-1802: 87-91).

Navin (1990: 6) provided the following comments in relation to the Marulan area.

An apparent scarcity of Aboriginal people in the Southern Tablelands was commented upon by early explorers. Not a single Aboriginal person was encountered in the course of early explorations by Meehan (1818), Throsby (1818), Throsby-Smith (1820), Wild (1820) and Kearnes (1822). References to ‘several native fires’ (Charles Throsby-Smith) and ‘the Fires of the Natives who appeared numerous’ (Joseph Wild) were the only signs recorded by the explorers of the presence of Aborigines in the region.

The sighting of fires by the early explorers, indicates that rather than there being no Aboriginal people in the area, that the Aboriginal people were purposefully avoiding contact with the explorers.

Linguistic studies record that the Gundungurra and the Ngunawal shared a common language (Eades 1976: 6). This suggests that these two groups interacted on a regular basis and that they probably shared some parts of their ceremonial lives.

As white settlement began to take hold in the Marulan area, there were accounts of attacks on the white settlers by Aboriginal people and retaliatory attacks on Aboriginal people by the settlers. In 1826 Governor Darling sent 30 troopers to the Bungonia area to act as a peace force following reports of ‘bands of angry natives gathering’. Governor Darling later wrote in a despatch to England (Governor Darling to Earl Bathurst Despatch No. 34 per Ship Toward Castle Government House, 23 May 1826 quoted in Eddie 1985: 7):

My Lord,

1st I have much satisfaction in stating to your Lordship, in reference to my despatch No. 28 that the Natives, who had assembled in the County of Argyle, have been dispersed without committing any depredation or act of violence. It is supposed that the prompt and unexpected appearance of the Troops in that distant part of the County had some effect in producing this desirable end. If so it may be hoped that it will be attended with still further beneficial consequences by checking any disposition they might feel to re-assemble.

2nd The steps that have been taken will I trust ensure the native from further aggression, as there can be no doubt of their friendly disposition, when unmolested, and, though it may be politic to prove our superiority, it would be painful to punish an Act of retaliation with the severity necessary to prevent recurrence of such proceedings on their part.

From the dispatch it can be seen that the Aboriginal people of the area who gathered (possibly for ceremonial purposes) were being driven from their land and prevented from the continuation of their ceremonial life and obligations to care for country by 1826.

In this regard Wyatt (1941) reported on early settlers accounts of ‘over 3000 Aboriginal people attending ceremonies in the Goulburn district’.

Further European settlement of the Marulan area followed and by 1832 there were already 12 properties listed between Marulan and Bungonia (NSW Calendar and General Post Office Directory).

Eddie (1985: 7) concludes:

The Aboriginal population in Argyle gradually decreased, mainly from diseases introduced by the whites and the influenza epidemic of 1846/47 almost completely wiped them out. In Settlers and Convicts Harris states that the Aborigines complained:

Plenty of water before white man come, plenty pish (fish), plenty kangaroo, plenty possum, plenty everything: now all gone. Poor fellow now, black fellow.

Williams (2004:8 quoting Koettig 1981; Rich 1988 and Flood 1980) discusses the material culture of the Gundungurra:

...material culture was diverse, with many different tools and items being recorded ... skin cloaks and woven headpieces, as well as various adornments such as strings of beads made of seeds, body painting and bones piercing the septum of men's noses. Men were also recorded as wearing tight belts made of possum hair from which tools such as hatchets and spear throwers were hung. The tool kit of the people included spears, spear throwers, stone hatchets, boomerangs, clubs, shields, digging sticks, wooden/bark containers, various flaked stone tools, bone and shell tools and woven baskets. The most common form of shelter was a bark gunyah.

Paton (1990) listed food sources available to the Gundungurra including, kangaroos, possums, koala, witchetty grubs, ant eggs, bandicoots, honey, eels, ducks, swans, platypus, fish, emu, goanna, busk turkeys and yams.

In addition to the ethnographic information above, Umwelt also sourced and reviewed documents from the Australian Institute of Aboriginal and Torres Strait Islander Studies, the Australian National University, the OEH library at Hurstville and resources already held by Umwelt. Both primary and secondary sources were reviewed including in addition to the above: Smith n.d.; Throsby 1818, 1829; Wild 1820; NSW Calendar and General Post Office Directory 1832; Baylie 1843; McAlister 1907; Wyatt 1941; Tindale 1974; Flood 1980; Eades 1976; Sullivan 1983; Eddie 1985; Packard 1986, Lance and Koettig 1986, Koettig 1991; Paton 1990; Navin 1990, Sefton 1995.

The outcome of the research was that whilst there were numerous mentions of the locations of ceremonial activities and burials, secular activities such as camping and hunting and gathering, though often mentioned, was rarely ever placed in a landscape context (i.e. mention is made of camp sites but no information is provided on where the camp site was located). In this regard Boot (2002:8) concluded:

The problems associated with ethnohistoric documents include their tendency to record unusual, rather than everyday events, and their focus on religious behaviour to the exclusion of women and children (Attenbrow 1976:34; Sullivan 1983:12.4).

3.1.1 Aboriginal Oral History

During survey of the Approved Project Area in 2004, a stone arrangement, a large artefact scatter and a number of scarred trees were recorded in a partially hidden valley. This area was identified by Bill Hardie from GTCAC as a ceremonial precinct. This area was unique within the Approved Project Area as it was the only valley within the area where the topography was of a nature that obscured the ceremonial area from view from all compass directions (refer to **Section 3.3.3** for further information in relation to the context of the stone arrangement and the other Aboriginal archaeological sites located within the Approved Project Area). It is noted that the ceremonial precinct has been conserved by Holcim Australia within a Cultural Heritage Management Zone (CHMZ) (refer to **Figure 3.1**).

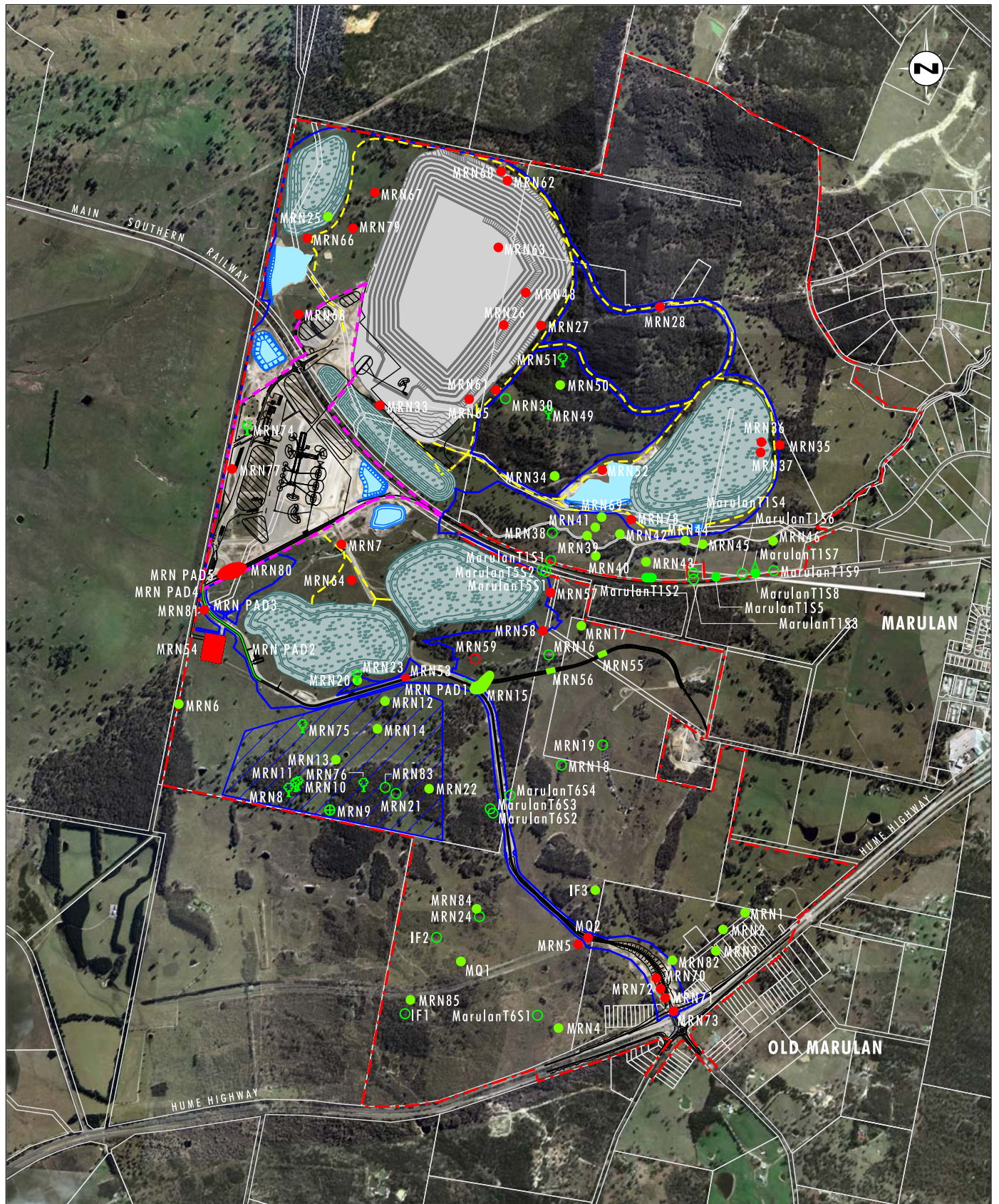


Image Source: Holcim Australia (Aerial Photo March 2012)
Data Source: LPI 2014

0 0.5 1.0 1.25 km
1:25 000

Legend

- Approved Project Area
- Lynwood Infrastructure Facilities
- Haul Road
- Approved Disturbance Footprint
- Quarry Pit
- Rehabilitated Area
- Dam
- Cultural Heritage Management Zone

- Sites Conserved
- Grinding Stone (CE) Conservation
- Stone Arrangement Conservation
- Scarred Tree Conservation
- Isolated Find Conservation
- Artefact Scatter Conservation

- Sites Salvages under AHIP#1100264
- Artefact Scatter - no further management required prior to impact
- Isolated Find - no further management required prior to impact

FIGURE 3.1

Previously Recorded Aboriginal
Sites in the Approved Operations
Area and their Conservation Status

Bill Hardie (GTCAC pers. comm. 2005) also reported that the rocky high points on the ridge and spur crests within the general Marulan area were suitable for burials while lower slopes exposed to the prevailing (cooling) westerly/south-westerly winds were good for summer camps, however, camp sites for the cooler months including autumn, winter and early spring would have been located in areas protected from these winds. Pat Little (PLALC pers.com. 2005) supported these comments.

3.1.2 Implications of the Cultural Context for Aboriginal Site Location

Whilst there are numerous ethnographic observations from the general Marulan/Goulburn area these observations are rarely ever placed in a landscape context (i.e. mention is made of camping and camp sites but no information is provided on where the camp site was located).

Table 3.1 presents the small amount of information derived from both primary and secondary references where activities were actually placed in a landscape context. Also included in the table is information provided by Bill Hardie (GTCAC) and Pat Little (PLALC) derived from the oral history of the area.

Table 3.1 Landform/Cultural Contexts

Landform Element	Cultural Context	Reference
High points on rocky ridge and spur crests.	Burials	Areas like these were used for burials. (Bill Hardie GTCAC: pers. comm. 2005).
Rocky hilltops	Burials	<i>Generally Aborigines were buried on the top of rocky hilltops...</i> (Lance and Koettig 1986:15).
Hilltops.	Burials and ceremonial sites	<i>Historical records suggest that burial and ceremonial sites were located on hill tops ...</i> (Lance and Koettig 1986: 25).
Small hill	Ceremonial	<i>These sites were the locations at which some of the most important ceremonial activities took place. They often comprised earth mounds, circular in shape in locations distant from usual habitation sites. Several bora grounds are known to have existed in the Goulburn district. One site was on a small hill near the existing Kenmore hospital ...</i> (MacAlister 1907:85)
Spur crest and slopes within hidden valley (view into valley restricted by spurs that leave narrow entrance to the valley).	Ceremonial Precinct Women's campground Men's campground	<i>The MRN9 stone arrangement located within the Approved Project Area was interpreted by Bill Hardie (GTCAC) as occupying part of a women's campground ('the men's campground would have been located across the valley among the stringybarks'). Further descriptions of the stone arrangement in this area provided by Bill Hardie have been omitted from this text at the request of Delise Freeman of Pejar Local Aboriginal Land Council (phone conversation 24 July 2007).</i>

Landform Element	Cultural Context	Reference
Lower slopes.	Camp sites	<i>Historical records suggest that stone artefact scatters [were located] on lower slopes. Few sites are found on middle slopes, especially on steeply sloping ground (Lance and Koettig 1986: 25).</i>
Areas of low to very low gradient exposed to/protected from the prevailing winds.	Camp sites	Comments provided by Bill Hardie (GTCAC) and Pat Little (PLALC) during the survey of the Approved Project Area (Umwelt 2005) indicated that summer camps would have been located in areas of low gradient exposed to the prevailing (cooling) westerly/south-westerly winds; however, camp sites for the autumn, winter and early spring would have been located in areas protected from these winds.

3.1.3 Implications of the Cultural Context for Aboriginal Site Type and Content

The very limited Aboriginal ethnography and oral history indicates the following for the Granite Pit Area:

- if mature trees remain in the area culturally modified trees (scarred trees) may have survived that reflect the practice of bark/heartwood removal for the manufacture of wooden bowls, shields, spear throwers and/or boomerangs
- camp sites represented by stone artefact scatters are likely to occur in the area
- stone artefacts used for the processing of food plants and the hunting, skinning and butchery of mammals for their meat and skin are likely to be found within the artefact scatters within some camp sites (tools manufactured from wood or bone are unlikely to have survived)
- stone tools used for the working of skins and for piercing skins so that they could be sewn together to make cloaks may be found in artefact scatters within some camp sites
- other site types such as butchery sites may also be located within the Granite Pit Area
- some camp sites may be related to Aboriginal people moving through the area to attend ceremony within the ceremonial precinct in the Approved Project Area
- lost or discarded stone hatchets are likely to be rare and not likely to found in the Granite Pit Area.

3.2 Environmental Context

The decisions that people make regarding such things as where they live, the range of resources they use and other aspects of daily life may be influenced by the environment in which they live. The preservation and visibility of sites is also affected by environmental factors such as vegetation cover, past land-use practices and disturbance. A review of the environmental context of the Granite Pit Area is therefore integral to considerations of the Aboriginal archaeological material likely to be located in the area and its integrity.

3.2.1 Climate

Umwelt (2013) discussed the climate of the Marulan area and the implications that this may have had on patterns of Aboriginal occupation/utilisation of the Approved Project Area. The climate data discussed is equally applicable to the Granite Pit Area and is reiterated below:

- average maximum temperature for the area is 28.1°C for January. Temperatures over 20°C are only recorded between October and April. Average minimum temperature is 1.3°C in July. Maximum temperature recorded in the area over the period of record is 37.8°C in January with a minimum of -7.8°C in June (it is noted that during fieldwork in the December to January timeframe in 2010 the temperature was highly variable ranging from 36°C to 10°C over a period of two hours due to weather changes)
- average annual rainfall is 735 millimetres with maximum average monthly rainfall (64.8 millimetres) occurring in January and average monthly minimum rainfall (47.8 millimetres) in July. The wettest months overall were November through March (late spring to early autumn), and
- on average July, August and September are the windiest months and the winds generally blow from the west or south-west throughout the year (the temperatures quoted above do not take into account the wind chill factor and a wind chill factor of minus 17°C was recorded during the salvage of the NMZSS in August 2007). June to August are recorded as months when most days are overcast
- During the July 2015 survey the temperature dropped as low as minus 8°C and all dams and pools in the creeklines were frozen.

3.2.2 Topography and Hydrology

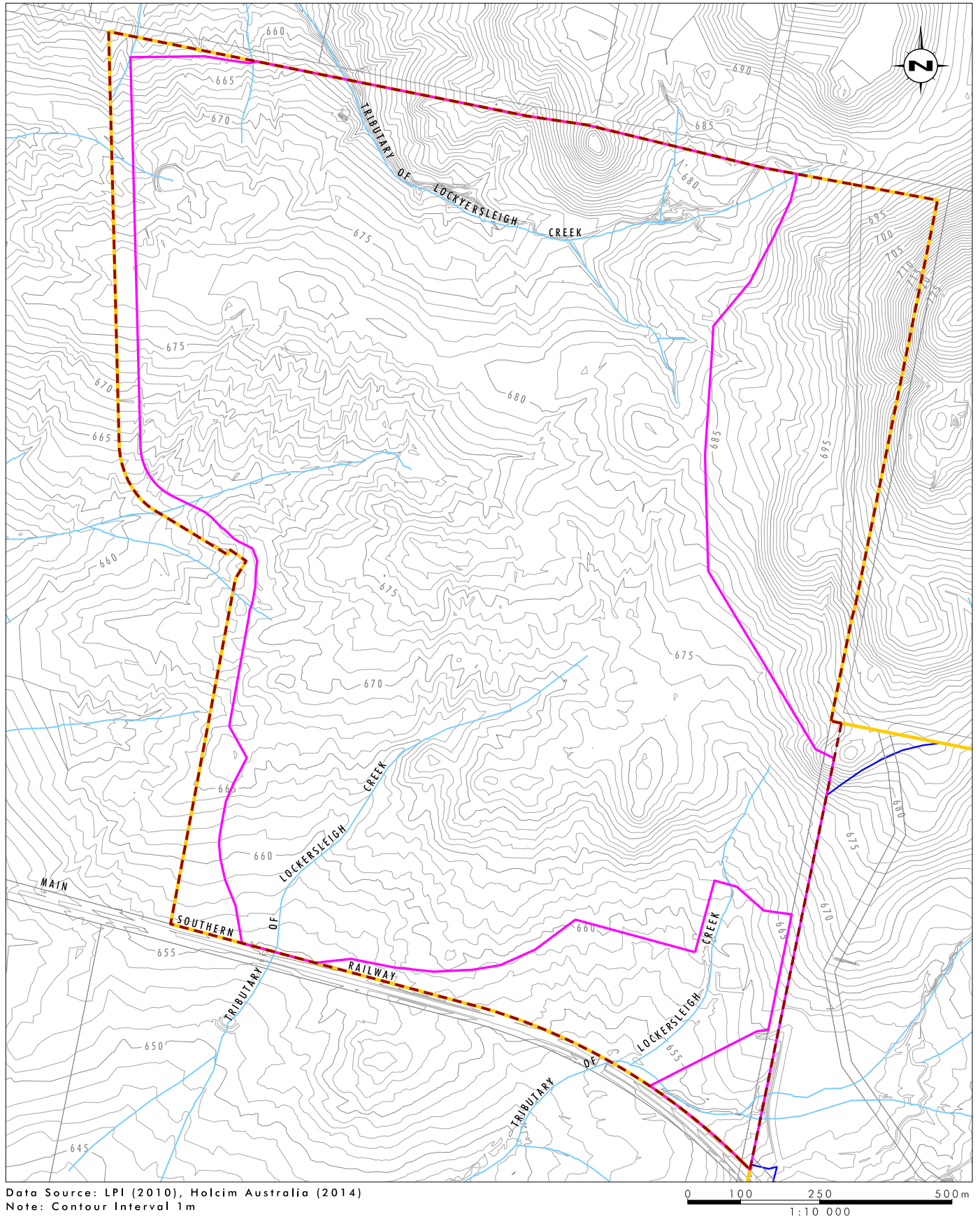
The topography of the Granite Pit Area consists of a series of low spurs interspersed by gentle slopes. The highest point is in the north-east (720 AHD) where westerly to south-westerly trending low spurs extend from a higher ridge crest just outside the Granite Pit Area. The general trend is for the land to drop away very gently to the west and south-west with the lowest point at approximately 655 AHD in the south-western extent of the Granite Pit Area.

The area is drained by a number of first and second order ephemeral tributaries of Lockyersleigh Creek. The tributaries drain to the north-west, west and south (refer to **Figure 3.2**). The majority of the creek lines are broad grassy waterways with minimal to no erosion. These tributaries only carry internal flow. Two tributaries of Lockyersleigh Creek (one in the north and one in the south-east) carry flow derived from outside the Granite Pit Area. Only one of these tributaries of Lockyersleigh Creek has been subject to entrenchment (deepening and widening) within the Granite Pit Area and has steep eroded banks. This is the most northerly of the tributaries which has a loop that enters the Granite Pit Area in the north-east and leaves the Granite Pit Area in the north-west. This tributary has a spring located near where it exits the Granite Pit Area and during the assessment period pools of water were recorded within the tributary

channel in this area weeks after the creekline has ceased flow and the remainder of the tributary was dry. The tributary of Lockyersleigh Creek that enters in the south-east has been blocked by the construction of a dam in the Approved Project Area and now only carries localised flow below the dam wall. However, previously this creekline would have supplied ephemeral, but relatively more reliable water derived from a relatively large catchment area.

There is limited floodplain development in the Granite Pit Area and this also only relates to the most northerly of the tributaries and is very limited in extent.

There are two internal tributaries that drain to the south. The flow of these watercourses, and that of the tributary that enters in the south-east, have been blocked by the Main Southern Railway and their courses become indistinct on the lower slope where flow now appears to spread across the low gradient slope before being channelled through culverts under the railway. As a result there is a significant build-up of colluvium and alluvium upslope of the Main Southern Railway on the lower slope and the area is relatively swampy after rain. Prior to the construction of the Main Southern Railway the tributaries would have continued to flow to the south and south-west and there is unlikely to have been any floodplain development.



Legend

- Modifications Project Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- Proposed Granite Pit Area
- Drainage Line

FIGURE 3.2

Topography and Drainage of
the Proposed Granite Pit Area

3.2.3 Geology and Soils

The geology of an area determines its morphology (e.g. due to erosion wearing away different rock types at different rates forming valleys and leaving landform elements like ridges and spurs) and its soil types. The morphology of the landscape determines how it is used by hunter-gatherers (e.g. travel routes may occur along creeklines or along ridge and spur crests with camping in elevated but low gradient areas along creeklines and on low spur crests). The soil types determine the food, medicine, bark and fibre plants that will grow and also the species of prey animals inhabiting an area. The geology also determines whether there are rock types available that would have been suitable for use by Aboriginal people for stone implement manufacture or for the sharpening of stone and wooden implements/tools. In addition, ecotones (areas along the boundaries of different geological boundaries/soil types), may be relatively richer resource areas as they have the capacity to provide a more diverse food resource within a restricted area.

Figure 3.3a indicates the regional geology for the broader Marulan area and **Figure 3.3b** indicates the geological boundaries within the Granite Pit Area (Lot 2), which contains the proposed quarry, overburden emplacement area and haul road. **Figures 3.3a** and **3.3b** show that:

- the majority of the proposed new disturbance (i.e. quarry, overburden emplacement area and bund) in the Granite Pit Area disturbance footprint is composed of the Carboniferous age Lockyersleigh Suite and specifically, the intrusive Lockyersleigh Granite, which contains a micro-gabbro dyke (Holcim 2015)
- the remainder of the new disturbance area is composed of the earlier Devonian age Bindook Porphyry Complex including the Joaramin Ignimbrite which forms a band along the eastern boundary of the Granite Pit Area, while a small area of Devonian age Barralier Ignimbrite is located along the northern margin. The majority of the Joaramin and Barralier Ignimbrite is located outside the area proposed for impact
- less than 1 per cent of the Granite Pit Area disturbance footprint is composed of exposed, deep orange Deep Sands derived from the weathering of the Lockyersleigh Granite. It is noted that the wombat burrowing has indicated that the deep sands are common beneath the ground surface across the Granite Pit Area, however, the area mapped as Deep Sands on **Figure 3.3b** is the only area where it is naturally exposed.

On **Figure 3.3b** the Joaramin Ignimbrite and the Barralier Ignimbrite have been combined as part of the broader Bindook Porphyry Complex. This has been done in order for ease of comparison with other archaeological studies in the area and most importantly with the Approved Project Area.

Within the Granite Pit Area the Bindook Porphyry Complex has been the most resistant to weathering and thus forms the majority of the area of the low spurs that enter from the north-east and central east. The spur crests and upper slopes within the Bindook Porphyry Complex have shallow to skeletal very rocky soil profiles. The Bindook Porphyry Complex outcrops across this area as low, angular boulders. The mid and lower slopes in the Bindook Porphyry Complex have slightly deeper soil profiles (exposed in wombat burrows) with the deepest soil profiles built up behind the Main Southern Railway on the lower slopes and mostly outside the proposed disturbance area.

The Lockyersleigh Granite mainly forms the lower gradient spurs and slopes. Deep colluvial sands have formed on the lower slopes. The spur crests have much shallower soil profiles and small to medium sized granite tors outcrop in several locations on the spur crests and on some spur slopes. A continuous spurline crosses the Granite Pit Area from east to west and is highest in the east where it is formed from the Bindook Porphyry Complex and gradually descends to the west where the geology changes to the Lockyersleigh Granite.

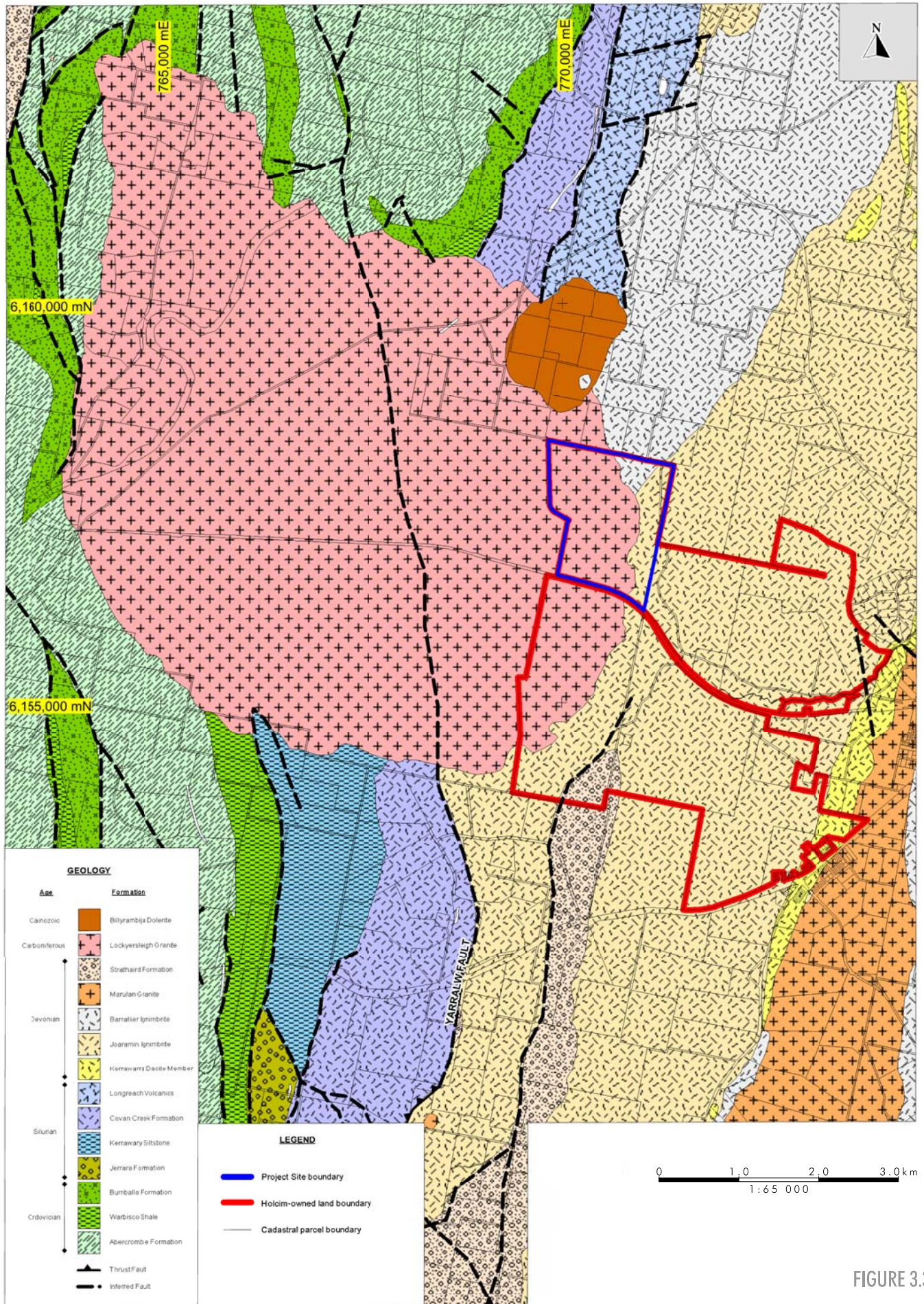
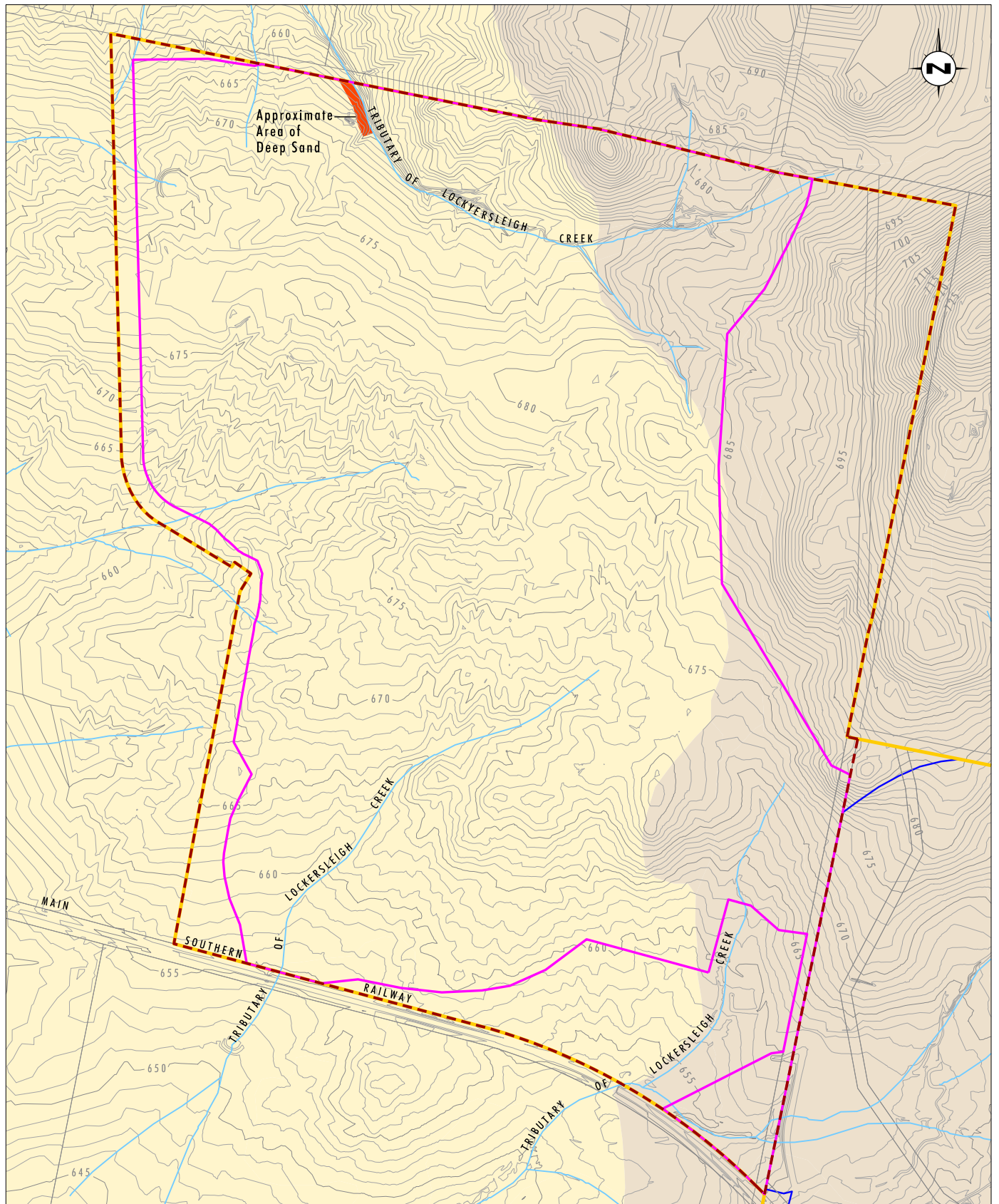


FIGURE 3.3a
Regional Geology



Data Source: LPI (2010), Holcim Australia (2014)
Note: Contour Interval 1m

0 100 250 500m
1:10 000

Legend

- Modifications Project Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- - - Proposed Granite Pit Area
- Drainage Line
- Lockyersleigh Granite
- Bindook Porphyry Complex
- Approximate Area of Deep Sand

FIGURE 3.3b

Geology of the
Proposed Granite Pit Area

The soils in general can be described as sandy. The soils from the Lockyersleigh Granite being coarse sand and those from the Bindook Porphyry Complex being less coarse and slightly higher in clay content. Prior archaeological survey by Saunders (2005) within the Granite Pit Area also identified the small area of exposed deep orange sand associated with the northern-most tributary of Lockyersleigh Creek discussed above (refer to **Figure 3.3b** for the location of the Deep Sand and **Section 3.3.3** for further details of Saunders survey). The area of Deep Sand is restricted in size and limited to the southern bank of the tributary and the footslope/lower slope associated with the tributary for approximately 50 metres west of the creekline and 150 to 200 metres north to south along the creekline within the Granite Pit Area disturbance footprint.

Stone artefacts recorded to date within the Approved Project Area have predominantly been manufactured from imported raw materials including; quartz, silcrete, quartzite, chert, dolerite and volcanic (mafic) (Umwelt 2013b). Evidence for use of the local igneous rock outcrops as sources of stone relates to a small number of flakes and broken flakes manufactured from ignimbrite and aplite, two pieces of granitic rock that were identified as grindstone fragments and the use of an *in-situ* boulder of Bindook Porphyry Complex as a grinding bowl (refer to **Section 3.3.3** for site/artefact details). There was also evidence of the use of dolerite which does occur as dykes and sills to the north of the Granite Pit Area. There was, however, no evidence of quarrying noted on any of the outcrops inspected within the Approved Project Area and it was thought that the advanced state of weathering of the exposed stone made the majority of it unsuitable for stone implement manufacture (Umwelt 2007c, 2008a, 2008e, 2013b). It is probable that any granite or ignimbrite rock outcrops (if any) within the Granite Pit Area will be similarly weathered and unsuited to use for stone implement manufacture and thus Aboriginal quarry sites are unlikely.

Furthermore, in relation to ignimbrite, there was evidence within the Approved Project Area of flaking of surface scree material which was used expediently and discarded after minimal use. It is possible, therefore, that some expedient use of ignimbrite obtained from the surface and flaked expediently may be present in the Granite Pit Area.

As noted, granite and ignimbrite have been recorded for use as grindstones for the processing of food plants within the Approved Project Area. These rock types are not suited for the grinding of stone, wooden or bone implements and thus it is highly unlikely the Granite Pit Area will contain any sets of grinding grooves.

3.2.4 Flora and Fauna

Aerial photography shows that the majority of the Granite Pit Area is cleared grasslands with a light scattering of remnant trees. The only dense vegetation cover remains in the north-east where a mapped road cuts across the north-eastern corner of the Granite Pit Area (refer to **Figure 1.2**). This area is outside the proposed development footprint.

The Ecological Assessment completed for the Modification Project reports that vegetation communities in the Granite Pit Area broadly consist of vegetation types including box-gum woodlands, low open forests, riparian woodlands, derived native grasslands and disturbed pasture. It is noted that grazing has resulted in the fragmentation and subsequent high disturbance and degradation of these communities.

During prior surveys of the adjacent Approved Project Area and throughout the subsurface testing and salvage program and ongoing monitoring program within the Approved Project Area, the presence of economic plants (used by Aboriginal people for food, medicine, bark and fibre) has been recorded (Umwelt 2005, 2007a, 2007b, 2008a, 2008b, 2008c, 2008e, 2010, 2012, 2013a, 2014). Those economic plants that have been observed are listed in **Table 3.2**. Aboriginal participants provided information in relation to plants used for the manufacture of artefacts; these ranged from scarred trees providing evidence of bark removal for shelters and coolamon manufacture, to gummy exudates from species such as black wattle (*Acacia decurrens*).

Table 3.2 Aboriginal Food and Useful Plants

Common Name and Scientific Name	Use	Reference
appleberry <i>Billardiera scandens</i>	Fruit eaten	Low 1989:40 Zola & Gott 1992:26
black wattle <i>Acacia decurrens</i>	Gum eaten	Bill Hardie 2004: pers. comm.
bracken fern <i>Pteridium esculentum</i>	Underground fibrous stem roasted and beaten with a stone to remove starch	Zola & Gott 1992:37
bulbine lily <i>Bulbine bulbosa</i>	Large, sweet, starchy tubers were eaten. The tubers are rich in calcium and iron and have a high water content.	Low 1989: 115-116 Zola and Gott 1992: 43
daisy yam or murrnong <i>Microseris lanceolata</i>	Tuberous roots were roasted and formed a staple carbohydrate source for Aboriginal people.	Zola & Gott 1992:7-8 Gott 1983
Flax lily <i>Dianella revolute</i> var. <i>revolute</i>	Berries eaten; roots of some species can be eaten after pounding and roasting; leaves split and used for weaving	Low 1989:8 Stewart & Percival 1997:17
grass tree <i>Xanthorrhoea australis</i>	Base of leaves and pith inside eaten, resin used for hafting stone tools, flowering stems used for spear shafts	Low 1989: 130; Zola & Gott 1992: 58-59
grey box <i>Eucalyptus moluccana</i>	Bark favoured for manufacture of coolamons and shields	Wilson pers. obs.

Common Name and Scientific Name	Use	Reference
kangaroo grass <i>Themeda australis</i> <i>Themeda triandra</i>	Seeds ground for flour, leaves and stems used for fibre and weaving. 'Used by Gundungurra people for its medicinal purpose and food source. After long journeys Gundungurra's cultural practice was to gather the grass and by using either string bark or paper bark would wrap the kangaroo grass around the feet to alleviate swelling and to sooth the feet. The Kangaroo grass was also used to produce flour to make a type of bread to eat'.	Greenway 1910: 16 Zola & Gott 1992: 58 Sharon Brown GTCAC 2015 (refer to Appendix B)
mat-rush <i>Lomandra</i> sp.	Long pliable leaves used for weaving baskets, leaf bases and flowers edible	Low 1989: 131, 174; Zola & Gott 1992: 59
narrow-leafed geebung <i>Persoonia linearis</i>	Ripe fruit pulp eaten; fine scrapings of wood from young stems mixed with breast milk for use as eye treatment; solution made from bark strengthened fishing lines	Stewart & Percival 1997:42
native cherry <i>Exocarpus cupressiformis</i>	Enlarged succulent stalklet (pedicel) eaten	Low 1989: 46
peach heath <i>Lissanthe strigosa</i>	Small sweet berries eaten raw	Low 1989: 42
rushes and sedges <i>Juncus</i> and <i>Cyperus</i> spp.	Underground stem or tuber can be eaten in some species, leaves used for weaving 'Leaves are used for weaving and the underground stem or tuber is a food source'.	Low 1989: 105; Zola & Gott 1992: 60 Sharon Brown GTCAC 2015 (refer to Appendix B)
stringybark <i>Eucalyptus</i> sp.	Fibrous bark used to manufacture string, sheets of bark used for shelter and containers 'Gundungurra uses include the Fibrous bark for medicinal purposes; shelter; Stringybark is significant to Gundungurra Women in making goolamons (coolamons) to collect fruit and berries. To also carry babies and infants'.	Bill Hardie 2004: pers. Comm. Sharon Brown GTCAC 2015 (refer to Appendix B)

Common Name and Scientific Name	Use	Reference
urn heath <i>Melichrus urceolatus</i>	Small sweet berries eaten raw	Low 1989: 42
water ribbons <i>Triglochin procerum</i>	Small bullet shaped tubers roasted	Low 1989: 109
Wattle <i>Acacia spp.</i>	‘Known to Gundungurra people as our wellbeing plant and is used in various ways, that include food source; medicinal purposes; ceremony (smoking ceremonies)’.	Sharon Brown GTCAC 2015 (refer to Appendix B)

In relation to fauna, the Ecological Assessment reports the following prey species:

- Birds: Australian wood duck (*Chenonetta jubata*), Pacific black duck (*Anas superciliosa*), grey teal (*Anas gracilis*) and Australasian grebe (*Tachybaptus novaehollandiae*)
- Reptiles: Cunningham’s skink (*Egernia cunninghami*), three-toed skink (*Saiphos equalis*), red-bellied black snake (*Pseudechis porphyriacus*) and eastern brown snake (*Pseudonaja textilis*)
- Mammals: common brush-tailed possum (*Trichosurus vulpecula*), common ringtail possum (*Pseudocheirus peregrinus*), sugar glider (*Petaurus breviceps ariel*), threatened squirrel glider (*Petaurus norfolcensis*). Commonly detected micro-bat species included white-striped freetail-bat (*Tadarida australis*), Gould’s eastern grey kangaroo (*Macropus giganteus*), common wallaroo (*Macropus robustus*) and common wombat (*Vombatus ursinus*).

GTCAC (2015) report that (refer to **Appendix B**):

...Kangaroos along with possums were not just a source of food. Skins were used in Gundungurra traditional practices to make blankets and body garments..

3.2.5 Previous Land-Use/Disturbance

A full historic heritage assessment has been completed by Umwelt for the Modification Project. The following European impact history summarises key historic land uses to provide context for this ACHAA.

The Granite Pit Area and its surrounds have a long history of European impact. The Lockyersleigh property which includes the Granite Pit Area was granted to Major Lockyer (an explorer, colonial administrator and surveyor) in 1827. The initial grant included an area of 2500 acres which by 1968 had increased to 10000 acres. The land has been used for producing grain, meat and wool and since 1968 as a horse stud. Currently the property is also used for tourism (refer to About Lockyersleigh – 2015:http://www.lockyersleigh.com.au/lockyersleigh_content.html - website accessed 14 May).

Thus the Lockyersleigh property has been subject to 187 years of impact by agricultural activities including land clearance, cultivation and the introduction of hard-hoofed grazing animals such as sheep, cattle and horses. These past and current agricultural land use practices (with the exception of cultivation) appear to have occurred across the entire Granite Pit Area and may have operated to damage or destroy the integrity of any Aboriginal archaeological sites or PADs in the area and to have damaged any Aboriginal

cultural/archaeological material they contained. It has almost certainly had the effect of removing many species of flora and fauna that would have been useful Aboriginal resources.

3.2.6 Implications of the Environmental Context for Aboriginal Occupation of the Granite Pit Area/Site Integrity

In summary:

- the Granite Pit Area was likely to have been relatively dry, with a warm summer (with temperatures that could vary widely within a single day), a relatively cool to cold spring and autumn and a very cold, windy and overcast winter. Based on the climatic data it can be assessed that:
 - o since the mid-Holocene (5000 years ago to the present) the most comfortable times of the year for Aboriginal occupation within the Granite Pit Area may have been late spring, summer and early autumn
 - o the cold south-westerly winds would drastically reduce temperatures and in autumn, winter and early spring may have seen Aboriginal people move out of the area or at least seeking shelter from the wind when camping overnight or stopping to undertake short-term activities related to hunting and gathering activities. Whilst in the hottest part of summer, they may have chosen to camp in areas where the south-westerly winds brought respite from the heat
 - o camping activity of any length within the Granite Pit Area was most likely to occur in the November though to March period when rainfall was the highest and the climate more amenable
 - o in terms of the location of the camp sites, the overall rainfall for the area is not high and the ephemeral tributaries would only have retained water for a very short period after rain. As water availability is a known determining factor in the location of Aboriginal camp sites, it can be assumed that the main camp sites within the Granite Pit Area, and thus the areas where the majority of artefactual material would have been discarded, would be in proximity to the creek channels with flow entering from outside the Granite Pit Area. The location of a spring in the channel of the most northerly tributary further suggests that this area would be a likely location for a camp site
 - o taking into account the cold west and south-westerly winds it was likely that preferred camping location within the Granite Pit Area in spring, autumn and winter would be in the valleys on the northern side of the main spur that trends generally from east to west and which would have provided some protection from the elements. In summer, the reverse may have been the case with Aboriginal people seeking respite from heat by camping in areas with a south-westerly aspect to the south of this spur or on the broad spur crest (refer to **Figure 3.2** and **Section 3.2.2**)
 - o lack of water would restrict the time Aboriginal people could stay in all but the south-easterly corner and in proximity to the most northerly tributary within the Granite Pit Area and thus if there are sites away from these locations they are generally likely to be small and reflect transient use of the area.
- it is unlikely that locally outcropping stone (if any) would have been used for stone implement manufacture. It is far more likely that raw material suitable for stone implement manufacture would be imported into the area (refer to **Section 3.3.3** for further discussion)
- there would have been sufficient flora and fauna to support small groups of Aboriginal people for short stays in the warmer months, however, in the cool to cold months animal and plant foods would be

unlikely to provide sufficient calories/nutrition to allow Aboriginal people to camp in the area for any length of time

- ecotones should be present along the boundary between the Bindook Porphyry Complex and the Lockyersleigh Granite and between the Lockyersleigh Granite and the area of exposed Deep Sands in the north-west of the Granite Pit Area. Of these areas the ecotone related to the Deep Sands in the Lockyersleigh Granite and the ecotone near the Bindook Porphyry Complex and the Lockyersleigh Granite in proximity to the northern tributary of Lockyersleigh Creek are the most likely to have been attractive to Aboriginal people and to prey species as they were also in proximity to what appears to have been the most reliable water source
- prior land-use practices in the general area are likely to have resulted in the following:
 - o the removal of the majority of scarred and/or carved trees during land clearance
 - o the removal of plant species that were valued economic resources for Aboriginal people
 - o competition for prey species
 - o the introduction of non-endemic flora and fauna that out-competed native flora and fauna
 - o a change in the hydrology of the creeks and thus in their morphology and endemic flora and fauna
 - o an increase in the downslope movement of the sandy soils and any artefacts they may have contained
 - o the mixing and reburial of artefacts from different sites and of different ages in areas where colluvium has aggraded
 - o damage/destruction by stock trampling of sites such as bora rings and stone arrangements (if they were present).

3.3 Archaeological Context

This section of the report discusses the known archaeological context of the general Marulan area, the adjacent Approved Project Area and the Granite Pit Area. This information is then considered along with the information provided by the cultural and environmental context to formulate a predictive model for site location, site type and site contents for the Granite Pit Area (refer to **Section 4.0**).

3.3.1 Known Aboriginal Sites in the Broader Region

A search of the OEH Aboriginal Heritage Information Management System (AHIMS) database conducted on 12 May 2015 revealed that 261 previously recorded Aboriginal archaeological sites are located within an area of 15 kilometres by 15 kilometres centred on the Granite Pit Area (Z55 GDA coordinates E765000-775000,N6147000-612000) and (Z56 GDA coordinates E225000-230000,N6147000-6162000) (refer to **Appendix D**).

Table 3.3 indicates that the Aboriginal site types within the search area consist of artefact scatters (145), isolated finds (90), modified trees (10), potential archaeological deposits (PADs) (6), isolated finds with PAD (3), artefact scatter with PAD (2), stone arrangement (1), stone arrangement with burial (1), artefact scatter/stone quarry (1), grinding bowl (1) and hearth (1). It is noted that a scarred tree and stone arrangement listed on the AHIMS (MRN31 and MRN32 - AHIMS #51-6-0272 and #51-6-0273 respectively)

are no longer assessed as sites and that MRN53 has a duplicated record – these have been removed from the totals discussed but have not yet been removed from the register). It is also noted that some of the sites initially listed as isolated finds have since been subject to further investigation and are now recorded in subsequent reports as artefact scatters and these have also been updated for this discussions (for site locations refer to **Figure 3.4**).

Table 3.3 OEH AHIMS Search Results

Site Type	Number	Percentage
Isolated Find	90	34.5
Isolated Find with PAD	3	1.1
Artefact Scatter	145	55.5
Artefact Scatter with a Stone Quarry	1	0.4
Artefact Scatter with PAD	2	0.8
PAD	6	2.3
Modified (Scarred)Trees	10	3.8
Stone Arrangement	1	0.4
Stone Arrangement with Burial	1	0.4
Grinding Bowl	1	0.4
Hearth	1	0.4
Total	261	100

While the search results indicate a dominance of sites containing stone artefacts (total percentage 92.3 per cent), there is also a small sample of rarer site types such as a stone arrangement, a stone arrangement and burial, a grinding bowl, a hearth and modified (scarred) trees .

Of the 261 sites and PADs, a total of 107 sites and five PADS were located within the adjacent Approved Project Area. Of these a total of 72 sites and four PADs are being managed for their long term conservation (12 sites) or managed *in-situ* for the 30 year life of the Approved Project. Further details of these sites and sites located in areas adjacent to, or in proximity to the Granite Pit Area are provided in **Sections 3.3.2** and **3.3.3** and in **Appendix E**.

3.3.2 Known Aboriginal Archaeological Sites in the Granite Pit Area

Of the 261 sites, one artefact scatter and two isolated finds are located within the current Granite Pit Area and two of these are within the area proposed for impact by the Modification Project. These are LA31 (#51-6-0386) and LA32 (#51-6-0387). A third site, LA33 (#51-6-0388) is outside the Granite Pit Area disturbance footprint. The site locations are shown on **Figures 3.4** and **3.5**. The three sites were recorded as part of a broader study undertaken by Saunders (2005) for a Development Application for the proposed subdivision of Lots 24, 25, 41, 42 and 43 of the property Lockyersleigh (it is noted that this project has not gone ahead).

LA31 was recorded as a low density artefact scatter located on a low-gradient, north-westerly facing slope above a tributary of Lockyersleigh Creek. The artefacts were distributed across an area of 50 metres by 20 metres and within deep orange sands that had been excavated by wombats. The artefacts consisted of five flakes and a flaked piece manufactured from quartz, quartzite and chert.

LA32 was recorded as an isolated quartz flake, located on a low gradient basal slope, 220 metres south-east of LA31 and on the opposite side of the tributary to LA31 (it is noted that ground truthing found that the MGA coordinates for LA31 and LA32 had been transposed on the AHIMS site cards and this has been corrected as shown on **Figure 3.5** – refer to **Section 5.4.1** for further details).

LA33 was recorded as an isolated quartzite flake located on a low gradient basal slope in the north-eastern corner of the Granite Pit Area and outside of the area proposed for impact.

Saunders (2005) assessed all three sites as having low archaeological significance (refer to **Section 3.3.3.9** for the remainder of the results of Saunders' survey in areas that fell outside of the Granite Pit Area).

One additional previously recorded site, MRN25 (#51-6-0266), is also within the footprint of the proposed haul road to the Granite Pit but is outside of the Granite Pit Area and within the Approved Project Area (refer to **Figure 3.5**). Holcim Australia currently has approval to impact this site with the written approval of OEH. OEH has approved the burial of site MRN25 under s.87/90 AHIP #1100264. This approval is related to the burial of the site under overburden from the Lynwood Quarry pit. In order to allow for the haul road for the Granite Pit Area, the extent of the overburden emplacement area in the vicinity of MRN25 has been decreased, however, impact to MRN25 is now proposed from haul road construction and this impact will need to be addressed in the proposed variation to s.87/90 AHIP #1100264 (refer to **Section 7.1** for details).

**Aboriginal Archaeological Sites Listed on the
OEH AHIMS Register within 7.5 Kilometres of the
centre of the Proposed Granite Pit Area**

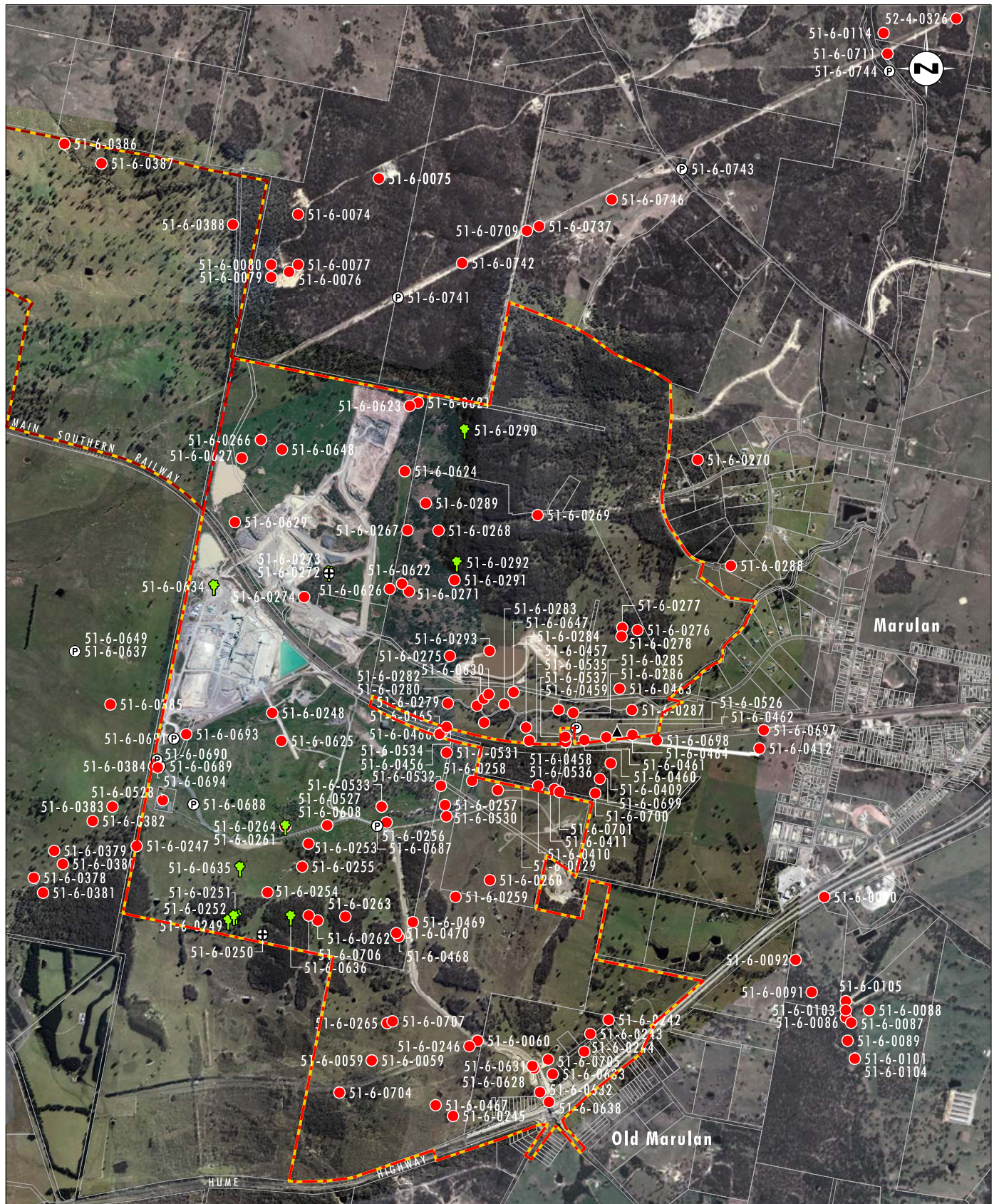


Image Source: Google Earth (2012), Holcim Australia (2014)
Data Source: LPI (2014), Holcim Australia (2014)

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Proposed Granite Pit Area
- Isolated Find/Artefact Scatter
- Grinding Bowl
- Potential Archaeological Deposit
- Scarred Tree or Carved Tree
- Stone Arrangement

FIGURE 3.5

Previously Recorded Aboriginal Archaeological Sites
Listed on the OEH AHIMS Register within the Approved
Project Area and the Proposed Granite Pit Area

3.3.3 Previous Archaeological Research

This section presents a summary of previous archaeological research in the locale of the Granite Pit Area. The information is provided in chronological order. The site locations are shown on **Figures 3.1, 3.4 and 3.5**.

3.3.3.1 Navin 1990

Navin carried out an archaeological survey of part of the Approved Project Area for an earlier proposed hard rock quarry. The survey was undertaken in two stages: the survey of all areas to be impacted by the proposed development and subsequently, the inspection of areas deemed to have high archaeological sensitivity. Two artefact scatters MQ1 (#51-6-0059) and MQ2 (#51-6-0060) and three isolated finds IF1 (#51-6-6-0103), IF2 (#51-6-0101) and IF3 (#51-6-0102) were recorded during the survey.

MQ1 was located on the lower slope of a spur, 200 metres from a tributary of Marulan Creek. The site was reported to have contained two broken pebbles and a quartz flaked piece. The artefacts were located in a scour (8 metres by 6 metres) below a tree. MQ1 was assessed as having low archaeological significance. MQ2 was located on a low spur. Nine artefacts were located in three exposures and consisted of a chalcedony core and flaked piece, a quartz flake, broken flake and flaked piece, a volcanic manuport, two flaked pieces and a chert flaked piece. MQ2 was assessed as having moderate archaeological significance.

The isolated finds were located in association with eroding gullies and consisted of two grey silcrete broken flakes and a broken quartzite flake. It was recommended that as MQ 1 would be impacted if development of the quarry proceeded that the artefacts be collected under Section 90 consent. As MQ2 was outside the area of impact it was recommended that the site be protected by revegetating the area. There were no recommendations made for the isolated finds.

It is noted that this earlier hard rock quarry did not proceed. A more extensive area including the Navin survey area was subsequently surveyed for the Lynwood Quarry project (the Approved Project Area – Umwelt 2005). Under the AHMP for the Approved Project Area MQ1 and IF1, IF2 and IF3 are being managed for their conservation. MQ2 was subject to subsurface testing and salvage under AHIPs #1077225 and #1100264.

3.3.3.2 McIntyre 1993

McIntyre reported on three sites located to the west of the Granite Pit Area. Two of these, G11 (#51-6-0066) and G13 (#51-6-0068), were artefact scatters located adjacent to the route of the 132 kV Marulan to Goulburn transmission line. G11 was located on the banks of Narrambulla Creek and contained five artefacts. The artefacts were manufactured from silcrete (4) and chert (1) and consisted of four cores and a flaked piece. G13 was described as located at the base of a tree and contained three artefacts manufactured from quartz (2) and silcrete (1). The third site, G5 (did not appear on AHIMS search results) was described as a 'large quarry site and work floor overlooking Towrang Creek'. Its dimensions were given as 'at least 60 by 100 m on the east bank of the creek'. McIntyre reported that at the time of recording (1989), the site was already highly disturbed and on subsequent re-inspection was found to be effectively destroyed through additional clearance work. The G5 'quarry site' was described as containing silcrete, indurated mudstone, chert and quartz. The NPWS site card for the site reports that at 'least some of these materials (quartz and silcrete) are being quarried at the site'.

3.3.3.3 Sefton 1995, 1996

In 1995, Sefton carried out a survey of the site of a proposed water augmentation project to the north and east of Marulan (from 11 kilometres to 1.5 kilometres distant from the Granite Pit Area). No sites were located during this survey. A subsequent survey for the Marulan Sewerage Augmentation project in 1996 resulted in the recording of seven artefact scatters and three isolated finds (NPWS site cards #51-6-0086 to #51-6-0104). The artefact scatters contained between six and 13 artefacts and were all located adjacent to Marulan Creek approximately 5 kilometres south-east of the Granite Pit Area. Artefact types included flakes, cores, broken flakes, flaked pieces, one backed blade and numerous bipolar flakes and cores and one volcanic manuport (pebble). Silcrete was the dominant raw material then quartz and chert. Siltstone and volcanic were also present in low numbers. Bipolar reduction was taking place for silcrete, quartz and chert. The isolated finds were located beside a tributary of Marulan Creek and contained a quartz bipolar flake, a grey silcrete flake and a yellow silcrete core.

A subsequent review of the archaeological survey by the Department of Public Works recorded a further artefact scatter, Marulan 8 (#51-6-0105). The site was located on the bank of a tributary of Marulan Creek. It contained three artefacts including two quartz flakes and a silcrete flaked piece (information from NPWS Site Card).

3.3.3.4 Johnston 1995

In 1995, Johnston (Australian Archaeology Survey Consultants) undertook a survey for a proposed extension to a sand quarry adjacent to the north-western corner of the Approved Project Area and east of the Granite Pit Area (refer to **Figure 3.5**). Johnston recorded five artefact scatter sites, MAS1 (#51-6-0074), MAS2 (#51-6-0080), MAS3 (#51-6-0079), MAS4 (#51-6-0076) and MAS5 (#51-6-0077) and one isolated find, MIF1 (#51-6-0075) during his survey. The artefact scatter sites contained between two and six artefacts and were mainly located in highly disturbed contexts due to what were reported as prior quarry activities. Johnson assessed that the artefacts had come from slopes and benches on the slopes. Raw materials used in artefact manufacture included silcrete, quartz, quartzite, chert and volcanic pebbles. The isolated find was located on a ridge top and was a grey quartzite core.

3.3.3.5 Dearling 1997

The survey for a proposed mushroom farm approximately 7 kilometres to the south-east of the Granite Pit Area, located three isolated finds, MF1 (#51-6-0093), MF2 (#51-6-0095) and MF6 (#51-6-0098) and three artefact scatters, MF3 (#51-6-0094), MF4 (#51-6-0096) and MF5 (#51-6-0097). The scatters included an extensive high density site (MF4) beside Narambulla Creek with artefacts eroding out of the bank of the creek, adjacent terraces and grassy flats. A diverse range of artefact and raw material types were noted at this location. Dearling (2007) recommended that this site be conserved as it was assessed as having moderate to high likelihood of retaining PAD. This site was located in the Bindook Porphyry Complex geology.

3.3.3.6 Navin Officer 1997

In 1997, Navin Officer Heritage Consultants revisited the sites located by Dearling in the same year due to Pejar Land Council Officers having changed, which meant that the current (at the time) community representatives had not been consulted. During the course of this visit and site inspection two areas where mushrooms were growing in large rings were noted. These features were tentatively identified as the remains of Aboriginal 'Bora Rings'. Ultimately it was found that there was no concrete evidence on which to base this identification. The development of the mushroom farm did not impact on the area in question.

3.3.3.7 ERM 2004

ERM carried out an assessment of Lots 1 and 3, adjacent to Simpson and Wilson Drive, to the west of Marulan and approximately 4 kilometres south-east of the Granite Pit Area. The survey area was approximately 100 hectares in size and the survey was undertaken to identify any heritage constraints associated with the proposed development of a subdivision. ERM reported that entire area was dominated by gentle slopes. Despite low ground surface visibility, five sites were identified including one artefact scatter, MW4 (#51-6-0411) and four isolated finds, MW1 (#51-6-0412), MW2 (#51-6-0409), MW3 (#51-6-0410) and MW5 (not on AHIMS). MW4 encompassed two areas of exposure and consisted of 12 silcrete artefacts considered to represent a single knapping event. This site had the potential to continue beyond the limits of exposed areas and was therefore also identified as having PAD.

The presence of sites within the survey area was considered anomalous due to the lack of reliable water sources in the area. However, all sites were situated within easy reach of Joarimin Creek and its tributaries suggesting that these low density sites represent a limited and transient use of the area.

ERM proposed the conservation of MW3, MW4 and MW5 which were located within the Bindook Porphyry Complex geology.

3.3.3.8 Williams 2004

In 2004 Williams undertook an assessment in preparation for potential rezoning of a property for the construction of a pyrotechnics facility approximately 2 kilometres west of Marulan South. The area surveyed was relatively small (approximately 80 hectares) and the level of effective coverage was quite low due to vegetation cover which limited ground surface visibility.

Two isolated finds (#48-4-0092 and #48-4-0093) and six artefact scatters (#48-4-0086 to #48-4-0091) were identified during the course of the survey. The two isolated finds were both located on spur crests in areas of poor visibility that Williams identified as having the potential for further archaeological deposits. More than 10 artefacts were found at four of the artefact scatter sites with the largest number being 38. Sites were present in a range of landscapes such as simple slopes, ridge crests and spur crest formations. However, the sites with greatest artefact concentrations were situated in proximity to watercourses. Quartz and silcrete dominated the raw materials present at these sites and three bipolar silcrete cores formed part of these assemblages.

As all site boundaries in his study area were defined by visibility, Williams suggested that subsurface deposits were also likely to exist in areas not subject to exposure. It was also suggested that all landforms in the area were suitable areas for camping activities. Based on this assertion it was anticipated that artefacts would be present in similar densities across all landforms in the survey area.

3.3.3.9 Saunders 2005

Archaeological Heritage Surveys was commissioned to undertake an assessment of Lots 24, 25, 41, 42 and 43 (constituting approximately 2500 hectares) on the 'Lockyersleigh' property which includes part of the current Granite Pit Area (refer to **Section 3.3.3.2**).

Survey areas were assessed for their archaeological sensitivity based on previous archaeological research, topography and prior land-use. As a result, four areas of particular sensitivity were identified for intensive survey and these included:

- elevated land associated with Osborne Creek (Area 1 = 75ha), Narambulla Creek (Area 2 = 148 ha), Lockyersleigh and Joarimin Creek (Area 3 = 135 ha)

- lightly timbered low gradient slopes and drainage lines in the north-eastern corner of the proposed subdivision (Area 4 = 219 ha).

Two further areas, both of which had been highly disturbed by past activity were also chosen for survey on the basis of landform and topography:

- a section of Lockyersleigh Creek, adjacent flats and locally elevated areas overlooking the flats (Area 5 = 12 ha)
- a basal slope/crest beside Narrambulla Creek (Area 6 = 6 ha).

As a result of the survey, 33 Aboriginal sites (designated LA1 to LA33 - #51-6-0356 to #51-6-0388⁴) were identified. These included 23 artefact scatters (one scatter was recorded as associated with a possible scarred tree) and 10 isolated finds. Five of the sites (LA2, 3, 12, 16 and 17) were assessed as having high archaeological significance at a local level and LA17 was assessed as having a low to moderate level of archaeological significance at a regional level due to the existence of the possible scarred tree. The survey located what was described by Saunders (2005) as two site complexes, one associated with Osbornes Creek the other associated with Narrambulla Creek (neither of which are within the Granite Pit Area).

The sites within the site complexes were described as follows:

- Osbornes Creek – LA2 – 50 to 100 artefacts within a site area of 25 metres by 12 metres. Artefact types included flakes and cores manufactured from silcrete and quartz
- Osbornes Creek – LA3 – 74 artefacts within a site area 90 metres by 10 metres. Artefact types included flakes, flaked pieces, cores and flaked pebbles manufactured from silcrete, quartz, quartzite, chert and tuff
- Narrambulla Creek – LA12 – 51-100 artefacts within a site area 80 metres by 12 metres. Artefacts included flakes, flaked pieces, cores and a backed blade manufactured from silcrete and quartz
- Narrambulla Creek – LA16 – 100+ artefacts within a site area 150 metres by 80 metres. Artefacts included flakes, flaked pieces, cores, chips, modified flakes and at least one hammerstone. The artefacts were manufactured from silcrete, quartz and volcanic
- Narrambulla Creek – LA17 – 100+ artefacts within a site area 270 metres by 30 metres. Artefacts included flakes, flaked pieces and cores manufactured from silcrete and quartz.

As noted in **Section 3.3.3.2** Saunders (2005) also located a low density artefact scatter (LA31 – #51-6-0386) and two isolated finds (LA32 – #51-6-0387 and LA33 – #51-6-0388) within the Granite Pit Area on a tributary of Lockyersleigh Creek (refer to **Figures 3.4** and **3.5**).

Saunders (2005) recommended a Narrambulla Creek Conservation Zone to protect LA12, LA16 and LA17. These sites were located in the Lockyersleigh Granite geology and were assessed as having moderate to high or moderate likelihood of having PAD.

Saunders (2005) also recommended an Osbornes Creek Conservation Zone to protect LA2, LA3, LA4, LA6 and LA7. These sites were located in the Lockyersleigh Granite geology and were assessed as having moderate to high or moderate or low (LA7) likelihood of having PAD.

⁴ LA1 to LA3 were outside the AHIMS search area

3.3.3.10 Umwelt 2005

The archaeological survey and assessment of the Lynwood Quarry project area (the Approved Project Area) was undertaken during the period 26 July to 6 August 2004, with the results of the assessment reported to OEH in May 2005. The survey was undertaken by Umwelt, GTCAC and PLALC.

The survey identified 48 previously unrecorded sites within the project area including: 29 artefact scatters, 12 isolated finds, six potential scarred trees and one stone arrangement (refer to **Table 3.4** and **Table 3.5** and **Figures 3.1, 3.3** and **3.4**). In addition, one potential scarred tree (MRN31) and one potential stone arrangement (MRN32) were recorded and later found not to be Aboriginal in origin but to be natural features and therefore are not discussed in this summary.

Table 3.4 Site Type/Site Name

Site Type	Site Name	Total
Stone Arrangement	MRN9	1
Scarred Tree	MRN8, MRN10, MRN11, MRN23, MRN49, MRN51	6
Artefact Scatter	MRN1, MRN2, MRN3, MRN4, MRN5, MRN6, MRN7, MRN12, MRN13 , MRN14, MRN15, MRN17, MRN20, MRN22, MRN25 , MRN27 , MRN28, MRN34 , MRN36, MRN39, MRN40 , MRN41 , MRN42 , MRN43 , MRN44, MRN45, MRN46, MRN48, MRN50	29
Isolated Find	MRN16, MRN18, MRN19, MRN21, MRN26, MRN24, MRN30, MRN33, MRN35, MRN37, MRN38, MRN52	12
Total		48

Note: The sites shown in bold were those with 10 or more surface artefacts when recorded in 2004.

Two additional sites recorded - MRN47 and MRN49 - both artefact scatters that were found to be outside the project area are not included.

The majority of sites were found to be located along watercourses with 24 of the 50 sites located within 30 metres of a watercourse. In terms of landform, 22.9 per cent of sites were located along the banks of minor tributary channels and 29.2 per cent were located along the banks of the higher order tributary channels. Away from watercourses, 10.4 per cent of sites were located on lower spur slopes, 10.4 per cent on the midslopes of spurs and 4.1 per cent located on the upper slopes of spurs. Spur crests and saddles contained 22.9 per cent of the sites (refer to **Table 3.5**). As is always the case with survey ground surface visibility was a determining factor in site visibility.

Table 3.5 Geographic Distribution of Sites in the Landscape

Site	Footslope /bank minor creek channel	Footslope/ bank major creek channel	Lower spur slope	Mid spur slope	Upper spur slope	Spur crest/ saddle	Total
Isolated finds	3	2	1	2	1	3	12 (25%)
Artefact Scatters	8	12	3	0	1	5	29 (60.4%)
Stone Arrangement	0	0	1	0	0	0	1 (2.1%)
Scarred tree	0	0	0	3	0	3	6 (12.5%)
Total	11 (22.9%)	14 (29.2%)	5 (10.4%)	5 (10.4%)	2 (4.1%)	11 (22.9%)	48

Of the 41 sites containing surface stone artefacts, 33 contained less than 10 artefacts, four sites contained 10 to 20 artefacts, three sites contained 21 to 50 artefacts and one site (MRN27) contained greater than 50 artefacts.

The dominant artefact types observed in the sites containing stone artefacts were flakes, broken flakes and flaked pieces manufactured from quartz, silcrete, quartzite, chert, ignimbrite, dolerite, granite and volcanic.

Only 12 of the sites identified were within the development disturbance footprint with the remainder set aside for either long term conservation or conservation *in situ* for the 30 year life of the quarry (refer to **Figure 3.1**).

3.3.3.11 ERM 2006a

ERM (2006) was commissioned by Blue Circle Southern Cement to undertake an Aboriginal cultural heritage assessment within an additional area of 25 hectares proposed to extend the life of an existing limestone quarry at Marulan South.

As a result of the survey a total of total of 38 artefacts were recorded within five areas of exposure associated with minor drainage lines across an area of three hectares. All five areas were assessed to be part of one large site (BSCS1 - # 52-4-0195). The low density artefact scatter was reported to consist mainly of silcrete and quartz flakes and cores.

3.3.3.12 ERM 2006b

ERM carried out an Aboriginal Cultural Heritage Assessment for Boral Resources of an area (subsequently known as Peppertree Quarry) proposed for a hard rock quarry at Marulan South as part of an Environmental Assessment in late 2005 and early 2006. Peppertree Quarry is located approximately 7 kilometres to the south-east of the Granite Pit Area. The ERM survey area was reported as having a low density of stone artefacts across its entirety which were recorded as 18 separate sites. An area which was to be subject to inundation by a proposed water storage facility on Tangarang Creek, was identified as having a higher density of artefacts and complexity of artefacts types and was assessed as having a high potential for subsurface archaeological deposit. As a result of the survey, 11 of the recorded sites were proposed to be subject to a program of surface collection and subsurface investigation. The sites affected were: MSQ8 to MSQ17 (#52-4-0150 to # 52-4-0159). Flakes and broken flakes dominated the recorded assemblages with lesser flaked pieces and cores. One of the isolated finds was a unifacially flaked granodiorite axe. ERM reported that utilised raw materials within the surface assemblage were dominated by silcrete, followed by quartz and chert (refer to **Section 3.3.3.16** for details of further investigations).

3.3.3.13 Umwelt 2007a and 2007b

In 2005 and 2006, Umwelt undertook survey and assessment for Country Energy of proposed transmission line easements and the proposed North Marulan Zone Substation (NMZSS) within the broader Lynwood Quarry project area. The Aboriginal archaeological survey of the transmission line easements and proposed substation were undertaken by Umwelt, GTCAC, and PLALC on 1 and 2 December 2005 with an additional day of survey completed on 21 March 2006. The survey identified 15 previously unrecorded sites; including, 10 isolated finds, four artefact scatters, and one grinding bowl located on an ignimbrite outcrop (refer to **Table 3.6** and **Figure 3.1**).

Table 3.6 Site Type/Site Name

Site Type	Site Name	Total
Grinding Bowl	Marulan T1 S7	1
Artefact Scatter	Marulan T1 S2 , Marulan T1 S3, Marulan T1 S5, Marulan T1 S8	4
Isolated Find	Marulan T1 S1, Marulan T1 S4, Marulan T1 S6, Marulan T1 S9, Marulan T5 S1, Marulan T5 S2, Marulan T6 S1, Marulan T6 S2, Marulan T6 S3, Marulan T6 S4	10
Total		15

Note: The sites shown in bold are those with 10 or more artefacts when recorded in 2005 and prior to subsurface testing.

Of the 15 sites, nine were located on spur crest landforms, four on slope landforms (two upper slope, one footslope and one lower slope), and two sites were located on rocky spur crest landforms. Six of the sites were located within 30 metres of a watercourse, two sites were located 30 to 50 metres from a watercourse, and seven sites were located more than 50 metres from a watercourse (refer to **Table 3.7**).

Table 3.7 Geographic Distribution of Sites in the Landscape

Site	Spur crest	Lower slope	Footslope	Upper slope	Rocky Spur Crest	Total
Isolated finds	4	1	1	2	2	10 (66.7%)
Artefact Scatters	4	0	0	0	0	4 (26.7%)
Grinding Bowl	1	0	0	0	0	1 (6.6%)
Total	9 (60%)	1 (6.6%)	1 (6.6%)	2 (13.4%)	2 (13.4%)	15

The artefact scatters located were generally small (<10 artefacts), with silcrete and quartz as the dominant raw materials and flakes and broken flakes the dominant artefact types. Three relatively uncommon stone artefact types (within the then known surface assemblage); backed points and a grinding bowl on an ignimbrite boulder, were recorded during the survey. No large surface assemblages were located during the survey.

3.3.3.14 Umwelt 2007c to 2014

Schedule 3, Condition 36 (b) of the Development Consent for the Lynwood Quarry Approved Project Area identified a requirement for Holcim Australia to undertake a subsurface testing and salvage program for Aboriginal sites located within its project disturbance footprint prior to the commencement of quarry construction. Condition 37 also identified a requirement for monitoring of all topsoil stripping 'unless the DEC [Department of Environment and Conservation] approves otherwise'. In line with the requirements of DEC (now the Office of Environment and Heritage - OEH), Holcim Australia developed an upfront subsurface testing program incorporating the known sites and all of the Archaeological Terrain Units (ATUs) within its project disturbance footprint (refer to **Sections 4.5** and **4.6** for discussions in relation to ATUs). This also included the areas associated with Country Energy infrastructure discussed in **Section 3.3.3.12**. The subsurface testing of the sites and ATUs and subsequent salvage (as required) was endorsed by the OEH and the relevant Aboriginal stakeholder groups as a suitable alternative to ongoing monitoring of ground disturbing works.

The subsurface testing and salvage program was extended in 2011 to incorporate minor modifications proposed by Holcim Australia to the project disturbance footprint (refer to Umwelt: 2010, 2011b). The modifications were intended to improve the Lynwood Quarry plant set up and optimise the site layout. The minor modifications to the project disturbance footprint resulted in the subsurface testing of one location identified as potential archaeological deposit (PAD5) and the monitoring of three further locations also identified as PAD (PADs 2, 3, and 4) (Umwelt 2011b) .

The initial Umwelt (2007c) Research Design and Methodology set out a series of three stages for the subsurface testing and salvage program for the Lynwood Quarry project disturbance footprint. The stages were proposed and approved by the OEH under s.87 AHIP #1077225 and combined s.87/s.90 AHIP #1077294. Additional works associated with the Country Energy (now Essential Energy) easements and the NMZSS were included into the initial project stages under two additional s.87/s.90 AHIP permits (AHIP #1100264 and #1089392), and two variations to existing s.87/90 AHIP permits (variation to AHIP #1077294 and variation to AHIP #1100264) to allow for project modifications. Works associated with these stages are outlined below:

- Stage 1 – Country Energy project disturbance footprint - monitoring of the mechanical excavation of Country Energy pole locations; collection and relocation of artefacts from a track within the Joarimin Creek South site (JCS); subsurface testing of ATUs within the Country Energy construction access footprint; and surface collection, monitoring of ground disturbance and subsequent manual excavation at the NMZSS area.
- Stage 2 – Holcim Australia project disturbance footprint - subsurface testing of known sites; subsurface testing of ATUs; further subsurface testing of ATUs; subsurface testing and monitoring of PAD locations; subsurface testing/salvage of the State significant Old Marulan township and reporting and AHIP application requirements.
- Stage 3 – Holcim Australia project disturbance footprint - surface collection of newly located sites and excavation of a known site (MRN27); and a final report incorporating the results of all stages.

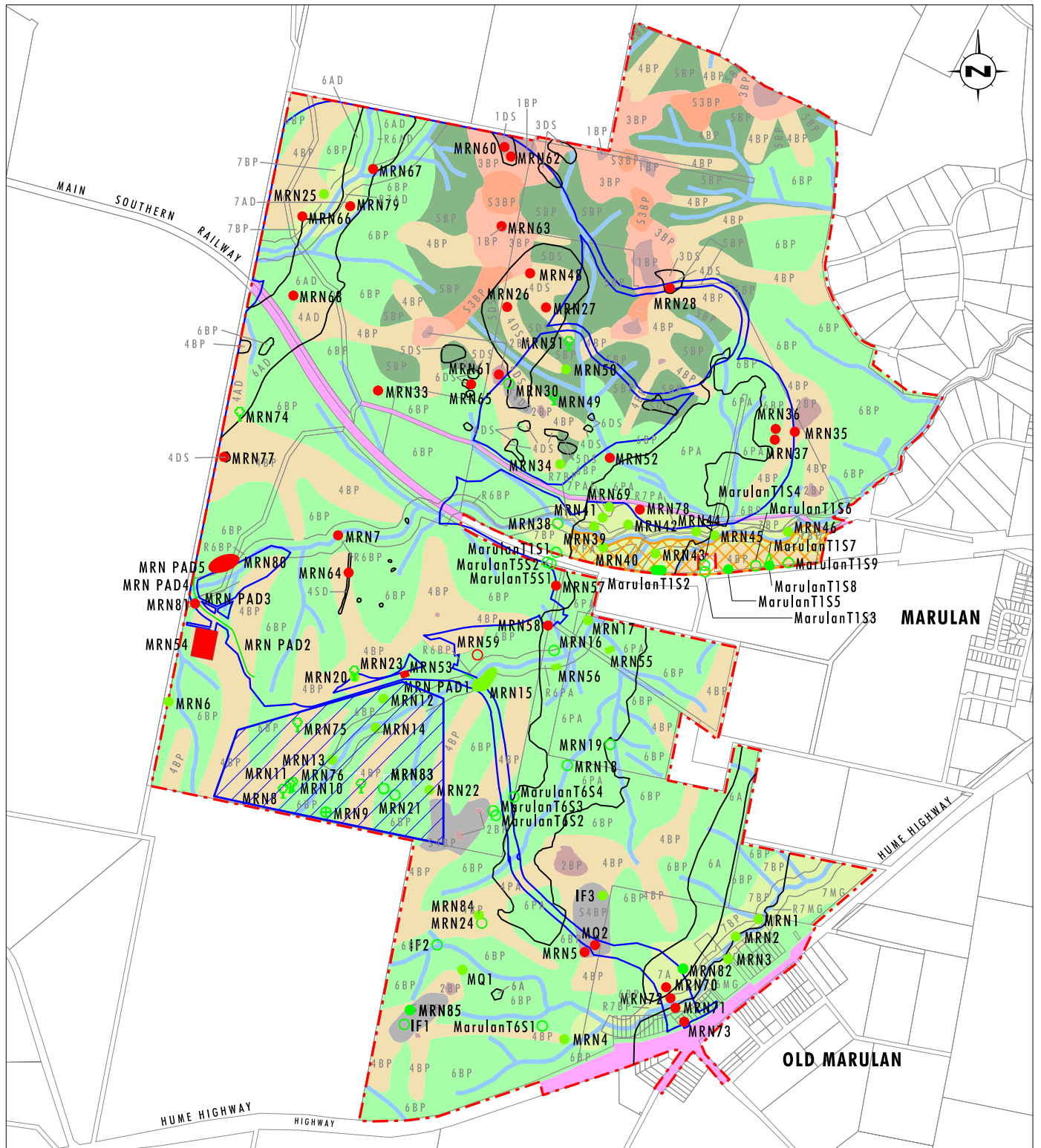
Each of the stages for the subsurface testing program followed a single comprehensive Research Design and Methodology (Umwelt 2007c, 2008d, 2008f, 2009a) and resulted in a subsequent report (Umwelt 2008a, 2008e and 2009b). Each stage was undertaken in compliance with the relevant AHIP conditions and the conditions of the Lynwood Quarry Aboriginal Heritage Management Plan (AHMP - Umwelt 2007d, revised 2011a). A minor modification to the project disturbance footprint also resulted in additional survey and assessment report (Umwelt 2010). No further sites were located, however, four new areas of PAD were identified (PAD2 to PAD5) and additional subsurface testing of PAD5 was required along with monitoring of minor ground disturbance works in PAD2, PAD3 and PAD4 (Umwelt 2011b).

As a result of the additional subsurface testing and monitoring PAD5 became MRN80 (an artefact scatter) and PAD3 became MRN81 (an isolated find) (refer to **Figure 3.1**).

During movements around the Approved Project Area associated with the subsurface testing program and the annual site monitoring (of the sites being conserved by Holcim Australia) an additional 8 sites were located. The sites included two scarred trees (MRN75 and MRN76), two isolated finds (MRN83 and MRN85) and four small artefact scatters (MRN77, MRN78, MRN79 and MRN84) (Umwelt 2012, 2013a, 2014). Finally, MRN82, a small artefact scatter was uncovered during construction (refer to **Figure 3.1**).

The combined results of all prior survey, subsurface investigations and site salvage were included in the final Stage 3 report (Umwelt 2013b). The results and conclusions arising from the Stage 3 report are provided below. The sites are shown on **Figure 3.1** and the surface collection, subsurface testing, salvage locations and ATUs are shown on **Figure 3.6**. **Figure 3.1** also shows the current conservation status of the sites within the Approved Project Area.

In total, 5217 artefacts were recovered from 37 sites. Surface artefacts were collected from 13 of the 37 sites and subsurface artefacts were recovered from 34 of the 37 sites (the majority of these sites were located through the ATU subsurface testing program). Of the 5217 stone artefacts recovered, 526 were from surface collection with the remaining 4691 artefacts were recovered during the subsurface testing and salvage program (refer to **Appendix E** for further details of the sites).



Data Source: Holcim Australia (2014), LPI (2004)

0 0.25 0.5 1.0km
1:25 000

Legend

- | | | |
|---|--|--|
| <ul style="list-style-type: none"> Approved Project Area Approved Disturbance Footprint and AHIP#1100264 Boundary PADs Conservation Cultural Heritage Management Zone Joarimin Creek South Area (JCS) Modified Creek Lines High Point Rocky Ridge Crest High Point Rocky Spur Crest Ridge Crest Spur Crest Moderate Slope Gentle Slope Very Gentle Slope | <ul style="list-style-type: none"> Saddle on Ridge Crest Saddle on Spur Crest Riparian Corridor in Gentle Slope Riparian Corridor in Very Gentle Slope Adamellite Dyke/Sills Deep Sand Andesite Marulan Granite Bindook Porphyry Siliceous Dyke Porphyritic Adamellite Adamellite Dyke Elevated Area within Gentle Slope Grinding Stone (CE) Conservation Stone Arrangement Conservation | <ul style="list-style-type: none"> ● Scarred Tree Conservation ○ Isolated Find Conservation ● Artefact Scatter Conservation ● Artefact Scatter - no further management required prior to impact ○ Isolated Find - no further management required prior to impact |
|---|--|--|

FIGURE 3.6

Aboriginal Heritage Sites and
Archaeological Terrain Units within
the Approved Project Area

Of the 13 sites containing surface artefacts only two (JCS and MRN27) contained more than 10 surface artefacts. Both of these sites were located on a low spur crest and adjoining gentle spur slope leading down to the riparian corridor of the main channel of Joarimin Creek (JCS), and a spur crest and adjoining slope leading down to an upper order tributary of Joarimin Creek (MRN27). Site MRN27 contained the majority of surface artefacts (369 artefacts) which represented over 70 per cent of all surface artefacts recovered and site JCS contained 111 surface artefacts (21.1 per cent of all surface artefacts).

However, the number of surface artefacts collected at site JCS only represents the surface artefacts located along the ARTC access track and not all the surface artefacts present within the site area, and therefore underestimates the actual percentage of surface artefacts within site JCS (a further 68 surface artefacts were identified within JCS during the 2012 monitoring program (Umwelt 2012)).

Of the remaining 11 sites containing surface artefacts (all contained less than 10 surface artefacts), four were located on spur crests (MRN26, MRN28, MRN64 and MRN77), four were located on spur slopes (MRN33, MRN35, MRN36 and MRN78), one site was located on a spur crest and slope (MRN25), one site was located in a saddle (MRN5) and one site was located on a ridge crest (MRN62) (refer to **Figure 3.1**).

Of the 34 sites where artefacts were recovered from a subsurface context:

- nineteen sites had less than 10 artefacts (MRN26, MRN28, MRN33, MRN36, MRN48, MRN53, MRN57, MRN59, MRN60, MRN61, MRN63, MRN65, MRN66, MRN67, MRN70, MRN71, MRN72, MRN78 and MRN81)
- seven sites had 10 to 20 artefacts (MRN15, MRN55, MRN56, MRN58, MRN62, MRN64 and MRN68)
- two sites had between 20 and 50 artefacts (MRN79 and MRN80)
- three sites contained between 200 and 500 artefacts (JCS, MRN25 and MRN69)
- one site had between 500 to 1000 artefacts (MRN73)
- two sites had greater than 1000 artefacts (MRN27 and MRN54).

The three sites with over 500 artefacts included MRN73 (761 artefacts, gentle lower slope above Marulan Creek), MRN27 (1314 artefacts, spur crest and adjoining slope to Joarimin Creek) and MRN54 (1392 artefacts, spur crest and adjoining slope down to Joarimin Creek). It is noted that whilst these three sites had the highest subsurface artefact numbers they were also subject to larger areas of subsurface testing and salvage and different forms of subsurface investigation. For example, the MRN73 artefacts were recovered from an area of 15,000 square metres during monitoring of grader scrapes; MRN54 from an area of 3250 square metres of grader scrapes and included within this area 20 square metres of manual excavation; and MRN27 from 40 square metres of manual excavation. Thus overall subsurface artefact densities were much higher in MRN27 ($32.85/\text{m}^2$), than MRN54 ($0.4/\text{m}^2$) and MRN73 ($0.05/\text{m}^2$) if just the numbers of artefacts per metre square are considered. The actual results of the investigations, however, show that 1149 of the artefacts (82.5 per cent) in MRN54 came from the 20 square metres of manual excavation ($57.4/\text{m}^2$) and that at least 33 per cent of the artefacts (252) from MRN73 were most likely related to a single silcrete knapping event spread over an area of approximately 6 square metres ($42/\text{m}^2$).

Only 10 of the salvaged sites contained both surface and subsurface artefacts including: JCS, MRN25, MRN26, MRN27, MRN28, MRN33, MRN36, MRN62, MRN64 and MRN78 (it is noted that MRN15 also had surface artefacts but that these were not salvaged as only a portion of the site was to be impacted by construction of the NMZSS access road and the Lynwood Quarry access road from the Hume Highway). Site MRN27 was the only location with a relatively large surface artefact assemblage (still significantly less artefacts than the subsurface) but the surface artefacts were assessed as generally being in a secondary depositional context due to disturbance (wombat burrows and power line easement clearance) and ongoing erosional processes.

Site MRN27 and MRN25 both contained high numbers of subsurface artefacts and were both located on spur crests and adjacent slopes down to a creekline with both sites in areas of deep sands (aeolian and colluvial respectively). MRN69 was located during subsurface testing of an ATU and had no surface artefacts at the time of the initial survey in 2005. MRN69 was located on the northern side of Joarimin Creek and on the opposite bank to JCS. MRN69 was located beside an older abandoned channel of Joarimin Creek and it was assessed that the site may represent an earlier period of occupation to JCS and other sites closer to the current channel of Joarimin Creek. Similar to the JCS site the northern bank of Joarimin Creek was also known to have a number of surface artefact exposures (MRN39, MRN41, MRN42, MRN45 and MRN46) and these may represent later Aboriginal occupation of the area when the creek had stabilised its channel in its current location. It was assessed as extremely likely that MRN39, MRN41, MRN42, MRN45, MRN46 and MRN69 on the northern side of Joarimin Creek and JCS on the southern side of the Joarimin Creek were expressions of a single extensive area of Aboriginal occupation reflecting numerous visits by small groups of Aboriginal hunter gatherers over an extended period of time (Umwelt 2013b).

Tables 3.8 and 3.9 provide data in relation to the results of the subsurface testing and salvage (MRN27 only) of the sites (locations that had surface artefacts recorded during the initial survey (Umwelt 2005)) and the ATUs subsurface tested to characterise their subsurface archaeological potential, respectively. In the table the ATUs have been separated into landform units.

Table 3.8 Site Testing and Salvage Subsurface Results

Site Testing	Subsurface	Percentage
Spur crest [#]	1588	77.2
Spur crest and adjoining slope	421	20.5
Gentle slope	46	2.2
Mid to lower slope	0	0.0
Low saddle	2	0.1
Upper slope	1	0.05
Total	2058	100

[#] includes MRN27 subsurface artefacts that were all recovered from the spur crest

Table 3.9 ATU Testing Subsurface Results

ATU Testing	Subsurface	Percentage
Spur crest	1662	63.7
Gentle slope	917	34.8
High point of ridge crest	2	0.1
High point of spur crest	4	0.2
Ridge crest	23	0.9
Mid to lower slope	9	0.3
Total	2633	100

Tables 3.8 and 3.9 indicate that the majority of the subsurface artefacts came from spur crests, spur crests and adjoining slopes and gentle slopes. This result was observed in both the ATU testing and the testing of known sites. While the testing of known sites did not identify a similar percentage of subsurface artefacts from the gentle slope within the sites (2.2 per cent) and ATUs (34.8 per cent) it was noted that this result had been biased in that the majority of the known sites on gentle slopes were outside the project disturbance footprint and thus were not subsurface tested/salvaged.

Overall, the known sites (surface artefacts) did provide a relatively good indicator of the subsurface potential of the Lynwood Quarry development disturbance area in regard to reflecting where (within which landform units) the highest numbers of subsurface artefacts were likely to be located. The ATU testing did however show that landforms such as high points on ridge and spur crests, ridge crests and midslopes had very low numbers of subsurface artefacts. These lower artefact densities were assessed as likely to reflect more transient use of the landscape (stop-overs while hunting and gathering) rather than overnight camp sites.

In relation to artefact types Umwelt (2013b) found that broken flakes (51.3 per cent), flakes (20.2 per cent) and flaked pieces (12.7 per cent) dominated the surface artefact assemblage, representing over 84 per cent of all surface artefact types. The subsurface assemblage was also dominated by broken flakes (57.6 per cent), flakes (18.2 per cent) and flaked pieces (11.7 per cent) representing over 87 per cent of all subsurface artefacts. The high proportion of broken flakes was assessed as having been inflated by impacts arising from agricultural practices since European settlement (i.e. tree clearing for agricultural purposes, cultivation, ripping and grazing, construction of farm infrastructure, construction of the Hume Highway, construction and removal of the Old Marulan township and the installation of more recent utilities [transmission lines and fibre optic cable]).

High levels of bioturbation (e.g. wombat burrowing) and erosional processes were assessed as also contributing to the high proportion of broken flakes by continually exposing artefacts on the surface where in post-contact times they have been subject to stock trampling and then reburial in the sandy soils. This recycling of artefacts to the surface was seen as reflected in the similarities between the surface and subsurface assemblages in terms of broken flakes and flaked pieces. It was also noted that high fragmentation rates were observed for quartz in sites JCS, MRN25, MRN27, MRN54, MRN69 and MRN73, sites that had evidence of the bipolar reduction of quartz pebbles.

Core percentages were assessed as low (absent from 37 sites). Examination of the cores found that the majority discarded in the sites were exhausted or very close to exhausted. When viewed in the light of other data from the artefact analysis it was assessed that cores were being reduced in the sites and those cores that were not exhausted were removed from the sites. It was also noted that the cores had been heavily reduced prior to entering the sites and this was thought to be related to the distance of the sites from the source of the raw materials (Umwelt 2013).

Twenty-one of the 37 sites (i.e. 56.8 per cent) that contained surface and/or subsurface artefacts had some form of retouched flake form within their assemblages, indicating that the re-sharpening of flakes and/or creation of morphological tool forms was not uncommon within the Lynwood Quarry (Approved Project Area) project area. Steep retouch was slightly more common than acute retouch within the surface collection but tended to be even more dominant within the subsurface assemblage, (i.e. mainly at sites JCS, MRN27, MRN54 and MRN73). Site JCS (surface collection) was the only site where acute retouch was dominant over steep retouch. The dominance of steep retouch suggested that the majority of retouched artefacts within the assemblages were intended for use in activities that required a robust working edge (i.e. the working of hardwood or bone). This assumption was supported by the results of the residue and use-wear analysis (Umwelt 2013).

Bondi points, backed blades, geometric microliths and backed flakes were only present within the surface collection of two sites: one geometric microlith at site JCS and one Bondi point and two backed blades at site MRN27. These represented only 9.1 per cent of all retouched flake forms within the overall surface assemblage. In contrast, 10 sites within the subsurface assemblage including sites JCS, MRN25, MRN27, MRN54, MRN62, MRN68, MRN69, MRN71, MRN73 and MRN80 contained these retouched flake forms which represented over 27 per cent of all retouched flake forms in the subsurface assemblage. As the majority of these tools were located in the subsurface assemblage of sites MRN27, MRN54 and MRN73, this suggested that these sites were a focal location for the manufacture and/or use/discard of backed flake forms. In all three of these sites geometric microliths dominated (Umwelt 2013).

Only five of the geometric microliths from MRN27 showed any evidence of usewear along the chord (three being minor usewear) and no residue from resin was observed (i.e. geometric microliths have been recorded as composite tools, refer to [Holdaway and Stern 2004 p263] and resin is likely to have been present on the artefact if it had been hafted). Similarly, only a small number of the geometric microliths in sites MRN54 and MRN73 exhibited microscopic evidence of usewear (eight of 19 in MRN54; and seven of 14 in MRN73) with none of these geometrics having microscopic evidence of resin. The presence of a substantial number of geometric microliths without usewear or evidence of resin suggested that people may have been manufacturing geometric microliths for future use in these sites (also referred to as 'gearing up' – Umwelt 2013).

In relation to raw materials, artefacts manufactured from quartz were dominant within the surface assemblage (50.5 per cent), followed by silcrete (31.5 per cent), with these two raw material types comprising 82 per cent of all raw materials collected. Small percentages of other raw materials made up the remainder of the surface assemblages (all less than 10 per cent) and included: quartzite, chert, chalcedony, dolerite, basalt, petrified wood, hornfels, ignimbrite and aplite. The raw material type of 14 artefacts (2.4 per cent) was unable to be determined due to advanced weathering of the raw material.

In contrast, the subsurface assemblage contained a similar range of raw materials but was dominated by silcrete (59.8 per cent), followed by quartz (22.5 per cent). As with the surface assemblage, small percentages of other raw materials made up the remainder of the subsurface assemblages (all less than 10 per cent of the assemblage) and included: quartzite, chert, chalcedony, dolerite, petrified wood, hornfels, ignimbrite, aplite and (possible) glass. The raw material type of 49 artefacts (1.1 per cent) was unable to be determined due to advanced weathering of the raw material.

The larger subsurface assemblages tended to contain a greater variety of raw materials than the smaller subsurface assemblages (five or more raw material types - not inclusive of indeterminate raw material category) within their respective subsurface assemblages (JCS, MRN15, MRN27, MRN54, MRN69, MRN73, MRN79, MRN80). The exceptions to this were sites MRN55, MRN72 and MRN78 that contained only 17 artefacts or less in their subsurface assemblage yet had raw material type variation of five and six. This was assessed to be the result of transient use of the three sites where artefacts manufactured elsewhere were discarded and where locally available raw materials (aplite and ignimbrite) were used expediently and then discarded (Umwelt 2013).

Based on the results of Umwelt (2005, 2007b, 2008c, 2008e, 2009b, 2010, 2011b, 2012, 2013a, 2013b, 2014) previous archaeological surveys and assessments, site monitoring and the subsurface salvage results it was noted for the Approved Project Area that (refer to **Figure 3.1** and **Figure 3.5**):

- artefact scatter and isolated finds were the most common site types located
- less common site types occurring within the surveyed areas include; a stone arrangement (MRN9), scarred trees (MRN8, MRN10, MRN11, MRN23, MRN49, MRN51, MRN74, MRN75, MRN76) and a grinding bowl located on an outcrop of ignimbrite (Marulan T1 S7 within JCS) (all of these sites were outside the project disturbance footprint and were being conserved in fenced and signed areas or were being protected during the life of the quarry)
- the camp site/possible campsite site distribution pattern was seen to reflect movement into the area from the north-west, west and south
- areas of PAD were identified within the survey and assessment areas and within areas that would not be impacted by the project
- sites were located on a number of differing landforms including; spur slopes, spur crests, saddles, creek terrace and within very gentle slopes in the riparian corridor
- the majority of sites were located close to watercourses
- sites located close to watercourses tended to contain relatively higher numbers of artefacts than those sites further away from a watercourse
- most sites contained less than 10 artefacts
- only one site (MRN27) had more than 50 surface artefacts
- quartz and silcrete were the most common raw materials used for artefact manufacture recorded within the surface assemblage during survey
- flakes, broken flakes, and flaked pieces were the dominant artefact types recorded within the surface assemblage during survey
- the dominant raw materials and artefact types identified within the surface assemblages were generally similar to the dominant raw materials within the subsurface assemblages
- sites with low numbers of surface artefacts generally also had low numbers of subsurface artefacts with the exception of site MRN25, where the number of subsurface artefacts was higher than anticipated (MRN25 is being conserved and thus was not salvaged)

- though the results of the surface survey and ATU testing were comparable in terms of which landforms were most likely to contain sites, the ATU testing did identify a greater use of the gentle slope landform than reflected by the survey results due to poor ground surface visibility in these heavily grassed areas. However, the larger sites within both the surface surveys and ATU testing were found to be located on spur crests and their adjoining short, low gradient slope down to a watercourse
- the high proportion of isolated finds and small artefact scatters suggests a general low density background scatter of artefacts that most likely reflects transient use of the landscape rather than periods of occupation and/or camping with just a few locations targeted for camping
- the vast majority of sites within the Lynwood Quarry Project Area (Approved Project Area) are either in a CHMZ and subject to long term conservation or are being managed *in-situ* for their protection during the 30 year life of the quarry. Thus only a sample of the sites was subject to salvage and artefact analysis and thus there are still some major gaps in the interpretive framework for the area (refer to **Figure 3.1**).

Based on all the available data Umwelt (2013b) prepared a hypothesis for how the Approved Project Area was being utilised by Aboriginal hunter-gatherers. This hypothesis was posed for further testing and is reproduced below.

Aboriginal people appear to have been using the landscape within the Lynwood Quarry project area for at least 3500 years. The main purpose for visiting the area over at least some of that time was to attend the early part of the male initiation ceremony during which mothers presented their sons to go through initiation and to be born again as men.

The Lynwood Quarry project area was very close to the tribal boundary between the Ngunawal (to the south) and the Gundungurra (traditional owners of the Marulan area) who shared a common language and shared ceremony. These are the two groups most likely represented by the artefactual evidence left behind in the sites.

Due to the harshness of the climate it is most likely that ceremony was held during summer when prey and food plants were most abundant and most nutritious and sufficient drinking water was present.

Sites around the periphery of the Lynwood Quarry project area were most likely used as camp sites as Aboriginal people travelled to and possibly from ceremony. A large camp site incorporating low spur crests and gentle gradient slopes beside Joarimin Creek and that covers both sides of the creek was the most likely gathering location with Aboriginal people camping in the areas closest to the direction from which they came. A smaller campsite located just to the north and downstream of the stone arrangement site was most likely used for camping during ceremony by a smaller group of people made up of initiated men, mothers and the initiates. This site was in view of the stone arrangement which was otherwise hidden from view in a narrow valley surrounded by spur crests.

Food resources would always have been restricted so it is unlikely that large groups of people gathered and it appears more likely that smallish groups of people camped in the area for perhaps only a few weeks but that this happened over an extended period of time and that use of the area for ceremonial gatherings would have been sporadic to allow resources to build up again. Between ceremonial gatherings the area was still used for hunting and gathering activities by even smaller groups of Gundungurra people.

Local stone was not really suited for tool manufacture and stone was imported into the area most likely from conglomerates around 10 to 12 kilometres south and west of Marulan. Dolerite was also imported from an outcropping dyke most likely somewhere in proximity to the west or north-west of the Lynwood Quarry project area. The imported stone was used sparingly and Aboriginal knappers used techniques to conserve the raw material supply. Gearing up activities (i.e. making parts of composite tools for future use) were observed but not retooling activities (i.e. replacing of broken or broken parts of composite tools).

The traditional lifestyle of the Gundungurra people as reflected within the Lynwood Quarry project area appears to have come to an end prior to the construction of the Old Marulan township in 1835.

The current assessment of the Granite Pit Area will assist with testing this hypothesis.

3.3.3.15 Australian Archaeological Survey Consultants (AASC) 2007

AASC was commissioned by Gunlake Quarries, a division of Rollers Australia Pty Ltd to undertake a cultural heritage assessment of an area of 230 hectares proposed for the development of a hard rock quarry and associated infrastructure approximately 2 kilometres to the north-east of the Granite Pit Area. Sites located were four small artefact scatters of less than 10 artefacts and a single isolated find. While it was not possible to access the original AASC assessment the Aboriginal Cultural Heritage Management Plan was available and this indicated that three sites (#51-6-0747, #51-6-0748 and #51-6-0749) have been surface collected and the artefacts relocated to the fourth location (#51-6-0750). Two of the sites listed recorded (located approximately 3.5 and 5 kilometres respectively from the Gunlake Quarry) during the assessment do not appear to have been registered as of 12 May 2015 and were located on a proposed bypass road also surveyed as part of the assessment.

The salvage report was not available at the time of writing.

3.3.3.16 RPS 2008

RPS was commissioned by Blue Circle Southern Cement to undertake surface salvage of Site BSCS1 (# 58-4-0195) located by ERM in 2006 under AHIP #1090087 (refer to **Section 3.3.3.11**). During the course of the salvage program a further three loci containing surface artefacts were identified and collected. A total of 91 artefacts were salvaged including 68 artefacts manufactured from silcrete, 13 from quartzite, eight from quartz and two from chert. Artefact types were described as 77 flakes, 8 flaked pieces, 4 cores and two pieces of debitage.

3.3.3.17 ERM 2010

Geotechnical works carried out in 2010 in the area of Boral Resources 'Peppertree Quarry' and monitored by ERM archaeologists and registered Aboriginal parties resulted in the discovery of a further 10 sites within the quarry footprint. Some of these sites were also assessed as likely to contain subsurface cultural material. As in 2006, ERM proposed a program of archaeological testing and possible open area excavation. These sites appear on an AHIMS register search as of the 12 May 2015 as isolated finds but are characterised as follows from the Aboriginal Cultural Heritage Management Plan: MQ19 (18 artefacts), MQ20 (3 artefacts), MQ21 (3 artefacts), MQ22 (1 artefact), MQ23 (80 artefacts), MQ24 (50 artefacts), MQ25 (29 artefacts), MQ26 (2 artefacts), MQ27 (29 artefacts), MQ28 (8 artefacts) and MQ29 (10 artefacts). These sites all occur to the north of the quarry and in close proximity to the channel of Tangerang Creek. Sites proposed for a program of surface collection and archaeological testing were MQ11, MQ18, MQ25, MQ26, MQ28 AND MQ29.

Sites MSQ6, MSQ7 and MQ27 were proposed for conservation. They were assessed as having a low likelihood of PAD.

3.3.4 Implications of the Archaeological Context for Aboriginal Occupation of the Granite Pit Area/Site Integrity

The full AHIMS search results and a table summarising details of the geographic location, likelihood of PAD and site contents for all those sites for which this information could be obtained has been included in **Appendix D** and **Appendix E** respectively. **Table 3.10** summarises this information. Please note that the data from the site cards identifies more sites with PAD than suggested by the AHIMS results provided in **Table 3.3**.

Table 3.10 Summary of Sites/Geographic Location

Site Type	Artefact Number	Potential for Subsurface Deposit	Position in the Landscape
Isolated Find	1	46 sites were not associated with PAD	Ridge crest – 4 Spur crest – 11 Saddle - 2 Midslope – 7 Lower slope – 19 Bench - 3
Isolated Find	1	5 sites were associated with PAD	Ridge crest - 1 Adjacent to a watercourse – 4
Artefact Scatter	2 to 50	54 sites were not associated with PAD	Ridge crest – 8 Spur crest – 6 Saddle - 2 Upper slope – 6 Midslope -11 Lower Slope -17 Adjacent to watercourse - 2 Creek channel - 1 Open paddock - 1
Artefact Scatter	2 to 50	73 sites were associated with PAD	Ridge crest – 3 Spur crest - 6 Upper slope - 1 Midslope - 2 Lower slope – 27 Bench - 8 Adjacent to watercourse – 26

Site Type	Artefact Number	Potential for Subsurface Deposit	Position in the Landscape
Artefact Scatter	50+	4 sites were not associated with PAD	Lower slope - 3 Spur crest - 1
Artefact Scatter	50+	8 sites were associated with PAD	Bench - 1 Lower-slope – 5 Spur crest and short slope adjacent to watercourse – 2
Scarred Trees	Not Applicable	1 scarred tree was associated with PAD	Saddle - 1
Scarred Trees	Not Applicable	9 scarred trees were not associated with PAD	Midslope - 2 Spur crest - 7
PAD	Not Applicable	2 sites were associated with surface artefacts	Spur crest - 1 Adjacent to watercourse - 1
PAD	Not Applicable	5 sites were not associated with surface artefacts	Ridge crest - 1 Lower slope - 3 Alluvial Terrace - 1
Stone Arrangement	Not Applicable	1 stone arrangement was not associated with PAD	Lower slope - 1
Stone Arrangement with Burial	Not Applicable	1 stone arrangement was not associated with PAD	Crest - 1

Table 3.10 indicates the following:

- artefact scatter and isolated finds were the most common site types located
- isolated finds that were not associated with PAD have been located in almost all landform contexts
- isolated finds associated with PAD were nearly always located close to watercourses
- artefact scatters that were not associated with PAD have been located in almost all landform contexts
- artefact scatters associated with PAD were also located in almost all landform contexts, however, there was a dominance of sites on lower slopes and close to watercourses assessed/found to have PAD
- overall the majority of isolated find and artefact scatter sites were located on lower slopes and adjacent to watercourses, sometimes on benches above the watercourse

- isolated finds and artefact scatters were also commonly found on spur crests/spur crests and associated slopes that lead down to a watercourse
- all but two of the artefact scatter sites with more than 50 artefacts were located on low spurs and associated slopes leading down to a watercourse or on lower slopes close to watercourses
- scarred trees are moderately rare site types
- scarred trees are not often associated artefacts or with PAD
- grinding bowls are extremely rare site types within what is generally a granitic geological area
- scarred trees were most often located in landforms away from the lower slopes and watercourses on the midslopes, spur crests and in saddles
- stone arrangements are extremely rare site types
- the stone arrangements were not associated with PAD and as there is only two and they are in different landforms there is no discernible pattern for their position in the landscape. It is noted, however, that their uses were very different. One was a burial and it was on a crest, the other was part of a ceremonial ground and it was in a hidden valley on the lower slope.

The archaeological context drawn from the results of prior survey and subsurface investigations also indicates that:

- there are two known sites within the proposed quarry within the Granite Pit Area. These are LA31 (#51-6-0386) a small artefact scatter and LA32 (#51-6-0387) an isolated find
- LA33 (#51-6-0388) an isolated find is outside the area proposed for impact within the Granite Pit Area
- there is a known artefact scatter (MRN25) within the haul road footprint for the Granite Pit Area but within the Approved Project Area
- the camp site/possible campsite site distribution pattern within the Approved Project Area was assessed as likely to reflect movement into the area from the north-west, west and south to attend ceremony. As the Granite Pit Area is to the north-west it can be expected that it may contain sites related to Aboriginal people moving south-east to attend ceremony
- flakes, broken flakes and flaked pieces were the dominant artefact types recorded with smaller numbers of retouched flakes and cores. Implement types such as stone axes and hammerstones were rare
- quartz and silcrete were the dominant raw materials used for artefact manufacture with other raw materials such as quartzite, chert, dolerite, hornfels, volcanic, petrified wood, chalcedony, ignimbrite, granite and aplite also present but forming a minor proportion of the assemblage
- the source of the majority of the raw materials is likely to be at a distance from the Granite Pit Area with the exception of dolerite, aplite, ignimbrite and granite which would be available either within the Granite Pit Area (ignimbrite, aplite and granite) or in areas adjacent to the Granite Pit Area. However, these generally inferior raw materials will always form a minor proportion of any assemblage
- the locally available raw materials are highly unlikely to have been quarried, but rather just picked up off the ground, flaked and used expediently

- sites with low numbers of surface artefacts generally also had low numbers of subsurface artefacts with the exception of sites located on spur crests and adjoining short, low gradient slopes down to creeklines and thus in proximity to a water source
- the high number of isolated finds and small artefact scatters represents a general low density background scatter of artefacts that most likely reflects transient use of the landscape rather than periods of camping with just a few locations with large assemblages being used for camping;
- due to the intensity of European land-use practices and the sandy nature of the soils, stratigraphic integrity of site soil profile is highly unlikely, though some spatial integrity may remain in those sites/PADs with relatively deep A1/A2 soil horizons
- from the available literature it appears that within the broader Marulan area 81 sites (10 scarred trees, 25 isolated finds, 44 artefact scatters, one stone arrangement and a boulder containing a grinding bowl) have been proposed for conservation. Six of the artefact scatters, one isolated find and one scarred tree were in the Lockyersleigh Granite and were assessed as having moderate to high or high likelihood of PAD, one artefact scatter was described as in deposits on a creek margin and was assessed as having moderate to high likelihood of PAD. Of the remaining sites 49 were in the Bindook Porphyry Complex and were assessed as having from low to a high likelihood of PAD (refer to **Section 8.0** for further details and **Table 2** in **Appendix E** for a summary of sites proposed for conservation). It is noted that the sites proposed for conservation within the Lockyersleigh Granite (Saunders 2005) have at the time of writing not been placed into conservation corridors as the proposed development did not proceed. It is further noted that of the 81 sites proposed for conservation 66 are in the Approved Project Area.