



LYNWOOD QUARRY
EXTRACTION AREA
MODIFICATION
PRELIMINARY ENVIRONMENTAL
ASSESSMENT



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PRELIMINARY ENVIRONMENTAL ASSESSMENT

June 2015

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Holcim (Australia) Pty Ltd

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1.0 Introduction

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 by the NSW Minister for Planning to construct and operate the Lynwood Quarry west of Marulan, NSW (refer to **Figure 1.1**). Lynwood Quarry is approved to transport a maximum of 5 million tonnes per annum (Mtpa) of product from the site. The key features of the existing approved operations are shown in **Figure 1.2**. Construction of the quarry commenced in late 2010 and it is now in the commissioning phase with operation of the Quarry planned to commence in mid to late 2015.

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

Recent operational readiness works, including further drilling and material testing, identified limitations within the Lynwood Quarry resource, revealing that the resource is more variable and characterised by more significant concentrations of either 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 Holcim Australia owned land, approximately 500 metres to the west of the Approved Pit. The proposed extraction modification area 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 un-fractured. The proposed granite resource will enable Holcim Australia to produce the in-specification products required to be delivered by Lynwood Quarry to supply the local, regional and Sydney markets.

This Preliminary Environmental Assessment (PEA) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Holcim Australia in order to brief the NSW Department of Planning and Environment (DP&E), relevant government agencies, the community and other stakeholders about the proposed Extraction Area Modification. It also identifies the key issues and planned assessment to be covered in the detailed Environmental Assessment (EA) which will accompany the modification application under Section 75W of the EP&A Act.

1.1 Proposed Modification Overview

Holcim Australia is seeking approval to modify its development consent (DA No 128-5-2005, as modified) to enable development of a Granite resource on land it owns to the west of the Approved Pit (refer to **Figure 1.3**) (the Extraction Area Modification) to address limitations identified within the approved Lynwood Quarry resource and enable the consistent supply in-specification products required by its customers.

As part of the Extraction Area Modification, there will also need to be a modified overburden emplacement strategy (refer to **Figure 1.3**), a haul road connecting the proposed Granite Pit to the existing approved crushing and screening plant, and a surface water diversion dam. A bund providing visual and noise screening is also proposed to be established to the west of the proposed Granite Pit (refer to **Figure 1.3**).



FIGURE 1.1
Locality Plan

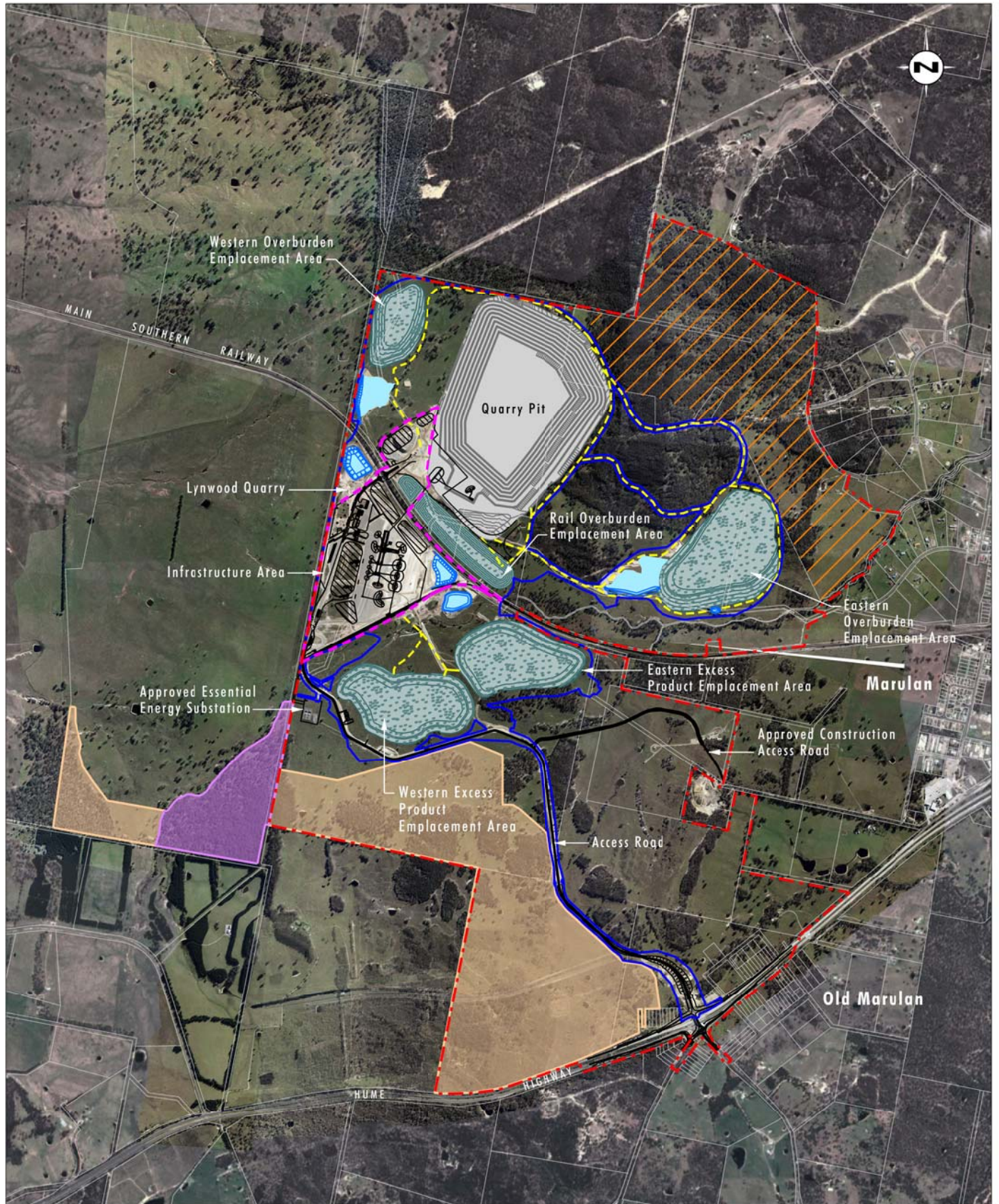


Image Source: Holcim Australia (Aerial Photo March 2012)
Data Source: LPI 2014

0 0.5 1.0 1.5 km
1:30 000

Legend

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

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FIGURE 1.2

Approved Conceptual
Quarry Plan
(Year 30)

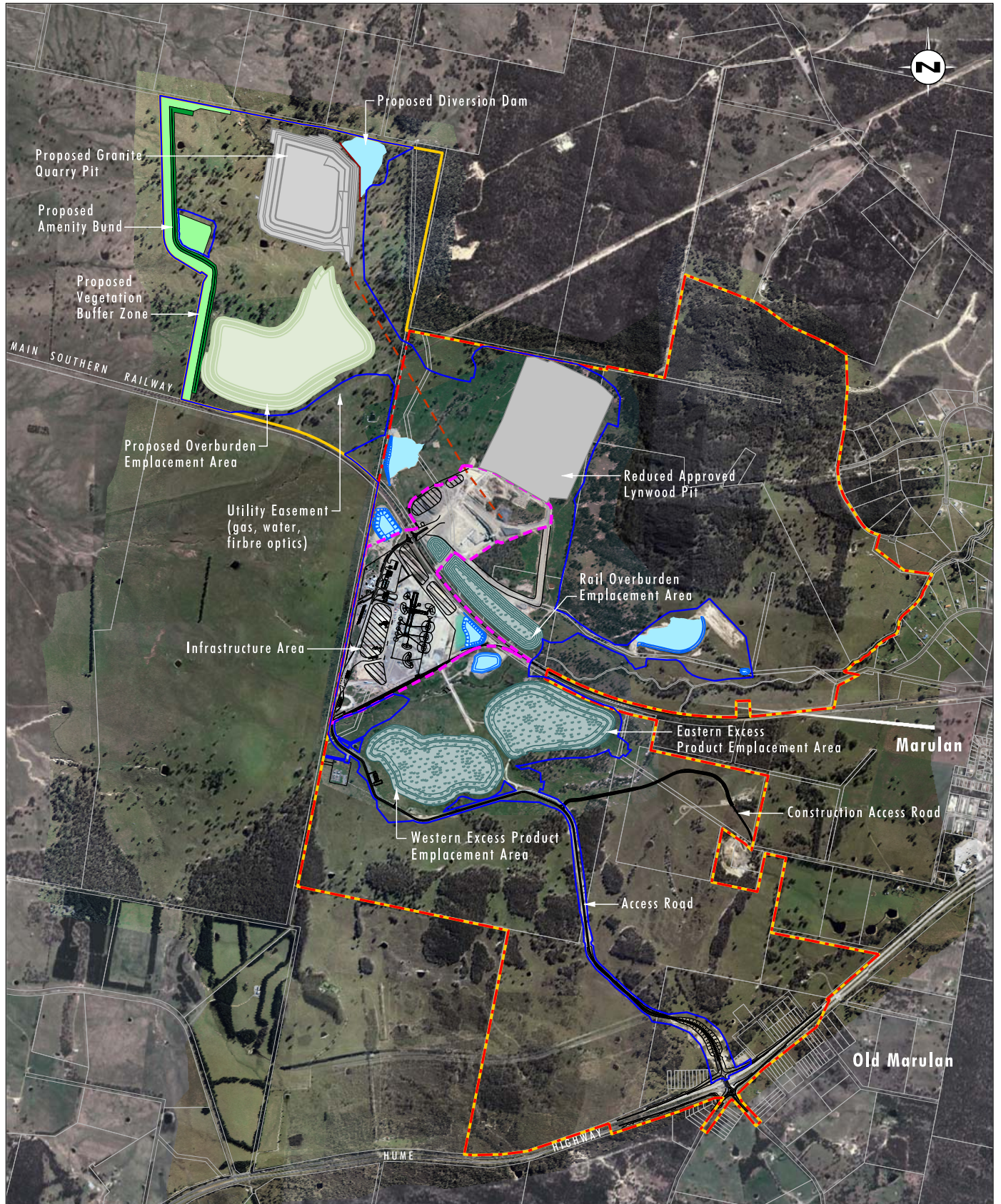


Image Source: Google Earth (2012), Holcim (2012, 2014)
 Data Source: LPI (2014), Holcim Australia (2015)
 Note: This concept design is indicative only and subject to resource confirmation, technical and environmental assessments.

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Legend

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

FIGURE 1.3a

Proposed Extraction Area
 Modification Project
 Stage 1

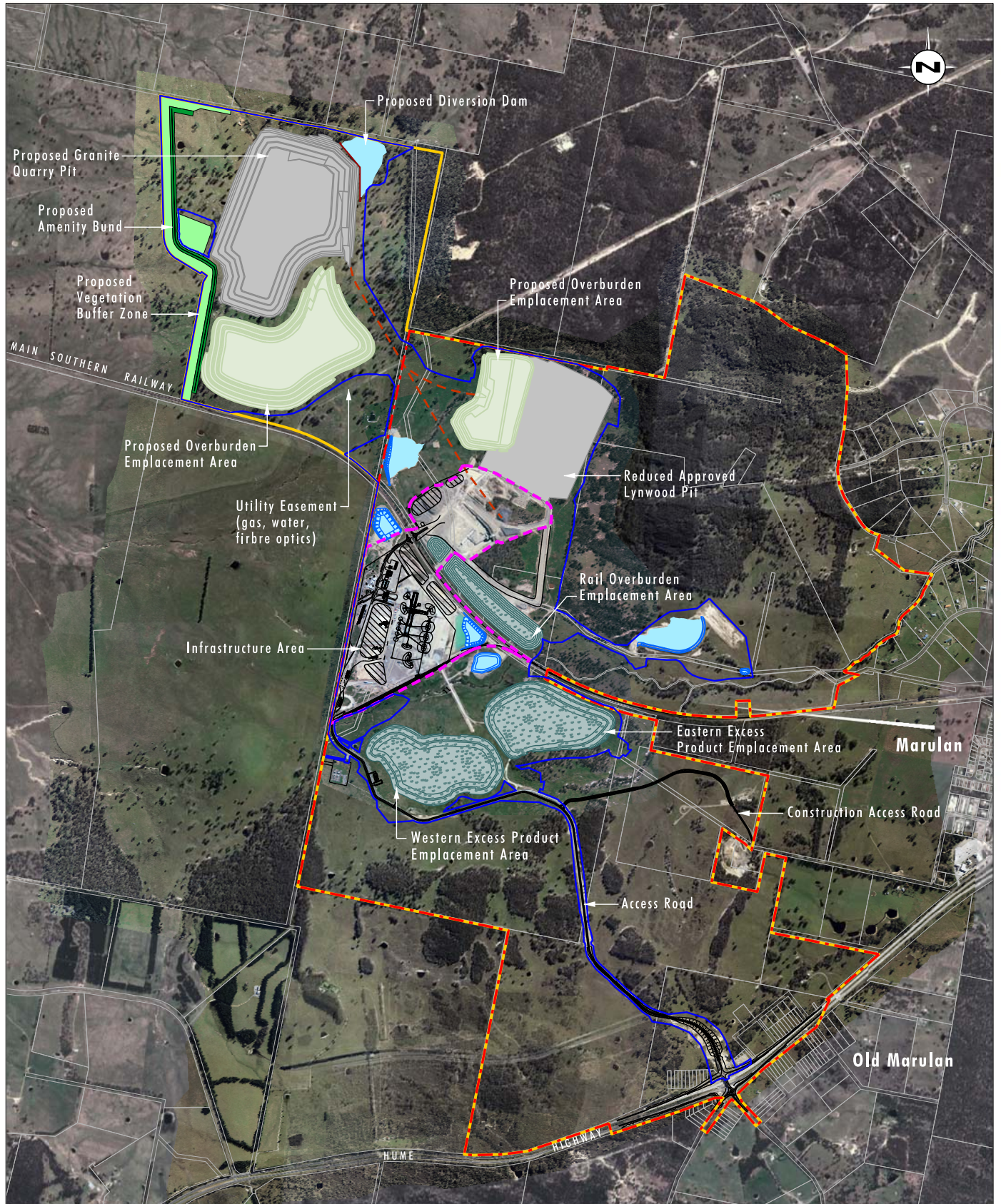


Image Source: Google Earth (2012), Holcim (2012, 2014)
 Data Source: LPI (2014), Holcim Australia (2015)
 Note: This concept design is indicative only and subject to resource confirmation, technical and environmental assessments.

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Legend

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

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FIGURE 1.3b

Proposed Extraction Area
 Modification Project
 Stage 3

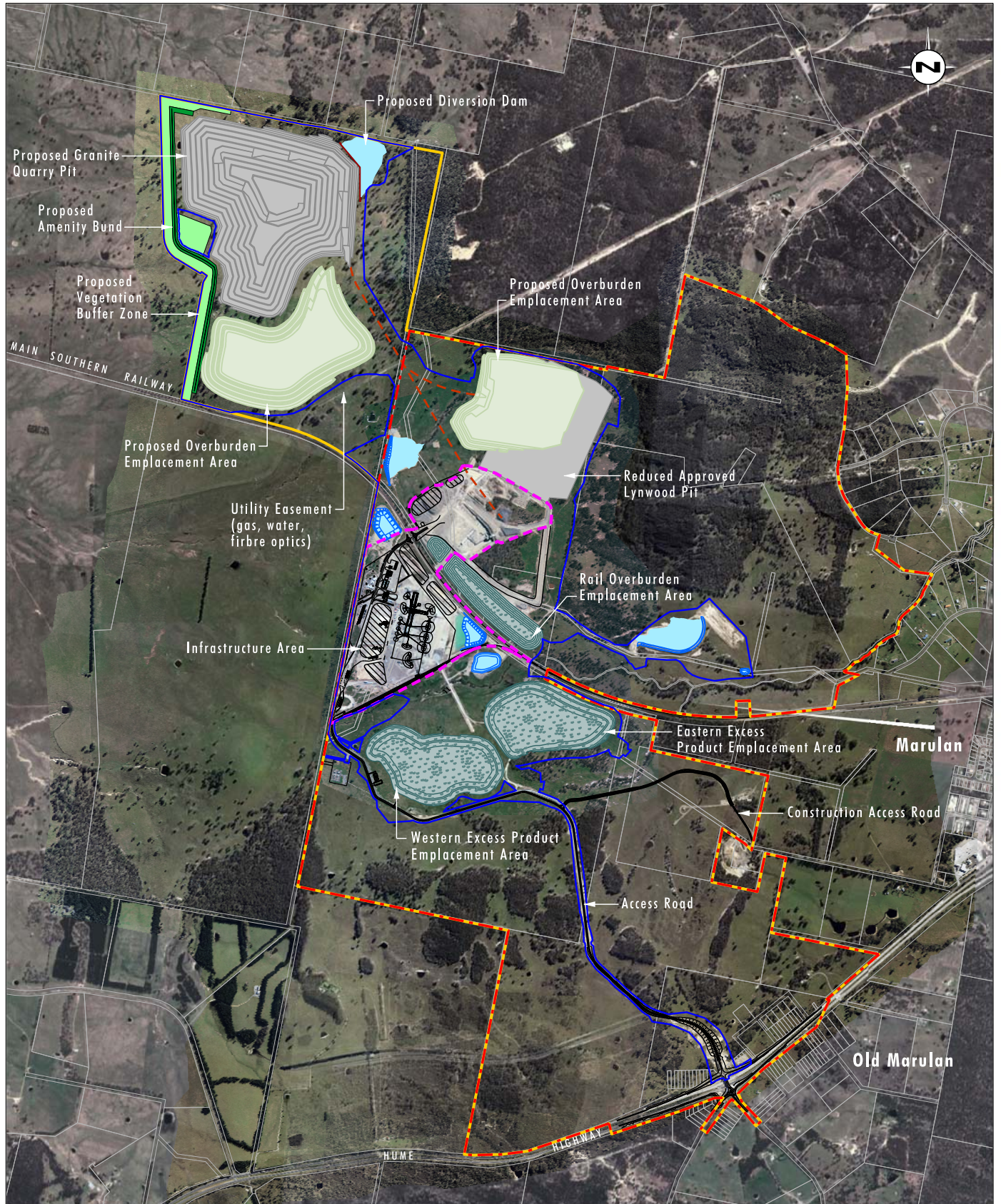


Image Source: Google Earth (2012), Holcim (2012, 2014)
 Data Source: LPI (2014), Holcim Australia (2015)
 Note: This concept design is indicative only and subject to resource confirmation, technical and environmental assessments.

0 0.5 1.0 1.5 km
 1:30 000

Legend

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

FIGURE 1.3c

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

Rock extracted from the proposed Granite Pit will be transported via an internal quarry haul road to the existing Lynwood Quarry crushing and screening plant and product transportation infrastructure (Lynwood Infrastructure Facilities) (refer to **Figure 1.3**).

As part of the proposed Extraction Area Modification, Holcim Australia will also be seeking approval to:

- reduce the overall footprint of the Approved Pit to reflect limitations within the resource;
- remove the approved Eastern Overburden Emplacement Area and associated haul roads, to be replaced by the modified overburden emplacement strategy, within the footprint of the Approved Pit, and adjacent to the Granite Pit; and
- enable backfilling of the Approved Pit, as modified, in the future to retain a single quarry void at the end of the Project, consistent with the existing approval.

Holcim Australia proposes to initially develop and operate the Granite Pit concurrently with the Approved Pit depending on customer product requirements, within the existing approved maximum limit of 5 Mtpa. Once the Granite Pit is fully operational, there will be a gradual transition of extraction operations from the Approved Pit to the proposed Granite Pit. Over the approved life of the quarry, the Approved Pit will be gradually backfilled using overburden and waste rock from the Granite Pit.

No changes are proposed to the currently approved quarry life which ceases in 2038, however, it is noted that the quarry was always intended to continue beyond this time and this is still the case. There will be no changes to the maximum production limit of the quarry, or the methods or volumes of transportation of quarry products from the site. No changes to the currently approved project infrastructure are required, however, some additional infrastructure (e.g. internal haul roads, water management structures etc.) will be required for the proposed Granite Pit. No changes to the quarry mobile equipment fleet are proposed, with equipment moving from one quarry pit to the other depending on product needs.

Further details on the proposed Extraction Area Modification are contained in **Section 3.0**.

2.0 Approved Operations

The following sections describe the existing approvals that regulate operations at Lynwood Quarry. Modifications to these approvals and any other approvals required are discussed in **Section 5.0**.

2.1 Existing Development Consents

The original development consent for Lynwood Quarry, DA-128-5-2005 (existing consent), approved the quarry development as described in the Environmental Impact Statement (EIS) for the Proposed Lynwood Quarry, Marulan (Umwelt, 2005). Since the original approval, there have been three modifications to the consent, as listed below:

- a) Modification Application DA-128-5-2005 MOD 1 and the accompanying Statement of Environmental Effects (SEE) titled '*Proposed Minor Modifications to Lynwood Quarry, Marulan*', (approved 7 May 2009).

- b) Modification Application DA 128-5-2005 MOD 2 and the accompanying EA titled '*Environmental Assessment Proposed Modifications to Lynwood Quarry, Marulan*', (approved 22 March 2011).
- c) Modification Application DA 128-5-2005 MOD 3 and the accompanying letter titled '*Holcim Australia Lynwood DA128-5-2005; DA128-5-2005 Modification 1 and DA128-5-2005 Modification 2*', (approved 19 August 2011).

The existing consent is valid until 1 January 2038.

2.2 Other Approvals

There are a number of other environmental and operational approvals issued under various commonwealth and state legislation which apply to the Lynwood Quarry. These approvals are outlined in **Table 2.1** below.

Table 2.1 – Commonwealth and State Legislation and Policies Relevant to the Quarry

Planning Provision	Comments	Approval Details
Commonwealth Legislation		
<i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	Lynwood Quarry is a controlled action under the EPBC Act and was granted approval in 2013.	EPBC 2012/6560
New South Wales Legislation		
<i>Water Management Act 2000</i>	Holcim Australia holds Controlled Activity Approvals under the <i>Water Management Act 2000</i> for works within the Joarimin Creek, Lockyersleigh Creek and Marulan Creek riparian zones.	CAA No. 10 ERM 2011/0446
<i>Water Act 1912</i>	A Part 5 licence is required for groundwater inflows into the quarry pit. Holcim Australia currently holds a Part 5 licence for groundwater monitoring piezometers on site.	Lic. No. 10BL605591
<i>National Parks & Wildlife Act 1974</i>	Holcim Australia holds Aboriginal Heritage Impact Permits (AHIPs) under s87 and s90 of the NPW Act for Aboriginal sites within the Approved Project Area. The current AHIP consolidates previous AHIPs for the site and covers ongoing works to be undertaken at Lynwood Quarry.	AHIP No. 1100264
<i>Protection of the Environment Operations Act 1997</i>	Holcim Australia holds an Environment Protection Licence (EPL) for the Approved Project Area.	EPL No. 12939
<i>Heritage Act 1977</i>	Holcim Australia holds an excavation permit under s60 of the Heritage Act to disturb historic heritage items, including a section of the Old Marulan Township which is listed on the State Heritage Register.	S65 Approval 2009/S65A/13

3.0 Proposed Modification

The proposed Extraction Area Modification comprises development of the following key features:

- a modified extraction area (to include the Granite Pit) to the west of the existing Approved Pit (refer to **Section 5.3.2**);
- reduction of the Approved Pit to reflect limitations within the ignimbrite resource;
- haul roads and water management system structures (refer to **Section 3.1**);
- revised overburden emplacement areas (refer to **Section 3.2**); and
- additional visual bund and vegetative screen (refer to **Section 3.2**).

These features are shown in **Figure 1.3**.

Other than the proposed changes to the layout or footprint of the development, the overall Lynwood Quarry project operational activities will be largely unchanged from the currently approved operations. **Table 3.1** compares the proposed modified development to the existing approved operations.

Table 3.1 – Comparison of Approved Project and the Proposed Modification

Major Project Components/Aspects	Approved Project	Proposed Modification
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.
Rail Facilities	Rail spur and loading facility as shown on Figure 1.2	No change.
Infrastructure	As shown on Figure 1.2	No change to approved infrastructure. Haul road to connect to Granite Pit and water management structures (refer to Figure 1.3).
Hours of Operation	24 hours per day, 7 days per week. Restrictions on some operations to minimise potential noise impacts.	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 Modified Extraction Area involving Granite Pit to the west of the existing Approved Pit (refer to Figure 1.3). Reduction of the Approved Pit footprint by approximately 55 hectares

Table 3.1 – Comparison of Approved Project and the Proposed Modification (cont)

Major Project Components/Aspects	Approved Project	Proposed Modification
Overburden 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 Figure 1.3), emplacement within part of the currently approved quarry limit, and a proposed emplacement area south of the Granite Pit. A visual bund will also be developed to west of Granite Pit (refer to Figure 1.3).
Excess Product Emplacement Areas	As shown on Figure 1.2	No change.
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 478 hectares.
Construction Phase	Largely completed, quarry currently in commissioning phase.	Construction limited to the haul road visual bund and water management infrastructure.

3.1 Conceptual Quarry Plan

The target granite resource is characterised by a homogeneous, relatively unaltered and unfractured rock mass. The geological, structural and rock quality characteristics of the granite have been assessed in detail in accordance with the JORC code, *The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves* (2012).

The proposed Granite Pit quarry operations are shown in **Figure 1.3**, and will produce approximately 120 million tonnes (Mt) of quarry product. The total Granite Pit quarry footprint once developed will be approximately 76 hectares.

There will be no change to the overall production rates from the Lynwood Quarry operations. The early stages of the Granite Pit will be operated in conjunction with the Approved Pit, with operations progressively transferring over to the Granite Pit. Rock extracted in the Granite Pit will be transported to the existing production plant for processing and handling.

3.2 Additional Infrastructure

A haul road will be constructed from the Lynwood Infrastructure Facilities to the proposed Granite Pit allowing quarried rock to be delivered to the existing facilities for processing and transportation to market. The proposed haul road will pass through an area approved for use as an emplacement area for the Approved Pit, referred to as the Western Overburden Emplacement Area (refer to **Figure 1.2**). Consequently, this overburden emplacement area

will not be developed. A spur road will be constructed off the main haul road, for the transportation of overburden to backfill the Approved Pit.

A dam will be developed on an ephemeral drainage line up-catchment from the proposed Granite Pit to manage surface water flow and to minimise runoff entering the quarry pit. Additional surface water management infrastructure will also be implemented to manage surface water flows in and around the proposed Granite Pit and associated facilities.

3.3 Overburden Emplacement

As discussed previously, the approved Eastern Overburden Emplacement Area (refer **Figure 1.2**) will not be built and will be replaced by backfilling of the Approved Pit and a proposed overburden emplacement area, south of the Granite Pit. Backfilling of the Approved Pit is expected to commence after completion of the approved Rail Overburden Emplacement Area and after extraction operations have ceased in the Approved Pit.

A visual bund approximately 10 metre high will also be developed to the west of the proposed Granite Pit to reduce noise and visual amenity impacts to the west of the quarry. This bund will be constructed as part of the initial extraction sequence and will be top-dressed using topsoil material from the pre-stripping operations. The bund will be revegetated as soon as practicable after development.

As discussed above, the proposed haul road will pass through the area approved for use as the Western Overburden Emplacement Area. Consequently, this overburden emplacement area will not be developed.

3.4 Interactions with Public Infrastructure

The haul road between the proposed Granite Pit and Lynwood Infrastructure Facilities will pass over a gas pipeline and optic fibre line both of which run in a roughly northeast-southwest alignment between the existing Approved Pit and the proposed Granite Pit (refer to **Figure 1.3**). A Council owned water pipeline is also located within this easement. All services located within the easement are buried underground. The Project has been designed to avoid impact on this public infrastructure.

4.0 Stakeholder Engagement

Holcim Australia has an established relationship with the surrounding community and other stakeholders and has implemented a process for ongoing engagement regarding the Lynwood Quarry Project. This includes the ongoing operation of a Community Consultative Committee as well as a range of other consultation mechanisms such as an open day in May 2014, newsletters, presentations to community groups, and participation in various community and business forums. Lynwood Quarry also has an Aboriginal Working Group that meets regularly to discuss Aboriginal cultural heritage issues relevant to Lynwood Quarry.

As part of the proposed Extraction Area Modification, Holcim Australia is committed to working with the community to minimise community impacts as far as practicable. Building on the existing engagement program, Holcim Australia will implement a detailed stakeholder engagement process. The engagement will include a range of mechanisms designed to provide the opportunity for community involvement, providing input for Holcim Australia to

consider in its project planning and design; to identify community needs, concerns and opportunities; and to be involved in the environmental and social assessment process.

The proposed modification will also involve detailed consultation with the Aboriginal Working Group and other registered Aboriginal parties as part of the Aboriginal Cultural Heritage assessment.

Holcim Australia will also consult with DP&E, Goulburn Mulwaree Council and other relevant government agencies during the assessment process.

5.0 Planning and Environmental Context

5.1 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 Quarry 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 the 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 considered an appropriate approval pathway for the proposed modification.

5.2 Permissibility

The proposed Extraction Area Modification is located in the Goulburn-Mulwaree Local Government Area and is subject to the *Goulburn-Mulwaree Local Environmental Plan 2009* (2009 LEP).

The additional land required for the proposed Granite Pit is zoned RU1 under the 2009 LEP. Extractive Industries are permissible with consent in the RU1 zone (refer to **Figure 5.1**).

5.3 Environmental and Community Context

The following sections identify the environment and community context in which the proposed Extraction Area Modification is proposed to be developed. Further discussion of the existing environment is contained in **Section 6.0**.

5.3.1 Topography and Drainage

The topography and drainage catchments around the proposed Extraction Area Modification project area are shown in **Figure 5.2**. The proposed Granite Pit is located in the Lockyersleigh Creek Catchment, with part of the existing Lynwood Quarry also lying within this catchment. The drainage catchments comprise several first order tributaries of Lockyersleigh Creek, with a second order tributary present along the northern boundary of the Project Area.

The majority of the proposed Modification area slopes gently to the south or west towards Lockyersleigh Creek, with a small ridge separating the proposed Granite Pit and the Approved Pit. The proposed Granite Pit is separated from Marulan township by a ridge line ranging from 690 to 710 mAHD that extends north–south to the east of the Granite Pit.

5.3.2 Geology and Soils

The proposed Extraction Area Modification lies near the divide of the volcanics that underlie the majority of the Southern Tablelands and the sedimentary formations to the east of this region in the upper reaches of both the Sydney basin and the Shoalhaven catchment. The Approved Pit targeted the Early Devonian-aged Joaramin Ignimbrite (a sub-group of the Bindook Volcanics).

The proposed Extraction Area Modification targets an intrusive granitic body to the west of the Approved Pit and is located within the eastern margin of the Carboniferous-aged Lockyersleigh Granite, close to the contact with more structurally deformed rocks of the Early Devonian Joaramin Ignimbrite (east of the Project Site) and Barrallier Ignimbrite (north of the Project Site) (NSW DPI, 2008).

The Lockyersleigh Granite is an unfractionated, I-type, medium-grained granite comprising two phases – a central porphyritic granitic phase surrounded by an equigranular more granodioritic phase. The main mass of the granite is porphyritic and generally pink whereas the marginal phase is typically equigranular and grey over a width of approximately 500 metres. The intrusion shows a strong magnetic response as highlighted by regional airborne magnetic data.

From a geological perspective, granite bodies like the Lockyersleigh Granite are attractive aggregate resource targets as they are often homogeneous, mineralogically stable rock masses, with low intensity jointing that makes them suited to bulk extraction. From a structural perspective, the Lockyersleigh Granite has the added benefit of being younger

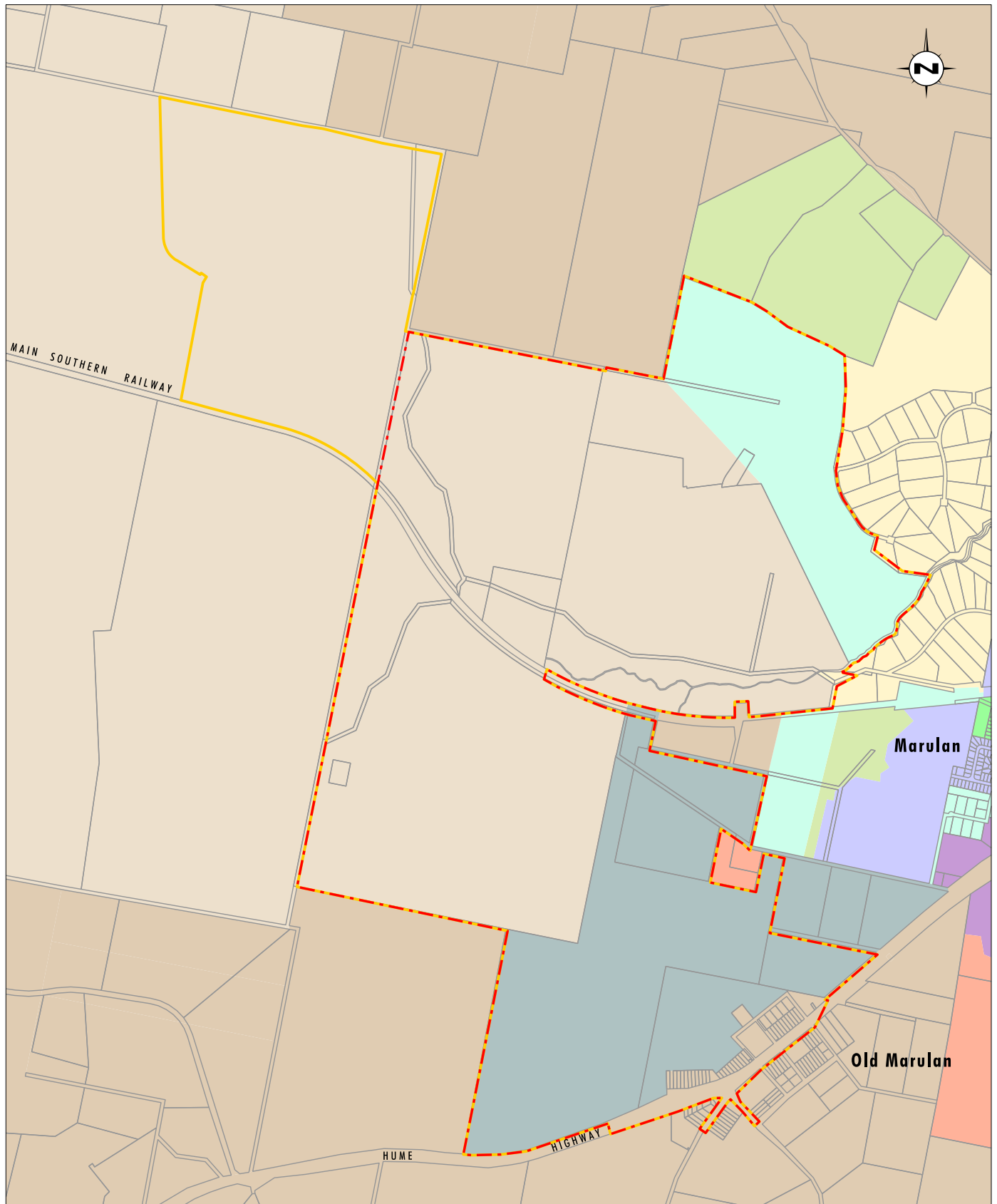


Image Source: Google Earth (2012)
Data Source: LPI (2014), Holcim Australia (2014), Goulburn Mulwaree LEP 2009

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Legend

- | | |
|---|---|
| Approved Project Area | RE1 - Public Recreation |
| Modification Project Area | RU1 - Primary Production |
| B6 - Enterprise Corridor | RU2 - Rural Landscape |
| IN1 - General Industry | RU6 - Transition |
| IN2 - Light Industry | SP2 - Infrastructure |
| R1 - General Residential | |
| R5 - Large Lot Residential | |

FIGURE 5.1
Land Zoning

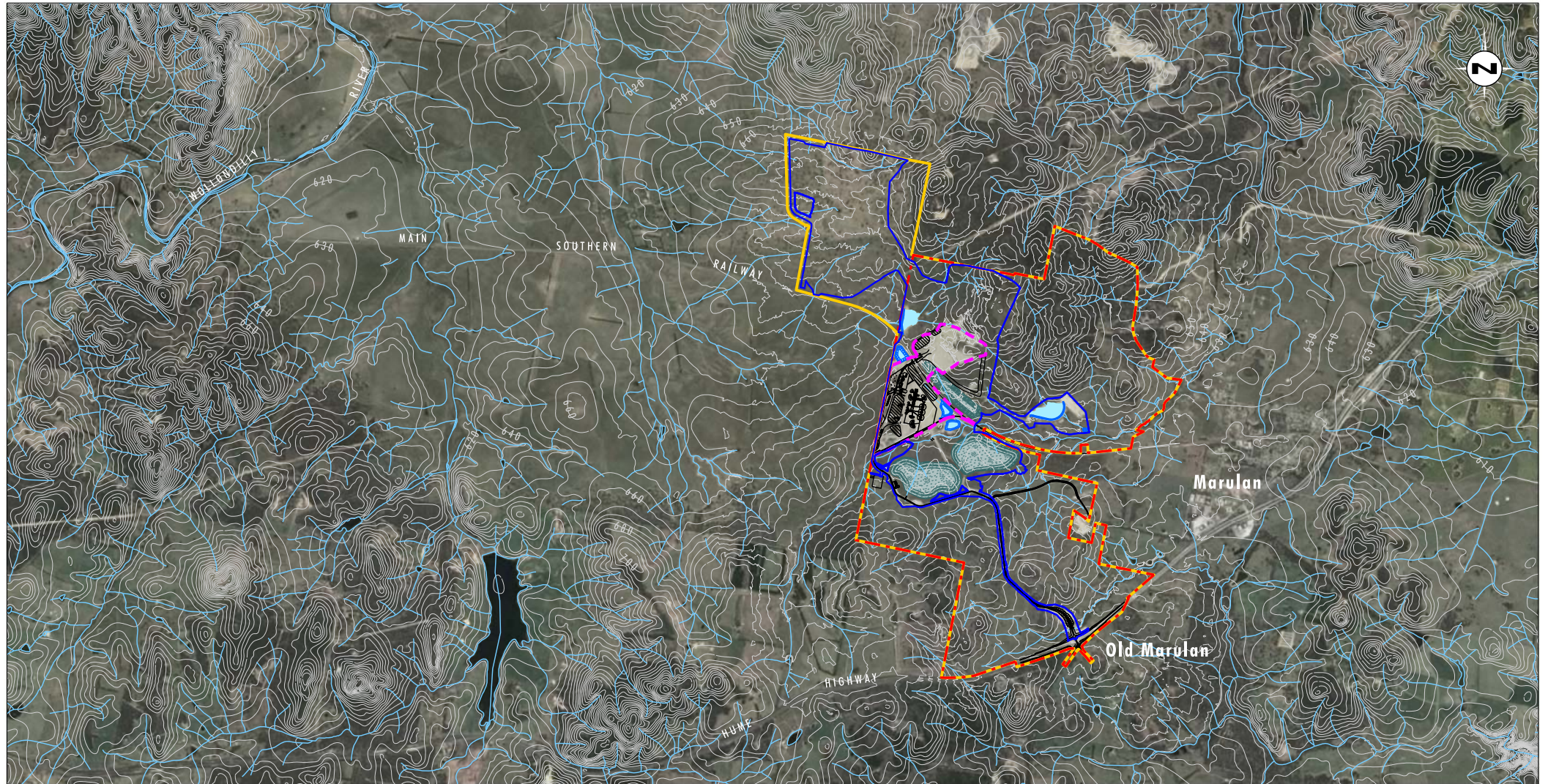


Image Source: Google Earth (2012)
Data Source: Holcim (2015), LPI (2004)
Note: Contour interval 5m

- Legend**
- Approved Project Area
 - Modification Project Area
 - Lynwood Infrastructure Facilities
 - Proposed Disturbance Footprint
 - Lynwood Infrastructure Layout
 - Emplacement Area
 - Dam

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FIGURE 5.2
Topography and Drainage

than almost all of the surrounding geological units, as well as post-dating the major regional deformation events (e.g. faulting and folding) that significantly impacted the older surrounding units.

The proposed Granite Pit is located primarily within the Garland and Bindook Road groups of the Lockyersleigh soil landscape unit. These are both yellow, podzolic soils (DECCW, 1991) and require management in regard to gully erosion hazard and sheet erosion hazard. Further assessment of soil characteristics will be undertaken in the EA.

5.3.3 Land Ownership

Holcim Australia owns all of the additional land required for the Granite Pit and associated activities, and also owns a large land area to the east of the Granite Pit associated with the existing Lynwood Quarry.

Ownership of the land surrounding the proposed Extraction Area Modification is shown in **Figure 5.3**. The land to the west and north of the proposed Extraction Area Modification is primarily larger rural land holdings, with the land to the east and south of the existing Lynwood Quarry site primarily smaller holdings (rural residential and residential area of Marulan to the east and smaller rural holdings to the south).

5.3.4 Land Use

The land to be occupied by the proposed Granite Pit is currently grazing land and has a long history of agricultural use. This area has scattered stands of trees and a more densely wooded area in the north-eastern corner. The land surrounding the Modification Project Area is all rural land, much of which is actively grazed, with the exception of the land occupied by Lynwood Quarry. Land use in and around the proposed Extraction Area Modification is shown in **Figure 5.4**.

Agriculture is the predominant land use, while other key land uses within the vicinity include:

- the residential area of Marulan to the east;
- rural residences approximately 3 – 8 kilometres to the north and west along Carrick Road, and rural residential areas approximately 3.5 kilometres to the north-east, along Brayton Road;
- the Holcim owned Johnniefields Quarry 3 kilometres to the north on Brayton Road, Gunlake Quarry which is located approximately 1.5 kilometres north of the Granite Pit and Boral's Peppertree Quarry to the south-east of Marulan (approximately 8 kilometres from the Granite Pit);
- small areas of industrial land associated with Marulan township;
- transport corridors and associated services including the Hume Highway and main southern railway;
- a bulk quarry services storage depot operated by Orica Explosives on a portion of the Lynwood Quarry site to the west of Marulan; and
- the Marulan waste management facility adjacent to the eastern boundary of the Lynwood Quarry site.

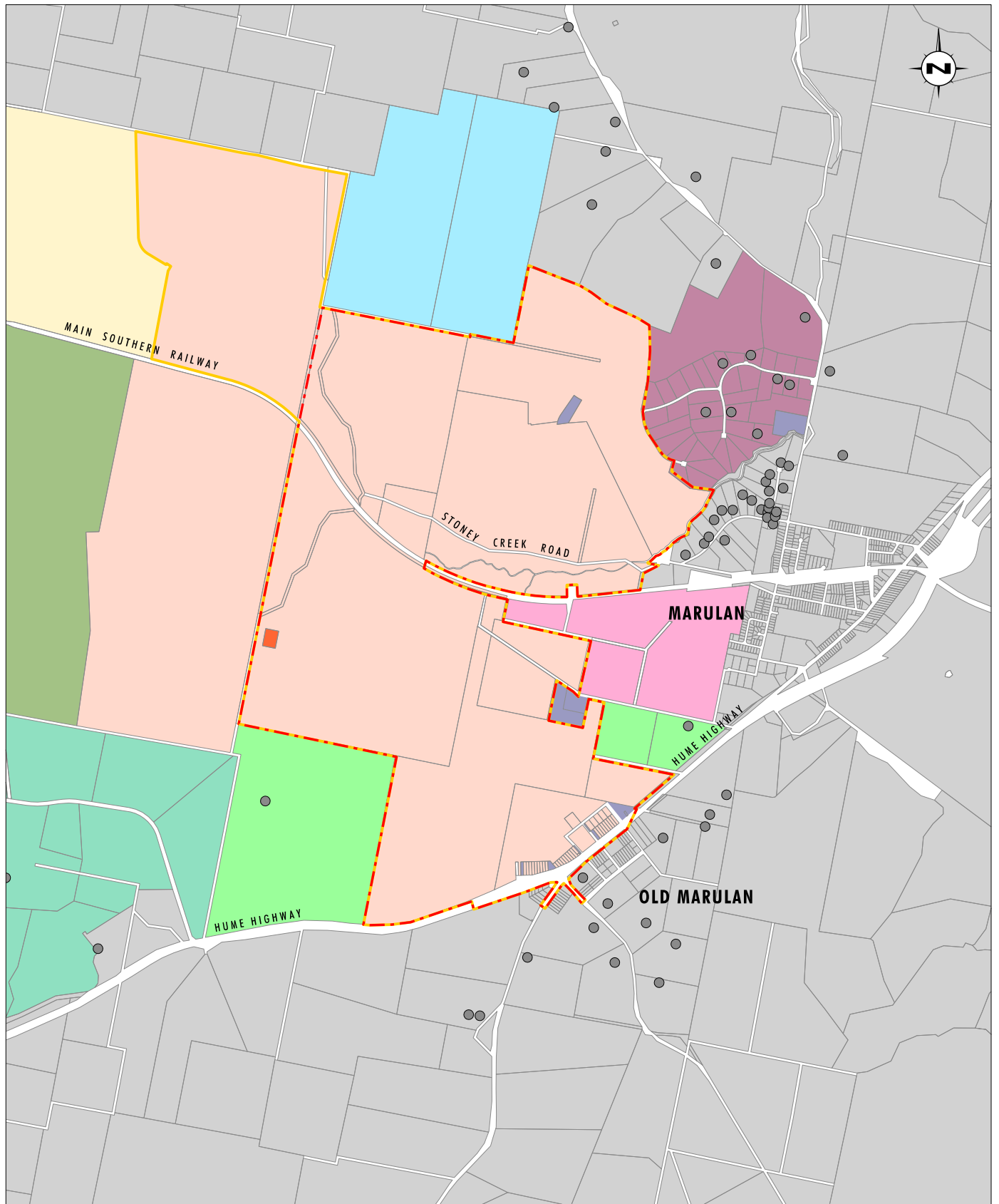


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0 0.5 1.0 2.0 km
1:40 000

Legend

- | | | |
|---|--|--|
| - - - Approved Project Area | Tailored Property | Dugan |
| Modification Project Area | Other Private Land | Rawson |
| ● Residence | South Ck Dairy | Country Energy |
| Holcim Australia | Oliveri | |
| Crown Land/GM Council | Onions Investments | |
| Newball Pty Ltd | Ranken Investments | |

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FIGURE 5.3
Land Ownership

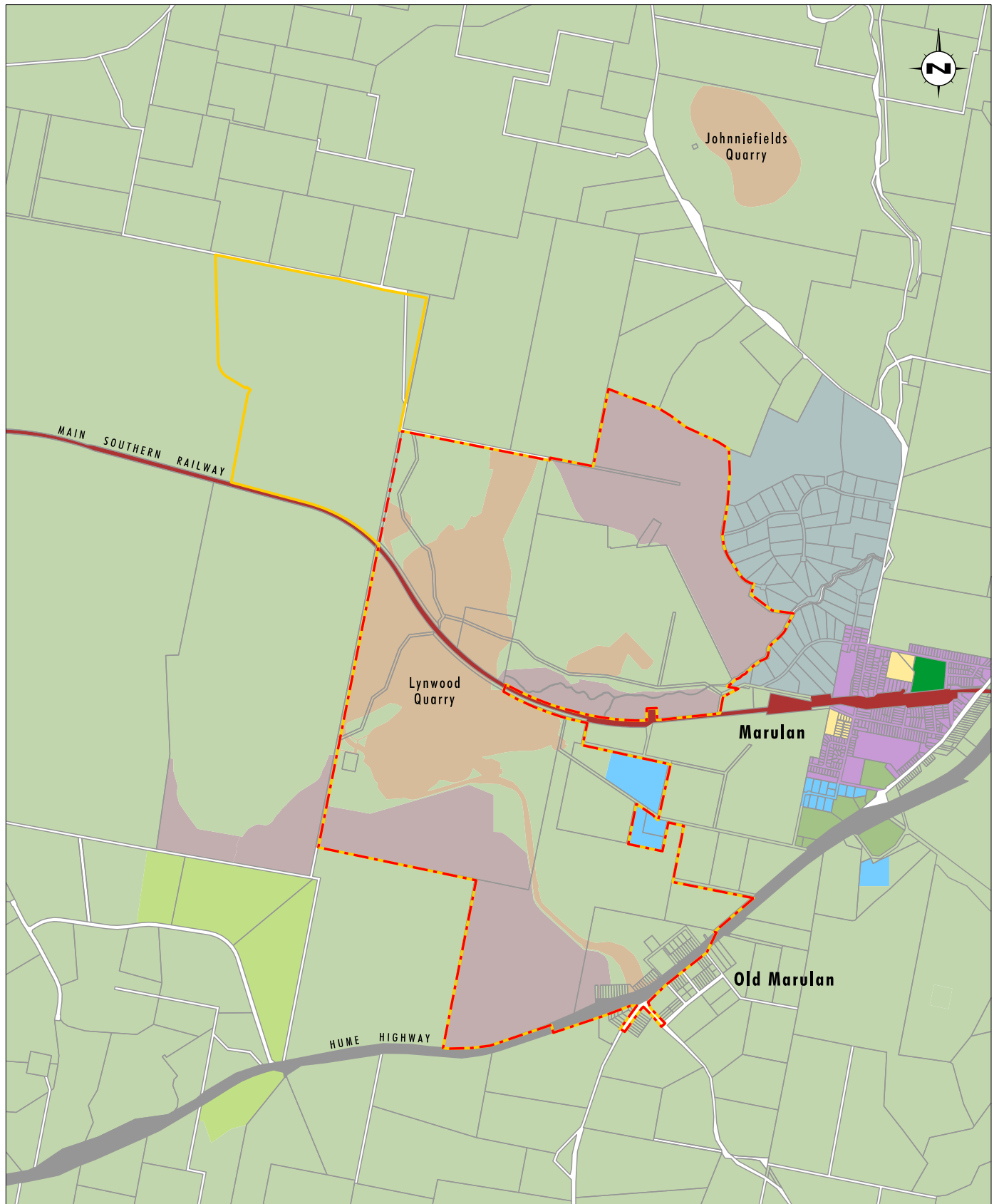


Image Source: Google Earth (2012)
Data Source: LPI (2014), Holcim Australia (2014)

0 0.5 1.0 2.0 km
1:40 000

Legend

- | | | |
|---|---|--|
| Approved Project Area | Industrial | Rural Residential |
| Modification Project Area | Pine Tree Plantation | |
| Conservation (Private) | Quarry | |
| Business | Railway | |
| Grazing | Recreation | |
| Highway | Residential Area | |

File Name (A4): R02/3330_006.dgn
20150515 15.08

FIGURE 5.4
Existing Land Use

Holcim Australia has also established biodiversity offset areas for the existing Lynwood quarry which are being managed for conservation (refer **Figure 1.2**). The Modification will not impact these established conservation areas.

The location of private residences around the proposed Extraction Area Modification is shown in **Figure 5.3**. The proposed Granite Pit is located approximately 2 kilometres from the nearest residence, which is located to the west. The proposed modification will ensure that proposed quarrying overburden emplacement activities are more distant from the nearby existing Marulan township, with the buffer from overburden emplacement activities increasing from the currently approved 2 kilometres to approximately 5 kilometres, while the buffer from Marulan township to the Granite Pit will also increase from approximately 3.6 kilometres to 5 kilometres. In contrast, the overburden emplacement and extraction activities will be marginally closer to more distant rural residential areas such as Towrang, with the buffer distance for overburden emplacement activities decreasing from approximately 12 kilometres to 10 kilometres, while the buffer to extraction activities will decrease from approximately 11 kilometres to 9.5 kilometres.

6.0 Key Environment and Community Issues

6.1 Preliminary Environmental Risk Analysis

To assist in identifying the key environmental and community issues that require further assessment, a preliminary environmental risk analysis has been completed for the Project and is detailed in **Table 6.1**. The preliminary environmental risk analysis identifies those issues requiring further investigation in the EA.

The key environment and community issues for the proposed Extraction Area Modification have been determined through a detailed scoping process, an understanding of community views and feedback and through consideration of the impacts of the existing operations.

The potential impacts associated with the construction and operation of the proposed Modification Project will be similar to those of the existing Lynwood Quarry and are well understood by Holcim Australia.

Table 6.1 – Potential Environmental Impacts Associated with the Project

Issue	Environmental Assessment	Further Assessment Required for the Project?
Noise	Construction and operation of the Modified operations has the potential to result in modified noise emissions. While the Granite Pit will be located further away from the majority of sensitive receptors and it is unlikely that there will be exceedances of existing approved noise criteria at any private residence, a detailed noise assessment will be undertaken to confirm the potential impacts and any additional mitigation measures that may be required.	Yes, refer to Section 6.2 for further detail
Blasting	Blasting will continue to be undertaken as part of the Modified operations and vibration and blast overpressure has potential to impact on nearby residences and infrastructure, an assessment of blast impacts will be prepared.	Yes, refer to Section 6.3 for further detail

Table 6.1 – Potential Environmental Impacts Associated with the Project (cont)

Aspect	Environmental Assessment	Further Assessment Required for the Project?
Air Quality	Construction and operation of the Modified operations has the potential to modify impacts on local air quality. While the Granite Pit will be located further away from the majority of sensitive receptors and it is unlikely that there will be exceedances of existing approved noise criteria, a detailed assessment is required to confirm the potential impacts and any additional mitigation measures that may be required.	Yes, refer to Section 6.4 for further detail
Ecology	Ecological survey work completed to date has indicated that the native vegetation areas within the proposed Extraction Area Modification retain a range of ecological values, some of which are threatened under either or both State and Commonwealth legislation. As clearing of vegetation is required, a detailed assessment of potential impacts is required. This will also consider the net impacts associated with reduced footprint of disturbance of Woodland in the approved quarry and emplacement area.	Yes, refer to Section 6.5 for further detail
Socio-economic	The proposed Extraction Area Modification is unlikely to present significantly different social or economic impacts than the currently approved project, however, a detailed community engagement program and assessment will be undertaken which may raise new issues or identify new potential impacts that need to be considered in the design and implementation of the Modification.	Yes, refer to Section 6.6 for further detail
Aboriginal Archaeology/Cultural Heritage	Due to the extent of known Aboriginal sites and cultural heritage values in close proximity to the proposed Granite Pit, it is considered likely that the proposed Extraction Area Modification has the potential to impact on values in addition to those already identified. A detailed assessment is required to confirm the potential impacts and any additional mitigation measures that may be required.	Yes, refer to Section 6.7 for further detail
Historical Heritage	As the Granite Pit is located in proximity to known historic heritage sites, it has the potential to impact on historic heritage values. As such, an assessment of potential historic heritage impacts will be prepared.	Yes, refer to Section 6.8 for further detail
Water Resources	Surface water resource impacts and effective management has been a key issue and design principal for Lynwood Quarry due to its location within the Sydney Drinking Water Catchment. A detailed groundwater assessment was completed for Lynwood Quarry which indicated that while groundwater is present, the local hard rock resources are poorly to very poorly permeable. The Granite Pit and its interaction with the Approved Pit and potential cumulative impacts need to be assessed. As such an assessment of the potential surface and groundwater impacts of the Project is required.	Yes, refer to Section 6.9 and Section 6.10 for further detail

Table 6.1 – Potential Environmental Impacts Associated with the Project (cont)

Aspect	Environmental Assessment	Further Assessment Required for the Project?
Visual Amenity	The Project has some potential to impact on the visual amenity of the area. A visual assessment including assessment of lighting impacts will be completed as part of the EA.	Yes, refer to Section 6.11 for further detail
Hazard	The proposed Extraction Area Modification will involve the construction of a haul road over the gas pipeline which runs in a roughly northeast-southwest alignment between the existing primary crusher area and the proposed Granite Pit. The potential hazards associated with construction over and vibration levels on the gas pipeline, along with other potential hazards associated with the proposed Extraction Area Modification will need to be considered in a hazard analysis completed as part of the EA.	Yes, refer to Section 6.12 for further detail
Greenhouse Gas and Energy	The Modification has the potential to impact on greenhouse gas emissions. Therefore an assessment of the greenhouse gas emissions and energy use associated with the Modified operations is proposed.	Yes, refer to Section 6.13 for further detail
Land resources and rehabilitation	The land to be occupied by the proposed Granite Pit is currently grazing land and has a long history of agricultural use. Accordingly, the EA will include a detailed assessment of the potential impacts of the Extraction Area Modification on agricultural resources and/or enterprises in the local area.	Yes, refer to Section 6.14 for further detail
Traffic	There will be no changes to the maximum production limit of the quarry, or the methods or volumes of transportation of quarry products from the site.	No
Waste	The proposed Extraction Area Modification is not expected to alter quantities of waste generated (apart from proposed overburden emplacement) by Lynwood Quarry or its management.	No

The proposed approach to the detailed assessment of key environment and community issues as part of the EA is discussed in the following sections.

6.2 Noise

Quarry operations involve the use of mobile earthmoving equipment and crushing and screening infrastructure and therefore have the potential to result in noise impacts. The proposed Granite Pit is, however, located further away from almost all surrounding residences than the Approved Pit, including Marulan township, and therefore has the potential to result in reduced noise impacts at many private residences when equipment is operating in the Granite Pit. Operations associated with the Granite Pit will be closer to rural residences located to the north and west of the quarry, however, the majority of these are a significant distance from the quarry, the nearest being 2 kilometres while the remainder are at least 8 kilometres from the proposed modified quarry and are unlikely to be significantly impacted.

The existing noise criteria for Lynwood Quarry outlined in the development consent will be applied to the proposed Modification and a detailed Noise Impact Assessment (NIA) will be completed. The NIA will be prepared in accordance with the *NSW Industrial Noise Policy 2000* and will assess the noise impacts from the proposed Extraction Area Modification on surrounding noise sensitive receivers. This will include a quantitative assessment of potential noise impacts (construction and operational).

The assessment will also evaluate all reasonable and feasible mitigation measures. The existing site monitoring and management measures will be detailed, reviewed and if necessary, recommendations will be made to amend the mitigation, which will include consideration of appropriate noise monitoring requirements for the modified operations.

6.3 Blasting

Blasting associated with quarrying results in vibration and blast overpressure which may impact on nearby residences and infrastructure. Blasts at Lynwood Quarry are designed to avoid adverse impacts to residences and infrastructure, with all blasting undertaken at the quarry to date meeting relevant statutory limits.

Key infrastructure that needs to be considered in blast design at Lynwood Quarry includes the natural gas pipeline, and the Main Southern Railway. This infrastructure will also be relevant to any blasting in the Granite Pit.

The Environment Protection Authority (EPA) sets guidelines for blasting based on human comfort levels. The guidelines have been adapted from the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines *‘Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration’* (ANZECC, 1990). The ANZECC guidelines are based on human comfort levels and are much more stringent than those based on the potential for damage to structures. These guidelines are reflected in the blasting criteria in the existing Lynwood Quarry development consent, which will also be applied to the proposed Extraction Area Modification.

Vibration criteria are also required for infrastructure within the surrounding area to ensure that potential impacts can be managed. Criteria for the gas pipeline and Main Southern Railway are also specified in the Lynwood Quarry development consent and will be applied to the proposed Extraction Area Modification.

A blast impact assessment will be undertaken for the proposed Extraction Area Modification to identify any potential impacts on surrounding residences, infrastructure and sensitive environmental features. The assessment will identify any controls that need to be incorporated into the existing blasting practice at Lynwood Quarry further to minimise potential impacts.

6.4 Air Quality

The proposed Extraction Area Modification has the potential to result in changes to the predicted air quality impacts of Lynwood Quarry and a detailed air quality assessment will be completed as part of the EA. As the Granite Pit will be located further from Marulan and most surrounding residences than the Approved Pit, it is expected that with the Granite Pit the overall impact of the operations on residential land use may be reduced.

A comprehensive range of air quality controls have been built into the design of Lynwood Quarry and these existing controls will be applied to the modified quarry operations. These

include dust management controls on for the quarrying operations such as water carts, fixed water sprays, use of dust suppressants on haul roads, optimisation of haulage routes to reduce travel distance as far as practicable, and progressive rehabilitation of disturbed areas to reduce exposed earth.

The development consent specifies relevant dust limits for the quarry and Lynwood Quarry also has a comprehensive dust monitoring program in place to monitor dust levels in the area surrounding the quarry to ensure compliance.

The air quality impact assessment will be undertaken in accordance with relevant EPA assessment guidelines, namely the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Department of Environment and Conservation NSW, 2005).

The assessment will involve the establishment of a computer-based dispersion model of dust emissions from the proposed Extraction Area Modification, with the impacts of the existing Lynwood Quarry operations also included. The quantitative assessment will:

- address construction and operational impacts;
- detail reasonable and feasible mitigation measures to minimise dust emissions; and
- review the need for any further air quality monitoring and management measures.

6.5 Ecology

The proposed Extraction Area Modification is located on land dominated by agricultural grazing lands, woodland vegetation and areas already disturbed as part of the gas pipeline easement. The majority of the grassland areas are dominated by introduced pasture species. Despite these past disturbances and the predominance of introduced pasture species, ecological survey work completed to date has indicated that the native vegetation areas within the proposed Extraction Area Modification retain a range of ecological values, some of which are threatened under either or both State and Commonwealth legislation.

The Lynwood Quarry site is known to contain a range of important ecological values including threatened ecological communities, and habitat for several threatened species. Biodiversity offset areas and habitat management areas have been established for the approved Lynwood Quarry, with these areas unaffected by the proposed Extraction Area Modification.

The proposed Extraction Area Modification will require clearing of some areas of native vegetation and will impact on ecological values. A detailed ecological impact assessment will therefore be undertaken as part of the EA.

The ecological assessment will consider impacts from construction and operation of the proposed modification in the context of both the NSW *Threatened Species Conservation Act 1995* (TSC Act), and the Commonwealth EPBC Act.

A detailed field survey program has commenced for the Modification to build on the extensive existing information from past work at the Lynwood Quarry site, and to identify gaps which require further detailed assessment or seasonal-specific surveys. These field surveys were designed to be generally consistent with industry standard survey guidelines published by Office of Environment and Heritage (OEH).

The fauna surveys completed to date were designed to identify range of species occurring in the proposed Granite Pit, and have included:

- habitat assessment;
- diurnal bird area searches;
- diurnal reptile/amphibian area searches;
- mammal trapping including Elliot A and Elliot B trapping and hair funnel sampling targeting terrestrial and arboreal mammal species;
- nocturnal spotlight surveys targeting native and introduced fauna species;
- nocturnal call playback surveys that target large forest owls (powerful owl [*Ninox strenua*] and barking owl [*N. connivens*]), koala (*Phascolarctos cinerus*) and the squirrel glider (*Petaurus norfolcensis*);
- baited remote camera surveys;
- nocturnal amphibian surveys in appropriate freshwater wetland habitat; and
- nocturnal Anabat surveys targeting the range of micro-bat species potentially occurring.

A winter bird survey, specifically targeting the swift parrot (*Lathamus discolor*) and regent honeyeater (*Anthochaera phrygia*) has also been undertaken.

The flora survey program was designed to target known vegetation communities and threatened flora known to occur in the general area, and includes quadrat and random meander surveys. The flora survey includes:

- identification and mapping of vegetation communities throughout the proposed Extraction Area Modification land. This includes surveying systematic floristic plots, rapid assessment plots and meandering transects in areas not previously surveyed. The survey also includes collection of biometric site value data according to the BioBanking methodology at each of the systematic floristic plots;
- verification of the potential for the proposed Extraction Area Modification land to support any threatened flora species, endangered populations or threatened ecological communities listed under the TSC Act or EPBC Act;
- targeted (seasonal) threatened flora surveys, including surveys for hoary sunray (*Leucochrysum albicans* var. *tricolor*) and terrestrial orchids; and
- targeted surveys for the box gum woodland community listed as being endangered and critically endangered under the TSC Act and EPBC Act respectively.

Following completion of the ecological survey and analysis of results, a detailed impact assessment will be undertaken in accordance with State and Commonwealth legislative requirements. The assessment will include:

- details of measures taken to avoid, reduce or mitigate impacts on biodiversity;
- accurate estimates of proposed extent of vegetation clearing;

-
- a detailed assessment of potential impacts of the proposed modification on any:
 - terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities and groundwater dependent ecosystems;
 - migratory bird species listed under CAMBA, JAMBA and/or ROKAMBA; and
 - regionally significant remnant vegetation, or vegetation corridors.

It is anticipated that an updated comprehensive biodiversity offset strategy will be required to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term and compensate for those impacts to threatened species and ecological communities that cannot be adequately avoided or mitigated. The biodiversity offset strategy will be completed in accordance with the NSW Biodiversity Offsets Policy for Major Projects and will be designed, where practical, to build on the existing biodiversity offsets and management areas established for Lynwood Quarry.

6.6 Socio-Economic Impacts

Socio-economic assessment is concerned with assessing and predicting the likely consequences of a Project in both social and economic terms. While economic assessment emphasises the monetary effects of a proposal, social impact assessment is concerned with assessing benefits and costs in non-monetary terms.

A comprehensive socio-economic impact assessment was completed for the Lynwood Quarry EIS (Umwelt, 2005), which included a detailed community involvement program. This assessment found that in general, Lynwood Quarry was expected to make a significant contribution to the local, regional and State economies through capital expenditure and employment. In addition, the community program found that the project had the strong support of the local community.

The proposed Extraction Area Modification is unlikely to present significantly different social or economic impacts than the currently approved project, however, a detailed community engagement program will be undertaken which may raise new issues or identify new potential impacts that need to be considered in the design and implementation of the Modification.

The social impact assessment will include consideration of potential impacts of the Modification, both positive and negative, on the community. The issues considered in the assessment will include (but not be limited to):

- environmental impacts on local and regional communities (dust, noise, visual amenity, rehabilitation/end land use, social amenity);
- issues relating to the ongoing sustainability and viability of neighbouring communities;
- impacts on sense of community;
- impacts on community infrastructure and services;
- impacts on other businesses and key industry sectors;
- a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the project, and

-
- an assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.

6.7 Aboriginal and Cultural Heritage

Comprehensive Aboriginal archaeological and cultural heritage assessments have previously been undertaken for the approved Lynwood Quarry. These assessments have identified 94 Aboriginal archaeological sites within the Lynwood Quarry site. As indicated in **Figure 6.1**, there are also three previously recorded Aboriginal sites in the vicinity of the Extraction Area Modification area.

Holcim Australia has an established cultural heritage management strategy that provides protection and ongoing management for heritage values on the site. This includes the implementation of a Cultural Heritage Management Plan for the quarry and the operation of an Aboriginal Working Group committee process through which Holcim Australia works with the local Aboriginal community to ensure the effective management of cultural heritage values as part of the quarry operations.

In relation to Aboriginal consultation, the initial approach will be to undertake the survey with the existing registered Aboriginal parties as part of ongoing consultation for Lynwood Quarry. The registered Aboriginal parties and OEHL will be consulted in relation to the survey strategy.

Due to the extent of known Aboriginal sites and cultural heritage values in close proximity to the proposed Granite Pit, it is considered likely that the proposed Extraction Area Modification has the potential to impact on values in addition to those already identified.

It is noted that Holcim has a current combined Section 87/Section 90 Aboriginal Heritage Impact Permit #1100264 (s.90/87 AHIP #1100264) which allows for subsurface testing and salvage within the current Project Area. This AHIP was varied in 2010 to include minor modifications to the rail loop and access road and to allow for impacts to identified Potential Archaeological Deposits (PADs) following approval. It is envisaged that any impacts to Aboriginal archaeological sites/PADs within the proposed modification area could also be managed/mitigated under a variation to s.90/87 AHIP #1100264 that would allow for any necessary subsurface testing and salvage following approval.

The Aboriginal cultural heritage assessment will include detailed consultation with the registered Aboriginal parties for Lynwood Quarry, a detailed field survey and an assessment of the impacts of the proposed Extraction Area Modification on cultural heritage values.

6.8 Historical Heritage

Past studies have identified a long history of European development within the locality of Lynwood Quarry, with historical records associating the Marulan area with expeditions in the late eighteenth century and early nineteenth century for the purpose of finding land suitable for grazing and agricultural expansion south of the 'exhausted' Sydney settlement.

The site of the former Marulan township (to the south of the existing township) is listed on the State Heritage Register (SHR). Part of this SHR area lies within the Lynwood Quarry site, however, the Modification will not result in any impact to this area.

As the Granite Pit is located in proximity to known historic heritage sites, it has the potential to impact on historic heritage values. The location of the proposed Extraction Area Modification was formerly part of the Lockyersleigh Property which is listed as a local

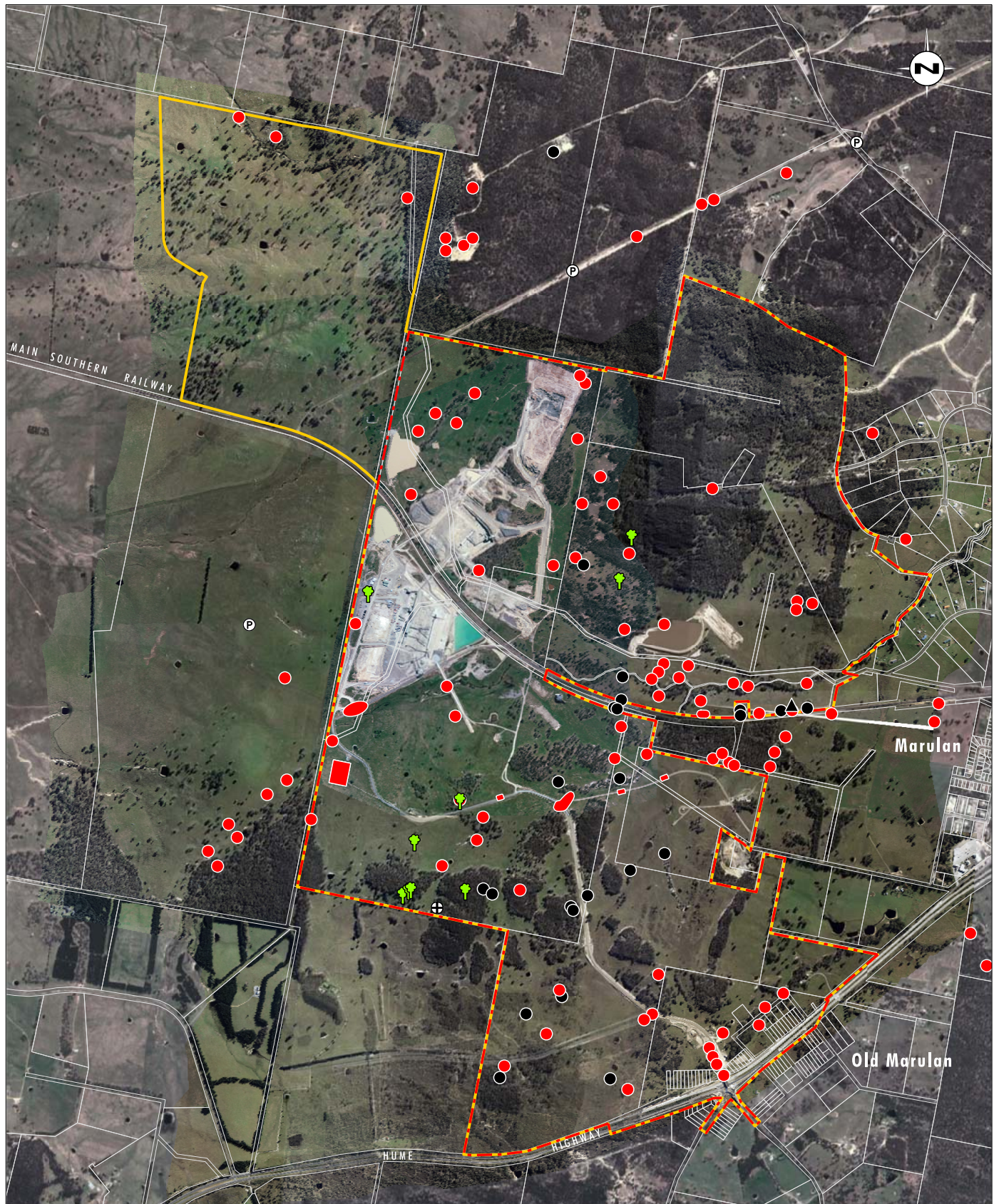


Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2014)

0 0.5 1.0 1.5 km
1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Artefact Scatter
- Isolated Finds
- P Potential Archaeological Deposit
- 🌳 Modified Tree (Carved or Scarred)
- ⊕ Stone Arrangement
- ▲ Grinding Groove

File Name (A4): R02/3330_008.dgn
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FIGURE 6.1
Previously Recorded
Aboriginal Sites

heritage item on the Goulburn Mulwaree LEP 2009. As it was formerly part of the property, the Modification Area is included in the LEP listing, however, the homestead and its associated buildings are approximately 2 kilometres west of the Modification Area.

The EA will include an assessment of potential historic heritage impacts prepared in accordance the *NSW Heritage Manual 1996* (Heritage Branch, OEH) and with consideration of the principles contained in the *Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance*. It will include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items and outline any proposed mitigation and management measures (including an evaluation of their effectiveness and reliability).

6.9 Surface Water

Surface water resources impacts and effective management has been a key issue and design principle for Lynwood Quarry due to its location within the Sydney Drinking Water Catchment. The water management system for the quarry was designed so that it would not result in detrimental impacts to downstream water quality. The design also considered the water usage at the quarry with the aim of maximising reuse of on-site water to meet site water demand, with off-site water sources used to supplement this where required. The water management controls that are implemented as part of the quarry operations are outlined in the Lynwood Quarry Water Management Plan. These same design principles will be applied to the proposed Extraction Area Modification.

As discussed in **Section 5.3.1**, the location of the proposed Extraction Area Modification lies within the catchment of Lockyersleigh Creek which drains to the Wollondilly River, which forms part of the Warragamba Dam catchment area (part of Sydney's drinking water supply). As the Project Area is located within the Sydney Catchment Authority area of management, particular requirements will need to be met by the Project regarding potential water quality impacts. The drainage of the location is illustrated in **Figure 5.2**, with several first order and one second order tributary of Lockyersleigh Creek occurring in the proposed Granite Pit area.

Major earthworks, such as the construction of the quarry pit, development of overburden emplacement areas and haul road construction will change the existing drainage patterns within the location of the proposed Extraction Area Modification and have potential to impact on downstream flow volumes and water quality. The design of the water management system is currently being developed and will include clean water management upslope of the quarry pit (refer to **Figure 1.3**) to manage the potential for water to run into the quarry pit. As for the existing Lynwood Quarry, the proposed Extraction Area Modification will be designed to have a neutral or beneficial effect on downstream water quality.

One dimensional flood modelling of the 100 year critical duration average recurrence interval (ARI) storm event will be required as part of the surface water assessment. The flood modelling will be undertaken to determine the potential extents of flooding along the upper tributaries adjacent to the Modification Area and proposed pit limits.

A detailed surface water assessment will be undertaken as part of the EA. The surface water assessment will include the identification and documentation of catchments and watercourses within and surrounding the location of the proposed Extraction Area Modification, the preparation of conceptual layouts of water management controls (the water management system) and the identification of the required water management measures to mitigate surface water impacts. It will also include an updated Lynwood Quarry water balance that includes the Granite Pit. The water balance will include a description of:

- site water demands;
- water disposal methods (inclusive of volume and frequency of any water discharges);
- water supply infrastructure; and
- water storage structures.

The surface water assessment will also include consideration of water licensing requirements and other approvals under the following Acts:

- *Water Management Act* (2000);
- *Water Act* (1912); and
- *Protection of Environment Operations Act* (1990).

It will also demonstrate that water for the construction and operation of the development can be obtained from (and operate in accordance with) the rules of the Greater Metropolitan Region Unregulated River Water Sources and the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources.

In addition, the surface water assessment will include an assessment of the potential impacts on surface water flows and quality and assess the potential for impacts on:

- downstream water users;
- existing user entitlements;
- groundwater-dependent and riparian ecology;
- the quantity and quality of regional water supplies;
- regional water supply infrastructure; and
- affected licensed water users and basic landholder rights.

6.10 Groundwater

A detailed groundwater assessment was completed for Lynwood Quarry which indicated that while groundwater is present, the local hard rock resources are poorly to very poorly permeable (Umwelt, 2005). Holcim Australia has over 10 years of groundwater monitoring data for the Lynwood Quarry site which will be utilised to gain a detailed understanding of the local groundwater regime. Holcim has also recently installed a series of groundwater piezometers across the location of the proposed Extraction Area Modification to build on this existing knowledge of the existing groundwater regime.

The groundwater impact assessment will consider the potential changes between the approved quarry operations and the approved quarry operations with the proposed granite pit. The groundwater impact assessment will:

- assess the project specific groundwater impacts for the proposed quarrying operations including:
 - proposed monitoring, data collection and analysis, as well as reporting;
 - groundwater inflow into the quarry pit including water quantity and quality impacts;
 - impact on any aquifers that may be present;
 - potential loss of water quantity or quality supply to local and regional users including consideration of any Water Licences;
 - post quarrying water level recovery;
 - impacts to groundwater dependent ecosystems;
 - groundwater management for construction and operation including monitoring, assessment and reporting;
 - groundwater recovery levels in the final void(s) and any interactions with aquifers including consideration of water quality impacts;
 - identification of any recommended groundwater impact mitigation and management control measures, contingencies or uncertainties; and
 - cumulative impact assessment (having regard to other sources of groundwater depletion/impact in the area).
- estimate the groundwater contribution to the Project's water balance;
- provide recommendations relating to the management of the groundwater resource and management of groundwater inflow into the Project; and
- provide a report including the above matters, to a standard appropriate for inclusion into an Environmental Assessment to meet NSW environmental planning and assessment requirements, including an assessment against the NSW Aquifer Interference Policy (AIP).

The assessment will be based on the results of a groundwater model to be developed that will include an expanded area to the west to be able to incorporate the Granite Pit. Accordingly, the assessment will consider the potential for cumulative impacts from the Granite Pit and the Approved Pit at Lynwood Quarry.

In addition, the assessment will assess the impacts of the Extraction Area Modification in the context of the relevant groundwater regulatory management framework outlined in **Section 6.9**, which includes assessment against the rules of the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources.

6.11 Visual Amenity

Lynwood Quarry was designed with a range of visual impact mitigation controls designed to either limit views of the quarry operations or to mitigate impacts on the visual character of the area. This includes designing and managing site lighting in accordance with Australian Standard AS4282 (INT) 1995 – *Control of Obtrusive Effects of Outdoor Lighting*.

During the early phase of commissioning the lighting system for the quarry, and before lighting controls were in place, testing of the electrical system generated some night lighting impacts that resulted in concern from some residences located approximately 8-10 kilometres to the west of the existing Quarry operations. Holcim Australia has been working with the community since that time to implement lighting controls that will reduce lighting impacts on the community. This has included independent lighting reviews that have confirmed that once fully implemented, the lighting controls for the quarry are in accordance with AS4282. Notwithstanding, Holcim Australia is continuing to work closely with the community on a comprehensive range of measures to further reduce the visibility of night lighting from the quarry operations. These include, for example, lowering the height of lights in the car park area, reducing the luminosity of external lighting and installation of glare shields.

The proposed Extraction Area Modification will result in vegetation removal, earthworks, quarry pit excavation, and overburden emplacement activities. These components and associated activities will be visible from some limited public viewing locations. No additional fixed night lighting is currently planned for the proposed Extraction Area Modification, however, there will be lighting associated with mobile equipment and mobile lighting in the quarry pit until 10 pm.

The Extraction Area Modification has also been designed with consideration of potential visual impacts to residences at Towrang to the west that may have long distance views, many of which are in the order of 8-10 kilometres from the site. The concept design of the project includes a visual bund along the western boundary of the proposed Granite pit as indicated in **Figure 1.3**. This bund will be constructed at the beginning of the Project and will be vegetated with trees so that it will assist in shielding views of the quarry from the west.

The key visible features of the proposed Extraction Area Modification will be the proposed overburden emplacement areas which will be progressively revegetated to help minimise the ongoing visual impacts of the development.

A detailed visual impact assessment will be undertaken as part of the EA and assess impacts of the changing landforms on site during the various stages of the project using a combination of digital terrain modelling, radial analysis, transects and photo montages to determine potential viewing locations.

The visual impact assessment will also consider lighting impact assessment for the modified operations, including the proposed Granite Pit. As part of the visual assessment, any additional management and mitigation measures necessary to minimise the visual impacts of the project will be determined.

6.12 Hazard Analysis

The proposed Extraction Area Modification will involve the construction of a haul road over the gas pipeline which runs in a roughly northeast-southwest alignment between the existing primary crusher area and the proposed Granite Pit. Similar to the existing situation at Lynwood Quarry, blasting in the Granite Pit will also result in some level of ground vibration affecting the pipeline, although blasting will be designed so that relevant vibration criteria are met. The potential hazards associated with construction over and vibration levels on the gas pipeline, along with other potential hazards associated with the proposed Extraction Area Modification will be considered in a hazard analysis completed as part of the EA.

The hazard identification study will involve:

- identification of potential credible hazard scenarios associated with the development, including bushfire risk;
- discussions with key stakeholders relevant to the hazard assessment (e.g. Jemena, gas pipeline manager);
- identification of the required hazard mitigation and management measures; and
- preparation of a report documenting the hazard study.

A report on the findings from the Hazard Analysis will be prepared for inclusion as an appendix to the EA.

6.13 Greenhouse Gas and Energy

As part of the EA, the existing predicted greenhouse gas emissions and energy usage will be reviewed as the proposed Extraction Area Modification has the potential to change the existing predictions due to changes in the location of quarrying.

The EA will include a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions and energy use for Lynwood Quarry including the proposed Extraction Area Modification. Any predicted change in greenhouse gas emissions will then be considered in a qualitative assessment of the potential impacts of these emissions on the environment, including in the context of climate change impacts. The assessment will also outline reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency.

6.14 Land Resources and Rehabilitation

The land to be occupied by the proposed Granite Pit is currently grazing land and has a long history of agricultural use. Accordingly, the EA will include a detailed assessment of the potential impacts of the Extraction Area Modification on:

- agricultural resources and/or enterprises in the local area, including:
 - any change in land-use arising from requirements for biodiversity offsets; and
 - a detailed description of the measures that would be implemented to avoid and/or minimise the potential impacts of the project on agricultural resources and/or enterprises.
- soils (including any acid sulfate soils) and land capability (including land contamination);
- landforms and topography; and
- land use, including conservation and recreational use.

Rehabilitation of the proposed Extraction Area Modification will involve a range of strategies, including shaping and revegetation of emplacement areas, quarry pit rehabilitation and progressive rehabilitation of disturbed areas. Consistent with the rehabilitation strategy for Lynwood Quarry, as outlined in the existing Rehabilitation and Landscape Management

Plan, the emplacement areas and other disturbed areas would be progressively rehabilitated using a mixture of primarily native grass, shrub and tree species.

The EA will include an outline of the approach to rehabilitation of the Granite Pit and quarry closure once quarry operations have ceased. It will also identify opportunities for ongoing rehabilitation during the operation of the quarry. The existing rehabilitation strategy for Lynwood Quarry will be adapted to address the rehabilitation and closure of the proposed extraction area and associated emplacement and disturbance areas.

7.0 Project Justification

A detailed justification for the proposed modification will be provided in the Environmental Assessment. In overview, the modification is essential for Holcim to consistently produce in-specification products required to be delivered by Lynwood Quarry to supply the local, regional and Sydney markets.

The established Lynwood quarry and associated capital investment in substantial infrastructure, access road and freeway interchange provides for effective and cost efficient supply of essential quarry products, and the Extraction Area Modification will ensure that the consistent supply of in-specification products can be delivered from this site, for the duration of the approved life of the development.

Table 7.1 provides a high level assessment of the balance between the potential project beneficial and adverse impacts associated with the proposed modification, in relation to the key environment and community issues identified in this PEA.

Table 7.1 – Net Project Impacts Overview

Issue	Potential Adverse Effect	Potential Beneficial Effect
Noise	Quarry operations have the potential to result in noise impacts. The detailed noise assessment will quantify potential impacts on surrounding private residences, including those which have reduced impact, and those to the west for which quarry operations will be closer. The operations are expected to be able to be managed to meet existing noise criteria in the current approval	The proposed Granite Pit would be located further away from most of the nearest surrounding residences than the Approved Pit, including Marulan township and therefore has the potential to result in reduced noise impacts when equipment is operating in the Granite Pit. Removal of the approved Eastern Overburden Emplacement Area from the proposed modification will eliminate future noise impacts from these operations to Marulan township that would otherwise have occurred during its construction and use.
Blasting	Blasting has the potential to result in vibration and blast overpressure which may impact on nearby residences and infrastructure	The proposed Granite Pit would be located further away from most of the nearest surrounding residences than the Approved Pit, including Marulan township and therefore has the potential to result in reduced blasting impacts when equipment is operating in the Granite Pit. Therefore has the potential to result in reduced blasting impacts compared to the existing Approved Pit.

Table 7.1 – Net Project Impacts Overview (cont)

Issue	Potential Adverse Effect	Potential Beneficial Effect
Air Quality	Construction and operation of the Extraction Area Modification has the potential to result in changes to the predicted air quality impacts of Lynwood Quarry, and this will be assessed in the EA.	A comprehensive range of air quality controls have been built into the design of Lynwood Quarry and these existing controls will be applied to the quarry operations in the proposed Granite Pit. Despite the increased haul distance, as the Granite Pit will be located further from Marulan and most surrounding residences than the Approved Pit, it is expected that the Extraction Area Modification will result in an overall reduction in air quality impacts of the Lynwood Quarry operations and that operations will continue to meet existing air quality criteria in the current approval. This will be confirmed by the detailed air quality assessment.
Ecology	The proposed Extraction Area Modification will require clearing of some areas of scattered woodland and will impact on ecological values. This includes areas of State –listed White Box community.	The removal of the approved eastern Overburden Emplacement Area which has not commenced construction, will avoid impact to approximately 40 hectares of woodland that was otherwise approved for disturbance. This will increase the area of woodland habitat retained on site and in particular be positive for fauna species.
Socio-economic	The proposed Extraction Area Modification is unlikely to present significantly different social or economic impacts than the currently approved project, which on balance were positive for the local and regional community.	The proposed modification will allow for the continued employment and investment activity in the region. Holcim will continue to support its Community Investment Fund initiative in the local community.
Aboriginal Archaeology/Cultural Heritage	Due to the extent of known Aboriginal sites and cultural heritage values in close proximity to the proposed Granite Pit, it is considered likely that the proposed modification has the potential to impact on values in addition to those already identified.	It is proposed to undertake detailed consultation with the existing Registered Aboriginal Parties and the management strategy for any identified sites will be undertaken in accordance with the outcomes of consultation with OEH and the Registered Aboriginal Parties.
Historical Heritage	Location of the proposed EAM was formerly part of the Lockyersleigh Property which is listed as a local heritage item on the Goulburn Mulwaree LEP 2009. As it was formerly part of the property, the Modification Area is included in the LEP listing, however, the homestead and its associated buildings are approximately 2 km west of the Modification Area.	Preliminary investigations have not identified any evidence of historic heritage value within the Modification area. The Modification is not expected to impact on any historic heritage values. This will be confirmed through site searches and a site inspection, which will be documented in the EA.

Table 7.1 – Net Project Impacts Overview (cont)

Issue	Potential Adverse Effect	Potential Beneficial Effect
Surface Water	Development of the Granite Pit, overburden emplacement areas and haul road construction will change the existing drainage patterns within the location of the proposed Extraction Area Modification and have potential to impact on downstream flow volumes and water quality.	As for the existing Lynwood Quarry, the proposed Extraction Area Modification will be designed to have a neutral or beneficial effect on downstream water quality and quantity.
Groundwater	While groundwater is present, the local hard rock resources are poorly to very poorly permeable. Notwithstanding, a detailed groundwater assessment will be completed.	The Granite Pit resource is significantly less fractured than the Lynwood ignimbrite resource. It is therefore anticipated that overall, groundwater impacts resulting from operations at Lynwood Quarry will be reduced as a result of focusing extraction operations in the Granite Pit.
Visual Amenity	The Project has some potential to impact on the visual amenity of the area, in particular as the pit operations will be located closer to some rural residences located to the west.	Removal of the approved Eastern Overburden Emplacement Area from the proposed modification will eliminate this visual impact from the Marulan township that would otherwise have occurred. In addition, the focus of quarry operations will also be located more distant from the Marulan township and associated rural residential areas.
Hazard	The construction of a haul road over the gas pipeline introduces a new hazard to Lynwood Quarry operations.	Careful evaluation of the potential impacts to the gas pipeline from construction and ground vibration (i.e. blasting) will be undertaken in consultation with the pipeline asset manager.
Greenhouse Gas and Energy	Increased haul length from the Granite Pit to the processing area has the potential to change the existing predicted greenhouse gas emissions and energy usage due to changes in the location of quarrying.	Reduced haul length from the Granite Pit to the Southern Overburden Emplacement Area (in lieu of the Eastern Overburden Emplacement Area) may offset any changes due to the increased haul length from the Granite Pit to the processing area.
Land resources and rehabilitation	Additional 95 ha disturbance footprint. No changes to overall approach to management of rehabilitation.	Removal of Eastern Overburden Emplacement Area from the Extraction Area Modification to prevent loss of good quality woodland habitat in comparison to the poorer quality fauna habitat in the Granite Pit area.

Further detailed assessment will be completed in the Environmental Assessment to confirm potential environment and community impacts.

8.0 Project Schedule

Based on current project timing, Holcim Australia intends to lodge the development application with the Department of Environment and Planning for adequacy review in August 2015.

9.0 References

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