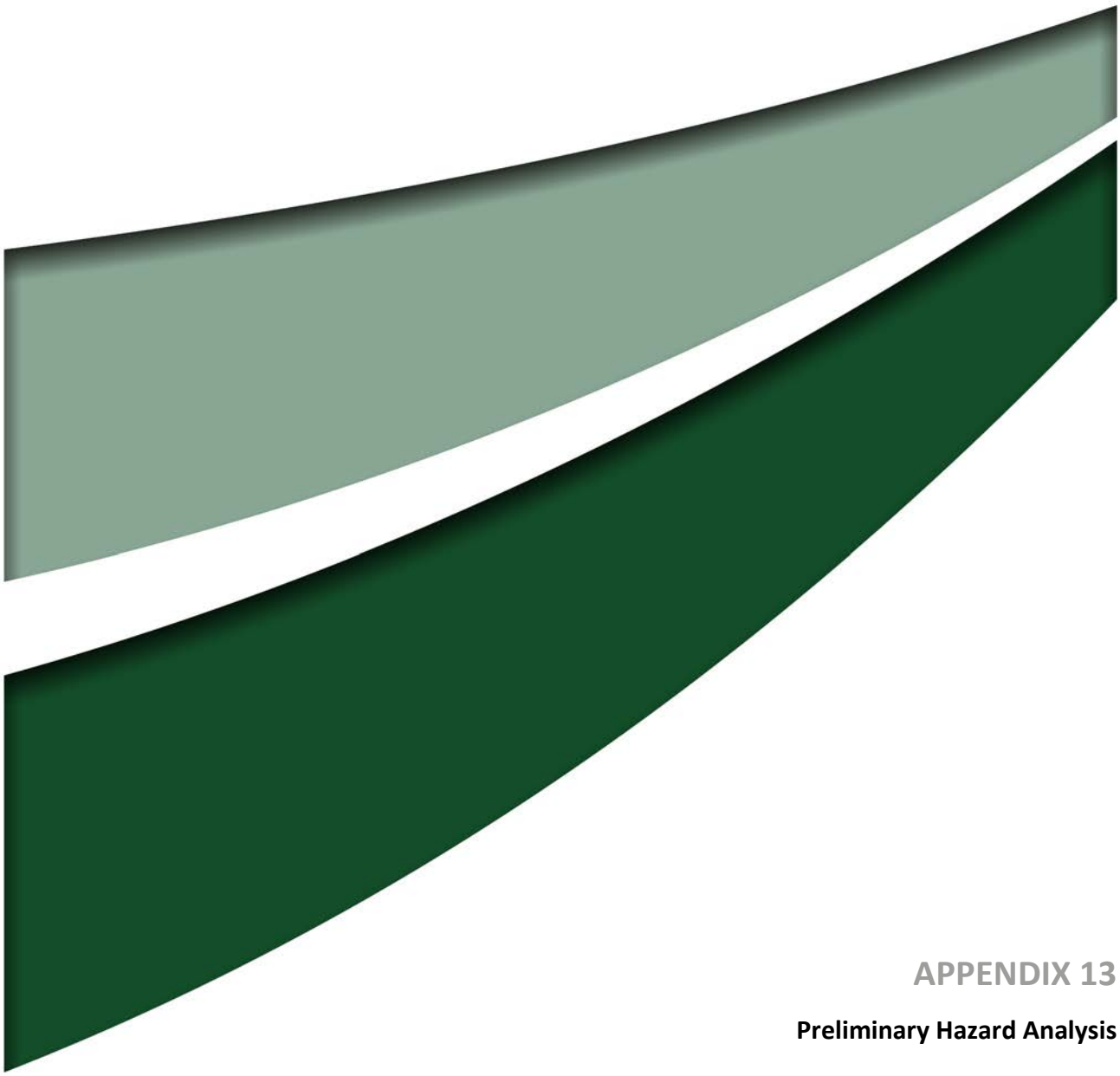

APPENDIX 13

Preliminary Hazard Analysis

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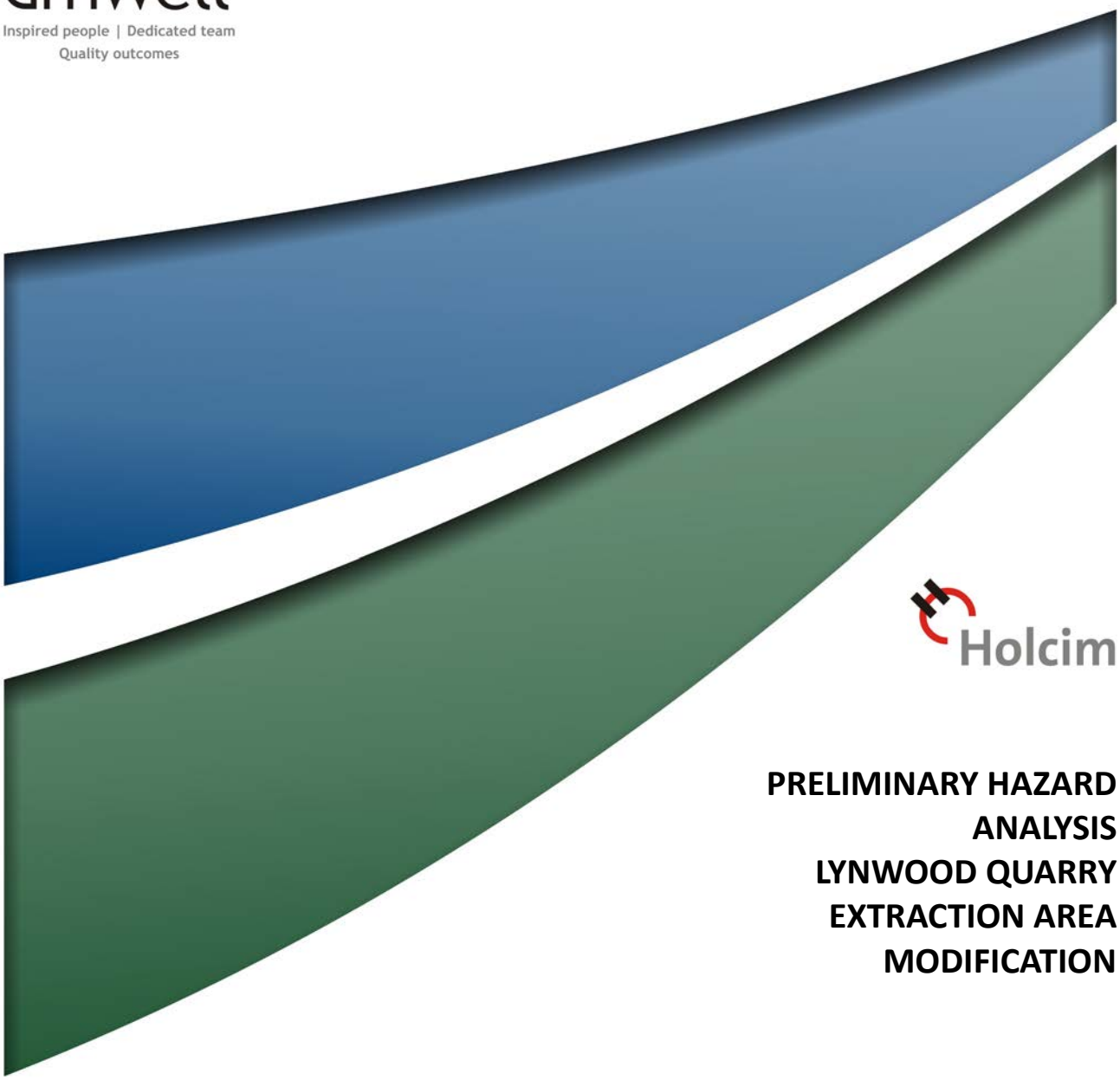
Inspired people | Dedicated team
Quality outcomes



Holcim

PRELIMINARY HAZARD ANALYSIS LYNWOOD QUARRY EXTRACTION AREA MODIFICATION

November 2015

PRELIMINARY HAZARD ANALYSIS LYNWOOD QUARRY EXTRACTION AREA MODIFICATION

Prepared by
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on behalf of
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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

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1.0 Introduction

1.1 Overview

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) to construct and operate Lynwood Quarry west of Marulan, NSW (refer to **Figure 1.1**), until 1 January 2038 (the Approved Operations). Lynwood Quarry consent has an approved production rate of up to 5 million tonnes per annum (Mtpa) of quarry products, includes a processing, 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. The key features of the existing Approved Operations are shown in **Figure 1.2**.

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 ready 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 and substantial areas are 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, which adjoins the Approved Project Area to the west of the Approved Pit (refer to **Figure 1.3**). The proposed additional 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 in-specification products required to be delivered by Lynwood Quarry to supply the local, regional and Sydney markets.

The planning approach for the proposed modification is to modify the existing consent under Section 75W of the EP&A Act. Umwelt (Australia) Pty Limited (Umwelt) has prepared this PHA on behalf of Holcim Australia to assess the potential hazards associated with the Lynwood Quarry Extraction Area Modification.

FIGURE 1.1

Locality Plan

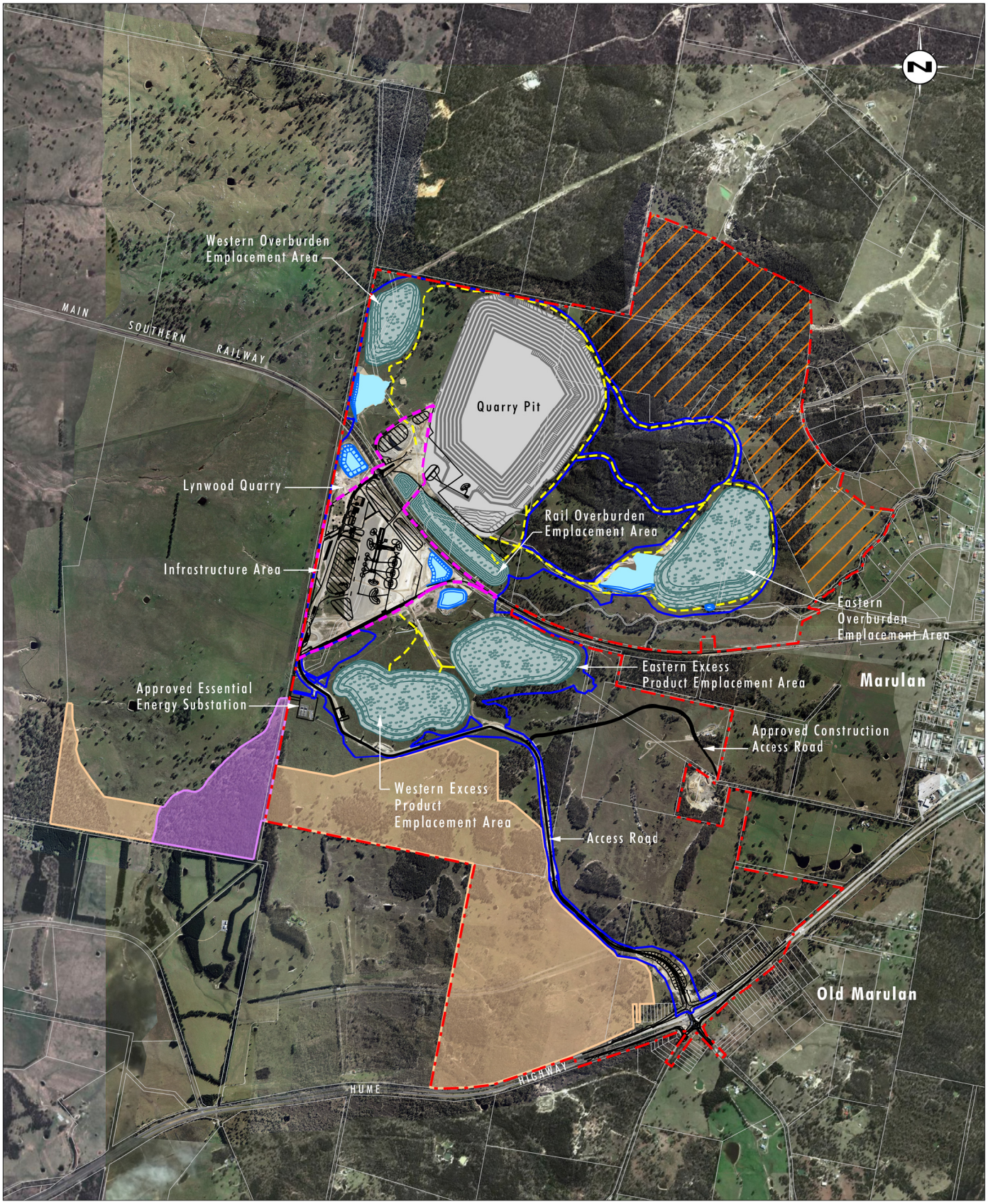

Image Source: Holcim Australia (Aerial Photo March 2012)
Data Source: LPI 2014

0 0.5 1.0 1.5km
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

FIGURE 1.2

Approved Conceptual Quarry Plan (Year 30)

File Name (A4): R14/3330_185.dgn
20151027 14.55

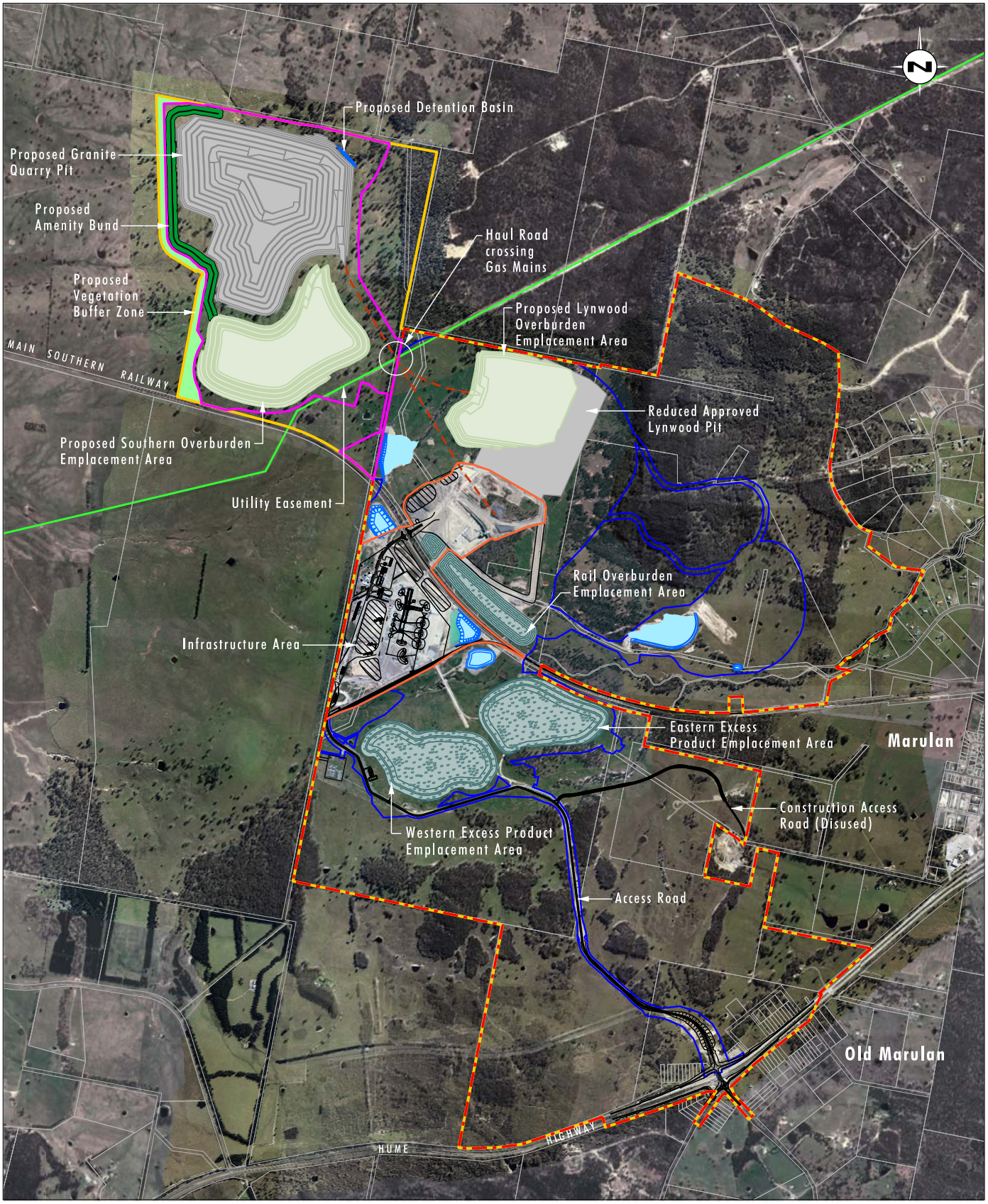

Image Source: Google Earth (2012), Holcim (2012, 2014)
Data Source: LPI (2014), Holcim Australia (2015)

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1:30 000

Legend

- Approved Project Area
- Modification Project Area
- Lynwood Infrastructure Facilities
- 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
- Utility Easement (including Gas Pipeline)

FIGURE 1.3

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

File Name (A4): R14/3330_188.dgn
20151027 14.57

2.0 Proposed Modification Description

2.1 Extraction Area Modification

The proposed Extraction Area Modification (hereafter Modification Project) comprises development of the following key features:

- A Granite Pit extraction area (the Granite Pit) to the west of the existing Approved Pit.
- Reduction in the extent of the Approved Pit to reflect limitations within the ignimbrite resource.
- Revised overburden emplacement areas.
- Additional haul roads and water management system structures.
- Additional amenity bund and vegetative screen.

These features are shown in **Figure 1.3**. Other than the proposed changes to the layout or footprint of the development, Lynwood Quarry from an operational perspective will be largely unchanged from the currently approved operations. **Table 2.1** compares the proposed modified development to the existing approved operations.

Table 2.1 Comparison of Approved Project and the 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.
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 **Figure 1.3**) 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 **Figure 1.3**). Reduction of the Approved Pit footprint by approximately 55 hectares.
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 **Figure 1.3**), emplacement within part of the currently approved quarry limit, and a proposed emplacement area adjacent to the Granite Pit. A amenity bund will also be developed to west of the Granite Pit (refer to **Figure 1.3**).

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, amenity bund and water management infrastructure.

2.2 Location and Surrounding Land Use

Holcim Australia has purchased land to provide significant buffer distances between the operating areas of Lynwood Quarry (including the proposed Granite Pit) and residential areas. It is noted that the proposed Granite Pit and processing plant are located in excess of 1.4 kilometres from the nearest residences.

The Lynwood Quarry land holding is immediately adjacent to a number of different land uses including residential, agricultural and a small parcel of industrial land. An approved Essential Energy substation and an approved Orica emulsion plant are located within the Modification Project Area.

Table 2.2 presents the relevant land use planning risk criteria for the surrounding land use category.

Table 2.1 Risk Criteria for Surrounding Land Uses

Land Use	Distance to Boundary of Granite Pit Area(m)	Risk Criteria (fatalities per annum)
Residential (nearest residence)	Approximately 1.4 km	1×10^{-6}
Industrial	0 (within Modification Project Area)	50×10^{-6}

Source: HIPAP No. 4 – Risk Criteria for Land Use Safety Planning (DoP, 2011a).

There are no land uses that require special precautions or further hazard mitigation measures over and above those required by *Hazardous Industry Planning Advisory Paper (HIPAP) No 4 – Risk Criteria for Land Use Safety Planning* (DoP, 2011a).

3.0 Statutory Requirements

Under *SEPP 33 – Hazardous and Offensive Development* (SEPP 33), a preliminary risk screening of the proposed development is required to determine the need for a Preliminary Hazard Analysis (PHA). The preliminary screening involves identification and assessment of the storage of specific dangerous goods classes that have the potential for significant off-site effects. If, at the proposed location, and in the presence of controls the risk level exceeds the acceptable criteria for impacts on the surrounding land use, the development is classified as a 'hazardous' and/or 'offensive' industry as appropriate and may not be permissible within certain land zones in NSW.

A 'hazardous industry' under SEPP 33 is one which, when all locational, technical, operational and organisational safeguards are employed continues to pose a significant risk. An 'offensive industry' is one which, even when controls are used, has emissions which result in a significant level of offence (e.g. odour or noise emissions). A proposal cannot be considered either hazardous or offensive until it is firstly identified as 'potentially hazardous' or 'potentially offensive' and subjected to the assessment requirements of SEPP 33. A PHA is required if a proposed development is 'potentially hazardous'.

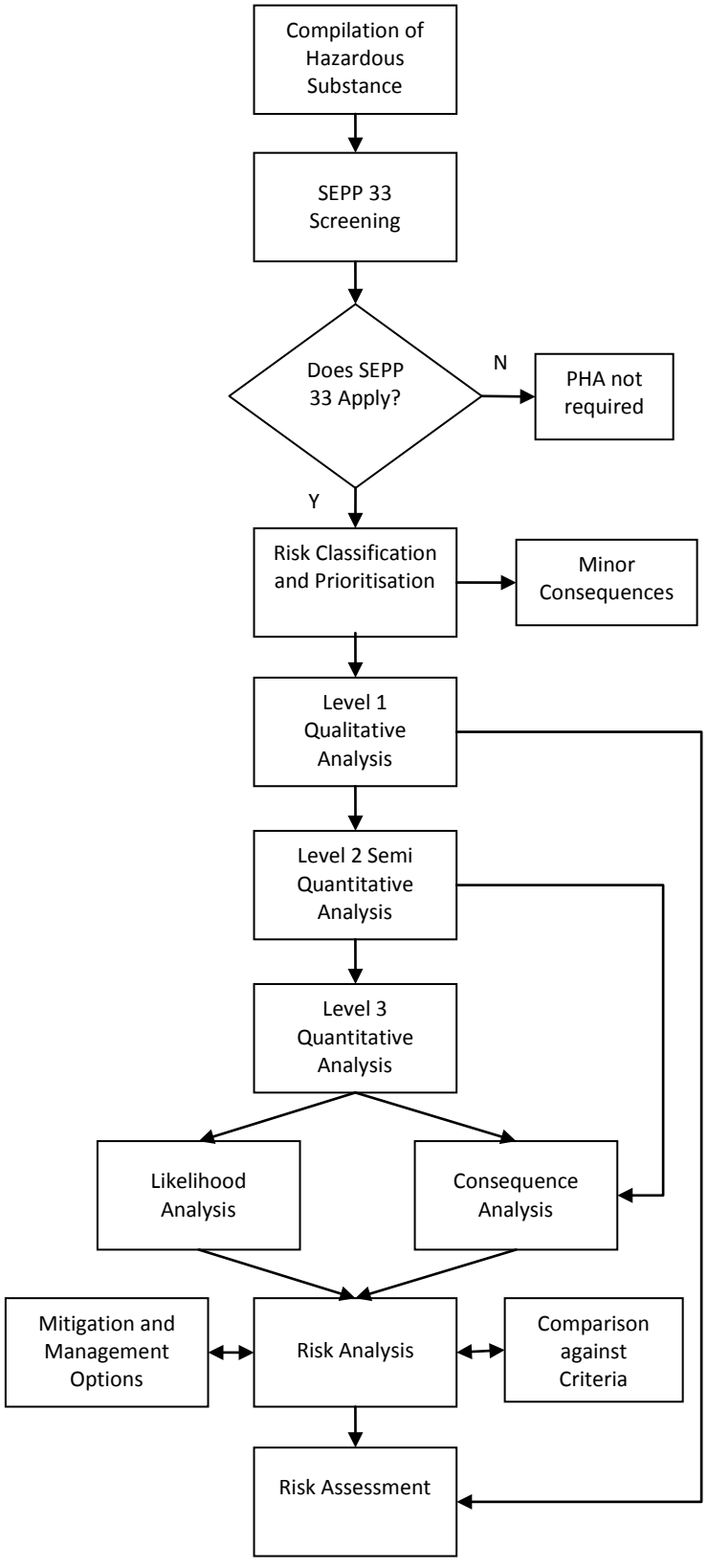
A proposed development may also be potentially hazardous if the number of traffic movements for the transport of hazardous materials exceeds the annual or weekly criteria outlined in Table 2 of *Applying SEPP 33* (DoP, 2011a). If these thresholds are exceeded a route evaluation study is likely to be required.

When a PHA is required*, HIPAP No. 6 – Guidelines for Hazard Analysis* (DoP, 2011b) and *Multi-level Risk Assessment* (DoP, 2011c) notes that the PHA should identify and assess all hazards that have the potential for off-site impact. The expectation is that the hazards would be analysed to determine the consequence to people, property and the environment and their potential to occur.

The methodology used to identify and assess the hazards and respective failure scenarios that have the potential for off-site impact is outlined in **Figure 3.1**. The details of how this methodology is implemented are discussed in the respective sections of this report.

In summary, the risk assessment involves the following processes:

- identifying the risks to be managed, including:
    - a preliminary risk screening (refer to **Section 4.0**)
    - classification and prioritisation of risks (refer to **Section 5.0**).
- analysis of the risks involved with the proposed Modification Project, including sources, consequences, and likelihood of consequences (refer to **Sections 4.0** and **5.0**)
- assessment of risk by evaluating the results of the hazard analysis. This involves comparison of analysed risks with risk criteria as identified in *HIPAP No. 4 – Risk Criteria for Land Use Safety Planning* (DoP 2011a) (refer to **Sections 5.0** and **6.0**)
- treatment of risks, including identification and assessment of safeguards and treatment plans (refer to **Section 6.5**).



SEPP 33 Screening involves compiling information on the quantity of hazardous materials used, the mode of storage and location with respect to the site boundary and the number and size of annual and weekly road movements of the hazardous material.

A proposed development should be considered potentially hazardous if the storage or transport of hazardous substances exceeds the respective screening thresholds.

Risk classification and prioritisation involves ranking of the facility using techniques to make broad estimates of the consequence and likelihood of accidents. The output is expressed in terms of individual and societal risk and is compared against respective criteria.

A Level 1 analysis is a qualitative assessment based on detailed hazard identification. The objective is to demonstrate that the activity does not pose a significant risk. Where the qualitative analysis cannot satisfactorily demonstrate there will be no significant risk, further analysis is required.

A Level 2 analysis supplements the Level 1 analysis by quantifying the main risk contributors to show that their consequences are acceptable.

A Level 3 quantitative analysis is required when the screening and hazard identification process and/or risk classification and prioritisation process has identified risk contributors with consequences beyond the site boundaries. The analysis requires a comprehensive quantification of significant consequences and their likelihood.

The Risk Assessment compares the results of the risk analysis with the respective risk criteria. Where the level of risk is not acceptable, risk minimisation, mitigation and management options need to be investigated.

Figure 3.1

Overview of PHA Methodology

4.0 Preliminary Risk Screening

Preliminary risk screening is undertaken to determine if a PHA is required. Preliminary risk screening compares the hazardous material storage quantities and hazardous materials transport quantities and frequency for a proposed modification with SEPP 33 trigger values. The storage and transport of hazardous materials for the Modification Project will remain unchanged from the Approved Operation. Therefore no assessment of the storage and transport of hazardous materials is required for the Modification Project.

While hazardous materials storage and transport remain unchanged from the Approved Operation, consideration must be given to any new activities associated with the construction and operation of the Modification Project. A new haul road between the proposed Granite Pit and Approved Quarry will be constructed over the Moomba to Sydney High Pressure Natural Gas Pipeline (the MSP) and the Moomba to Sydney High Pressure Ethane Pipeline (the EP). The location of the haul road pipeline crossing is shown on **Figure 1.3** and lies between the Approved Pit and the Granite Pit. The land to the north of the haul road crossing is used for quarrying and agricultural purposes and the nearest residence is approximately 2200 metres from the pipeline, north-east of the crossing (refer to **Figure 4.1)**.

APA Group manage, operate and maintain the MSP and the EP. The MSP links the Cooper Basin gas fields at Moomba SA with distribution networks in Sydney and regional NSW. The pipeline easement is 25 metres wide with the MSP 6 metres from the edge of the easement and the EP 11 metres from the opposite edge. At Marulan, the MSP is 860 mm diameter and operates at a pressure of up to 6 mega Pascals (MPa). The EP links the Cooper Basin gas fields at Moomba SA with the Qenos petrochemical plant in Botany NSW. At Marulan, the EP is 220 mm diameter and operates at a pressure of up to 15.5 MPa. The MSP and EP are separated by a distance of 8 metres.

During construction and operation of the proposed haul road the potential for the MSP or EP to be damaged and a subsequent release of natural gas or ethane to occur needs to be assessed. Potential for damage to the pipelines as a result of vibration from blasting in the proposed Granite Pit must also be considered. Both natural gas and ethane are flammable gases and pose a fire and explosion risk. The risk screening process indicated that, for the purposes of SEPP 33, the Project is potentially hazardous due to the proposed haul road / pipeline crossing interactions. Consequently, a qualitative risk assessment has been undertaken to assess the potential for off-site impacts associated with a natural gas or ethane fire and/or explosion (refer to **Section 5.0**).

In addition, initial consultation has been undertaken with APA Group in regards to the proposed Modification Project.

umwelt

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

0 100 250 500m
1:10 000

Legend

- Approved Project Area
- Modification Project Area
- Approved Disturbance Footprint
- Proposed Granite Pit Disturbance Footprint
- Quarry Pit
- Proposed Overburden Area
- Proposed Haul Road
- Residence Location

FIGURE 4.1

Gas Main Crossing

5.0 Qualitative Risk Assessment

5.1 Introduction

A qualitative risk assessment uses judgement and descriptive scales to determine the risk of each of the hazards identified. This risk is then assessed against qualitative criteria to determine whether the facility could cause an incident of a magnitude significant in terms of risk to people, property or harm to the biophysical environment.

Low and acceptable risks can be allowed with minimal mitigation, however, if the risks are significant a higher level of analysis will be required.

5.2 Methodology

In accordance with the HIPAP6, a qualitative risk assessment requires (as a minimum):

- hazard identification using word diagrams, simplified fault / event trees and checklists
- generalised consequence analysis of key risk contributors to demonstrate that their consequences are confined within the project boundaries. This analysis should incorporate the results of the preliminary screening and risk classification and prioritisation assessments
- evaluation of the risks against the qualitative criteria in *HIPAP No. 4 Risk Criteria for Land Use Safety Planning* (DoP, 2011a)
- demonstration of adequacy of the proposed technical and management controls to ensure ongoing safety of the proposed development
- should include all facilities which reported exceedances of initial screening thresholds.

As there were no facilities on site that reported exceedances of initial screening thresholds, following the process outlined in Applying SEPP33 (DoP, 2011) the scope of the qualitative risk assessment has been limited to the construction and operation of the haul road over the MSP and the EP.

5.3 Qualitative Risk Criteria

The qualitative risk assessment criteria have been developed to identify key risks to the environment, society, heritage and business reputation. The criteria are based on a risk assessment matrix consistent with *Australian Standard AS4360 - Risk Management* (AS4360). The qualitative assessments of risk severity and likelihood (refer to **Tables 5.1** to **5.3**) were used to help provide a general assessment of the hazards with off-site consequences, which are presented in **Section 5.5**. The overall risk level was determined by using the matrix in **Table 5.3**.

Table 5.1 Qualitative Measures of Consequence

	Level	People Losses	Environmental Harm
1	Insignificant	No injuries	-
2	Minor	First aid treatment	On-site release immediately contained
3	Moderate	Medical treatment	On-site release contained with outside assistance
4	Major	Extensive injuries	Off-site release with no detrimental effects
5	Catastrophic	Death	Toxic release off-site with detrimental effect

Source: AS/NZS 4360:2004 Risk Management

Table 5.2 Qualitative Measure of Likelihood

Level	Descriptor	Description	Guideline
A	Almost Certain	Consequence is expected to occur in most circumstances.	Occurs more than once per month.
B	Likely	Consequence will probably occur in most circumstances.	Occurs once every 1 month – 1 year.
C	Occasionally	Consequence should occur at some time.	Occurs once every 1 year - 10 years.
D	Unlikely	Consequence could occur at some time.	Occurs once every 10 years – 100 years.
E	Rare	Consequence may only occur in exceptional circumstances.	Occurs less than once every 100 years.

Source: AS/NZS 4360:2004 Risk Management

Table 5.3 Qualitative Risk Matrix

Likelihood of the Consequence	Maximum Reasonable Consequence				
	(1) Insignificant	(2) Minor	(3) Moderate	(4) Major	(5) Catastrophic
(A) Almost certain	11 High	16 High	20 Extreme	23 Extreme	25 Extreme
(B) Likely	7 Moderate	12 High	17 High	21 Extreme	24 Extreme
(C) Occasionally	4 Low	8 Moderate	13 High	18 Extreme	22 Extreme
(D) Unlikely	2 Low	5 Low	9 Moderate	14 High	19 Extreme
(E) Rare	1 Low	3 Low	6 Moderate	10 High	15 High

Source: AS/NZS 4360:2004 Risk Management

5.4 Hazardous Event Identification

A desktop hazard identification study was undertaken by Umwelt and subsequently reviewed by Holcim Australia. The hazard identification study was undertaken in a systematic way using guide words to identify hazards. The study was carried out in accordance with *HIPAP No 4 – Risk Criteria for Land Use Safety Planning* (DoP, 2011a).

The desktop hazard identification study included:

- a review of the inventory of materials proposed to be stored and used on site
- consideration of the range of tasks, both routine and occasional, proposed to be used on site
- an overview of relevant legal standards
- proposed transport of materials to and from the site
- risks posed to the bio-physical environment
- consideration of site security
- consideration of external events that could impact the site.

The hazard identification process is based on a brainstorming session using guidewords such as:

- fire
- explosion
- loss of containment
- incompatible substances
- environmental impact
- corrosive
- spill control
- physical damage
- vehicle accident / collision
- structural failure
- hazardous substances
- human error
- maintenance
- security.

All hazard scenarios identified were qualitatively assessed for the likelihood, consequence and risk. Mitigation measures were also identified and recorded. The outcomes of the hazard identification study were recorded in a spreadsheet which is presented in **Section 5.5**.

5.5 Qualitative Risk Assessment Results

The results of the hazard identification session are presented in **Table 5.4**. For the purposes of this assessment, significant risks have been defined in **Table 5.4** as those with a risk rating of high or extreme, as defined by risk values exceeding 9 and 17 respectively. None of the risks associated with the Modification Project were found to constitute extreme, high or moderate risks, with all risks rated as low.

The activities with 'low' risk will be mitigated and managed with the safeguards outlined in **Table 5.4**.

On the basis of the hazard identification study, a qualitative assessment of the risks associated with the development is sufficient for compliance with the requirements of Hazardous Industry Planning Advisory Paper (HIPAP) 6 *Guidelines for Hazard Analysis* (DoP, 2011), as the risks associated with the Modification Project have been found to be low.

Table 5.4 Hazard Identification Study

Plant	**Lynwood Quarry Extraction Area Modification**
Description	**Construction and operation of haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and High Pressure Ethane Pipeline**
Prevention and Mitigation measures identified relevant to each of the Hazardous Events identified include:	
• Design and maintenance of pipe in accordance with the *AS 2885 Pipelines – gas and liquid petroleum* series	
• Limit excavation depths where possible and working with a buffer distance above the pipe to prevent contact with the pipe	
• Designated crossing covered with steel plate to prevent overstress of pipelines during construction	
• Use of appropriate equipment including excavator/backhoe fitted with a cleanup or "gummy" bucket to limit tooth penetration in event of contact with pipe	
• Soft procedural controls including APA Group's Intrusive Works and Permit to Work Systems	
• Fencing of site during construction	
• Construction works supervised by APA Group's Permit Officer	
• Access to authorised personnel only	
Additional Measures that should be generically applied during each step of the construction phase include:	
• Operator awareness and training	
• Soft procedural controls including supervision	
• Route selection	

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Construction and operation of haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and High Pressure Ethane Pipeline**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Physical damage of pipes during excavation	Equipment or traffic causing damage during excavation for preparation of haul road sub grade	Overstress of pipelines Pipe failure and gas leak Ignition of gas leak (fire) Damage to pipelines	Use of APA Group's Intrusive Works Request (IWR) form and Permit to Work process. Pipe location to be positively identified by "Potholing" (preferably with water lance and vac truck) under the supervision of an APA Group representative. All works within 5 m of the pipeline or that have the potential to cause damage to the pipelines supervised by an APA Group representative Defined access route for mobile plant around pipeline to be specified. Emergency Response Plan to detail actions to be taken in the event of a pipeline failure. Input from APA Group to be incorporated.	2	D	5	Site inspection (and geotechnical assessment if required) to ensure mobile plant access route is appropriate Haul road pipeline crossing installation methodology to be reviewed and approved by APA Group. Daily toolbox meetings to consider the planned construction activities and identify any additional controls required.

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Construction and operation of haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and High Pressure Ethane Pipeline**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Physical damage of pipes during haul road operation	Failure of haul road pipeline crossing structure over time	Overloading of pipelines Pipe failure and gas leak Ignition of gas leak (fire) Damage to pipelines	Civil design will ensure installed road meets load bearing capacity requirements and relevant standards. Maintain haul road pipeline crossing to meet structural standards required to bear traffic loads. Emergency Response Plan to detail actions to be taken in the event of a pipeline failure. Input from APA Group to be incorporated.	2	D	5	Haul road pipeline crossing design to be reviewed and approved by APA Group.

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Construction and operation of haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and High Pressure Ethane Pipeline**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Physical damage of pipes during installation of road	Impact from mobile plant during backfilling Compaction of road base and road to achieve required load bearing capacity	Overstress of pipelines Pipe failure and gas leak Ignition of gas leak (fire) Damage to pipelines	Limited excavation depth to ensure pipes remain covered by a layer of earth to minimise possibility of direct impact. All works within 5 m of the pipelines or that have the potential to cause damage to the pipelines supervised by an APA Group representative Limit compaction and vibration to levels approved by APA Group. Emergency Response Plan to detail actions to be taken in the event of a pipeline failure. Input from APA Group to be incorporated.	2	D	5	Haul road pipeline crossing installation methodology to be reviewed and approved by APA Group. Daily toolbox meetings to consider the planned construction activities and identify any additional controls required.

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Construction and operation of haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and High Pressure Ethane Pipeline**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Physical damage of pipes during quarry operation	Failure of pipeline as a result of blasting vibration	Pipe failure and gas leak Ignition of gas leak (fire) Damage to pipelines	Blasting impact assessment to be undertaken for blasting vibration to determine potential impacts on pipes. The outcomes of this assessment will be used to design the blasts to be used in the Granite Pit to ensure that relevant criteria are met. Emergency Response Plan to detail actions to be taken in the event of a pipeline failure. Input from APA Group to be incorporated.	2	D	5	

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Overview – General**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Failure of safety protocols	Work being undertaken outside of APA permit system.	Unidentified or unmanaged pipe failure	APA Group Intrusive Works and Permit to Work systems to be supported by other soft procedures Site inductions, checklists, permits and other procedures to be implemented	2	D	5	Additional measures to be incorporated into the construction phase to reduce reliance on the Permit to Work system and APA Group construction supervision
Flooding	Inadequate drainage High rainfall	Inundation of construction site Washout of backfill Exposure of pipelines	Site drainage designed in accordance with construction and operation Site Water Management Plan Ensure compaction of soils over pipeline to satisfaction of APA Group	2	D	5	Review of site drainage and controls if necessary

Plant		Lynwood Quarry Extraction Area Modification					
Description		**Overview – General**					
Hazardous Event	**Possible Cause**	**Potential Consequence**	**Prevention and Mitigation**	**S**	**P**	**R**	**Additional Measures**
Unauthorised access	Exposure of pipeline during construction activities Unauthorised access by public Breach of security/ sabotage	Damage or interference with pipelines Pipe failure and gas leak Ignition of gas leak (fire)	Fencing of construction site around gas pipelines Authorised personnel only Appropriate signage Cover exposed pipelines (if exposed) when excavation unattended	2	D	5	If high levels of unauthorised access are identified during the construction phase, a security patrol will be initiated
Lightning	Pipelines exposed during construction activities and lightning resulting in physical damage to the pipeline	Damage to pipelines Pipe failure and gas leak Ignition of gas leak (fire)	Pipeline has been designed in accordance with AS 2885 All equipment and heavy machinery to be located at a distance to exposed pipes and excavation activities All works to comply with APA Group's construction requirements for exposed structures No works to be undertaken in periods of adverse weather conditions	2	E	3	Exposed pipelines to be covered in periods of adverse weather conditions where practical

Notes: S = Severity – Table 5.1; P = Probability – Table 5.2; R = Risk – Table 5.3

6.0 Risk Analysis

Risk analysis involves comparing the level of risk found during the qualitative analysis with previously established risk criteria, and deciding whether or not that level of risk can be accepted in accordance with HIPAP 4 – *Risk Criteria for Land Use Safety Planning* (DoP, 2011). Such decisions take into account the wider context of the hazard and include consideration of the tolerability of the hazards borne by external parties.

Low and acceptable risks can be allowed, in accordance with HIPAP 4 – *Risk Criteria for Land Use Safety Planning* (DoP, 2011), with minimal further mitigation, however, they should be monitored and periodically reviewed to confirm they remain at this level. Higher level risks should be treated using appropriate safeguards to lower the level of risk.

Risk analysis and assessment generally involves the following processes:

- Assess the risk of potential hazardous events which may have off-site implications using appropriate qualitative techniques (e.g. a risk matrix). This will determine whether existing off-site risk levels will be increased by the development.

- Assess the impacts of the proposed development on individual and societal risk, surrounding land uses, the potential for a cumulative impact through the propagation of the incident and risk to the surrounding biophysical environment.

- Identify risks associated with propagation from existing hazardous events in nearby equipment/processes.

- Management of residual risks using safeguards.

6.1 Risk of Potential Hazardous Events

The highest probability event leading up to a failure of the pipelines during the proposed construction activities would be associated with accidental damage to a pipeline. To minimise the potential for failure of a pipeline, the pipelines have been designed in accordance with AS 2885 and AS 4799, construction works around the pipelines will be supervised by an APA Group representative, and there will be a range of procedural controls in place either resulting from the design review or the review of the daily construction schedule.

The risk assessment identified that physical damage of the pipe during earthworks preparation and construction activities constitutes the most probable hazard associated with the construction activities for the Modification Project in or around the pipeline easement. Possible causes identified include:

- Equipment or traffic movement across the pipeline easement causing damage to the pipelines during earthworks.

- Physical contact during excavation of the pipelines for haul road construction.

Preventative measures identified include:

- The appropriate design of the haul road/pipeline crossing to the relevant codes or practice and standards.
- Review and approval of haul road/pipeline crossing design by the appropriate APA Group representatives.
- Equipment or traffic that could cause damage during earthworks preparation being controlled by the APA Permit system.

Other risks that were considered to have some significance included:

- Unauthorised access to the construction area if the pipeline is exposed. This is to be addressed by the installation of suitable boundary fence and security patrol as appropriate.
- The potential for damage to a pipeline during adverse weather events, which will be minimised by ensuring all equipment and heavy machinery is located at suitable distances from the exposed pipes and excavation activities, and no works are undertaken in periods of adverse weather conditions. Where practical the exposed pipes are to be covered in periods of adverse weather conditions.

A number of high consequence low probability risks were also identified during the risk assessment and these are presented in **Table 5.4**.

6.2 SEPP33 and Societal Risk

The assessment of societal risk is undertaken as part of the SEPP 33 screening and risk prioritisation process. The qualitative assessment indicated that SEPP 33 screening was not required and it is considered that the societal risk associated with the development is negligible. Additionally, due to the lack of dangerous goods involved with the Modification Project and buffer distance to nearest residential and recreational areas, societal risk was not required to be further investigated.

6.3 Propagation Analysis

A potentially hazardous event within a facility can cause further hazardous events in the same development or other developments. The qualitative assessment did not identify any risks associated with significant off-site impacts resulting from the Modification Project (refer to **Table 5.4**). Therefore it is considered that the risk of propagation associated with the Modification Project is negligible.

6.4 Risk to Biophysical Environment

The main concern for risk to the biophysical environment is generally with effects on whole systems or species populations. For the development, the construction activities will be confined within the Modification Project Area and away from the off-site biophysical environment. The impacts of the hazardous events which have the potential to occur at the site are predicted to be relatively low and generally restricted to within the Modification Project area. The PHA has not identified any hazardous events associated with the Modification Project that would threaten a whole system or species population.

The Environmental Assessment (EA) for the Modification Project includes a range of studies that consider the risk to the biophysical environment such as a water resources assessment, an air quality assessment and ecological assessment.

6.5 Summary of Risk Management Measures

The key technical control measures identified in **Table 4.5** include:

- pipelines designed in accordance with relevant standards
- geotechnical assessment to determine soil stability at pipeline crossing location prior to construction activities
- civil design of the haul road/pipeline crossing to ensure installed road meets load bearing capacity requirements and relevant standards
- use of appropriate equipment to minimise the impact on the pipes in the event of contact
- use of process and design controls including limited excavation depths, buffer distances and designated crossings to limit potential for contact with or overstress of the pipes during haul road construction.

The key non-technical safeguards and procedures identified in **Table 4.5** include:

- assessment of process designs, site layout and design changes
- procedural control including APA Group's Daily Permit System, site inductions and other procedures
- operating procedures, including awareness and training
- cessation of operations in adverse weather conditions and where practical covering of exposed pipelines
- implementation of site speed limit, driver training, route selection and physical barriers where appropriate
- provision of physical controls including fencing of site during construction
- limiting access to authorised personnel only and implementation of security patrol if necessary
- appropriate training and supervision of operations
- provision of ongoing maintenance and operation procedures.

7.0 Conclusion

The preparation of a PHA for the Modification Project was undertaken to comply with requirements of the Department of Planning and Environment regarding the potential for off-site impacts associated with the construction of a haul road over the Moomba to Sydney High Pressure Natural Gas Pipeline and the Moomba to Sydney High Pressure Ethane Pipeline.

Assessment of hazardous materials storage and transport for the Modification Project was not undertaken as hazardous materials storage and transport will remain unchanged from the Approved Operation.

A qualitative risk assessment of the haul road gas pipeline crossing identified some credible hazard scenarios with the potential for off-site impacts. The qualitative assessment found that the risks associated with these scenarios can be mitigated and managed with a range of technical and non-technical safeguards. The assessment found that the risk of off-site impacts associated with the Modification Project is negligible. The assessment also found that the risk of propagation and cumulative impacts on surrounding land uses is negligible.

The existing Lynwood Quarry operates under Environment Protection Licence (EPL) 1371 as extractive industries are an activity listed in Schedule 1 of the *Protection of the Environment Operations 1997* (POEO) Act. As such the Modification Project is considered to be 'potentially offensive development'. SEPP 33 also states, however, that if an EPL can be obtained for a development, the development is not considered to be an 'offensive industry' and is permissible under SEPP 33. As the Modification Project doesn't change the type of activity or nature of the activity, it is considered likely that a modification to the existing EPL could be obtained for the Project. On this basis, it is unlikely that the Modification Project would be considered an offensive industry.

8.0 References

AS/NZS 4360:2004 : Risk Management

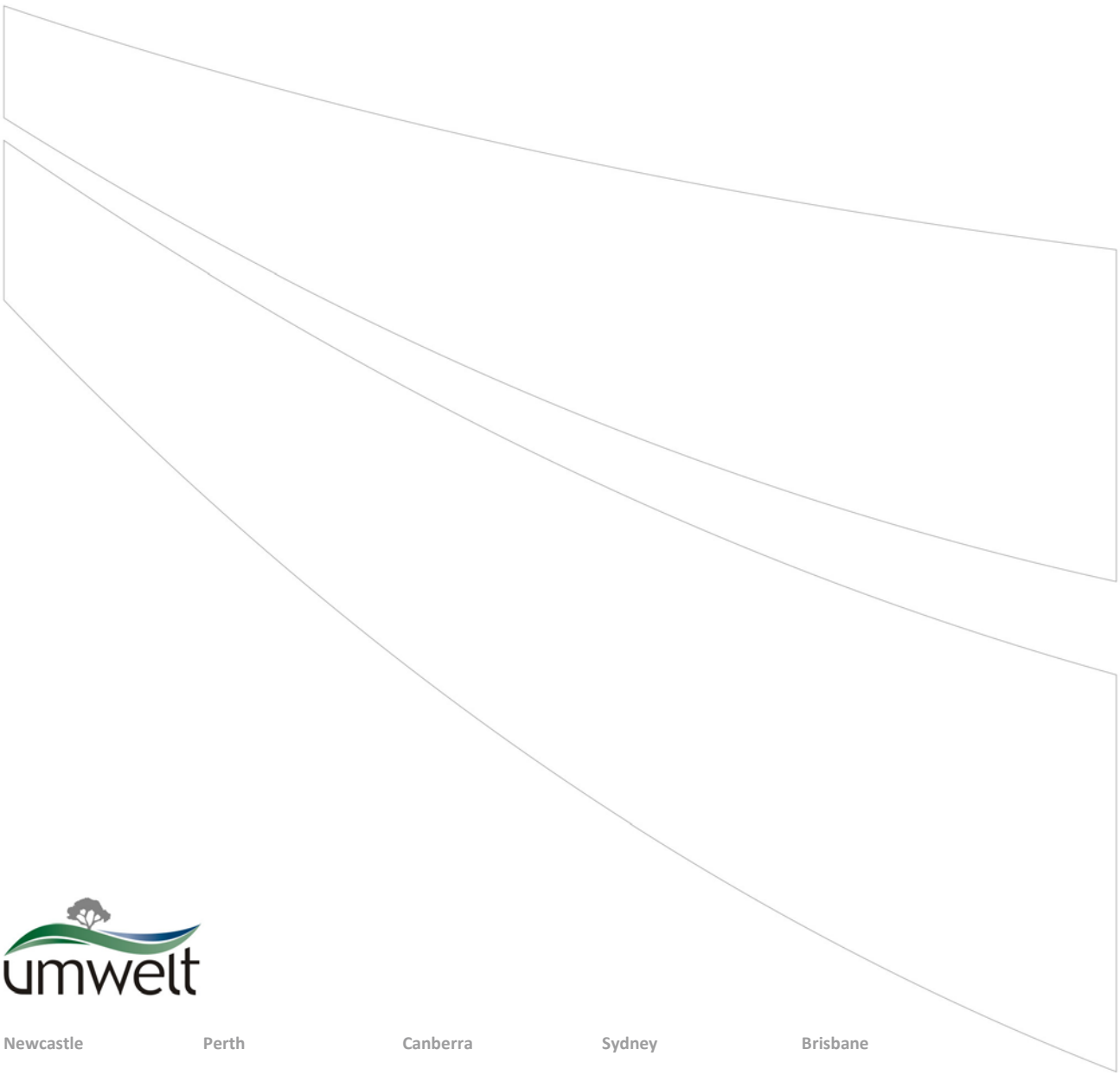
NSW Department of Planning (2011a). Hazardous Industry Planning Advisory Paper (HIPAP) No 4 – Risk Criteria for Land Use Safety Planning.

NSW Department of Planning (2011b). HIPAP No. 6 – Guidelines for Hazard Analysis.

NSW Department of Planning (2011c). Multi-level Risk Assessment.

NSW Department of Planning January 2011 Applying SEPP 33 Hazardous and Offensive Development Application Guideline.

Umwelt (Australia) Pty Limited (2005). Environmental Impact Statement Readymix Holdings Pty Ltd Proposed Lynwood Quarry, Marulan. Unpublished report prepared on behalf of Readymix Holdings Pty Limited.



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