Brandy Hill Quarry

Expansion Project

Hanson
HEIDELBERGCEMENT Group

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1 Executive Summary

Background

Hanson Construction Materials Pty Ltd (Hanson) currently operates a hard rock quarry, Brandy Hill Quarry, in the suburb of Seaham in New South Wales. The property is wholly owned by Hanson (the Company) and the Company have been operating the quarry since 2001. The current development consent was granted by Port Stephens Shire Council in 1983.

The continued operation of Brandy Hill Quarry will require expanding the quarry into new areas of the site. The location has been used as a source of building materials since the mid 1980's and is therefore well established in the area. The material being extracted is currently used primarily for concrete aggregates, sealing aggregates and road base products.

Due to current quarry operations nearing the limits of available resources, a detailed assessment was undertaken to determine the viability of expanding the quarry so it can remain a long term source of valuable quarry resources. The current operation extracts 700,000 tonnes of material annually and employs 20 people.

The proposed Development

Hanson is seeking to expand the allowable extraction area and increase the rate of production to 1.5 million tonnes per annum and continue operations for a further 30 years. This is a significant change to the current consent and meets the criteria listed within schedule 1, clause 7 (1) (a) and (b) of the State and Environmental Planning Policy (State and Regional Development) 2011 for assessment as a 'state significant development' under section 89C (2) of the *Environmental Planning and Assessment Act 1979* (the EP&A Act).This will require a development application to be lodged with the Department of Planning and Environment in which the Minister for Planning or a delegate will be the determining authority for this development. This Environmental Impact Assessment provides an assessment of the impacts the development will have on the surrounding environment.

The Proponent is also seeking consent to install a concrete batching plant, capable of producing 15,000m^3 per annum and to receive up to 20,000 tonnes per annum of concrete washout material for recycling. The ability to continue production and sales 24 hours a day 7 days a week is seeking to be retained.

A detailed assessment of the available resource has been conducted and a geological investigation has identified over 78 million tonnes of available material within the proposed new extraction area. The existing extraction area of 19.45 hectares to RL 30 metres is nearing exhaustion and to continue operations the quarry needs to expand. The proposed extraction limit will be 78.5 hectares (including the existing disturbed areas) to RL -78 metres (AHD). This will provide access to enough resource to sufficiently cover the 30 year life span of the quarry and provide long term security for this regional resource.

The plant infrastructure will be moved to a new location to allow for the quarry pit form to access the resource. This wouldn't occur until approximately 20 years from consent being granted. The concrete batching plant is planned to be installed within 10 years depending upon growth in the area. The plant will be in place to provide backup for the Raymond

Terrace plant and the Maitland plant. The new concrete plant could potentially replace the Raymond terrace plant if concrete sales if circumstances warrant it..

Concrete washout material recycling will occur on site with up to 20,000 tonnes annually recycled. The concrete washout material will be brought by trucks returning from concrete plants on the return run after delivering BHQ products into the plants. By back-loading these truck deliveries the numbers of truck movements will not be heavily impacted by having recycling occur on site. The recycling process utilises the existing fixed and mobile plant, no new infrastructure will be needed to facilitate the recycling at BHQ.

The ability to continue supplying the hunter region with products from BHQ ensures a competitive market in the region. The high cost of transporting materials creates the need for quarries to be in close proximity to large existing markets, such as the Newcastle, Hunter Region and Central Coast areas. Demand for aggregates is forecasted to increase and BHQ is ideally located to meet this demand within the region. As an existing quarry, expanding BHQ will have less environmental impact than opening a new quarry to meet future demand.

The continuation and expansion of activities at BHQ will provide ongoing employment opportunities over the 30 year consent period. The increased production and addition of the concrete plant and concrete recycling will create a total of 30/31 jobs for the local community. The continuation of employment opportunities has flow on effects within the local area; providing benefits for the wider community. Investment at BHQ, including building a concrete plant and relocating plant infrastructure will provide flow on employment opportunities for contractors and other local businesses.

The proposed development has been thoroughly assessed to identify any environmental impacts and allow for the development of targeted management or mitigation where impacts have been predicted to occur. Through the Environmental Impact Assessment (EIA) process, this document provides a detailed outline of the project's environmental impacts. The BHQ expansion will provide significant benefits to both the local, regional and state community and help to promote ecologically sustainable development principles though socio-economic benefits, best practice principles and community involvement.

Consultation

Consultation with relevant stakeholders through the environmental impact assessment process has allowed for potential impacts to be identified and adequately assessed. Government agencies provided comment on the majority of potential impacts that required assessment. Additionally community consultations from early in the process helped to identify issues that needed heightened attention during the EIA process. Aboriginal consultation occurred to identify any cultural significance at the site, in the desire to retain any culturally important artefacts or places.

Consultation was an important factor in determining the risks associated with different areas of the proposed development. Information obtained was used in the environmental risk analysis and allowed for the determination of which environmental aspects required further attention within the EIS.

Environmental Issues

Consultation with government agencies and other stakeholders provided Hanson with a comprehensive list of issues that needed to be addressed within this document. A risk

assessment was conducted based on the environmental issues listed below. The risk assessment identified which development actions will impact these environmental issues and whether a comprehensive assessment should take place (**Section 5**). The environmental issues that needed to be addressed, after identification through the risk assessment process, are listed below:

Table 1: Environmental Assessment

Environmental Assessment Issue	Conducted By	Location of Assessment
Social and Economic	Hanson Construction Materials Pty. Ltd.	**Section 5.3** **Appendix 17**
Land Resources	Martens and Associates & Peter Brown from Hanson Construction Materials Pty. Ltd.	**Section 5.4** **Appendix 6**
Biodiversity	Biosis Pty. Ltd	**Section 5.5** **Appendix 7**
Traffic and Transport	Intersect Traffic	**Section 5.6** **Appendix 8**
Noise and Vibration	Vipac Engineers & Scientists	**Section 5.7** **Appendix 9**
Blasting	Vipac Engineers & Scientists	**Section 5.8** **Appendix 10**
Air Quality	Vipac Engineers & Scientists	**Section 5.9** **Appendix 11**
Heritage	Biosis Pty. Ltd	**Section 5.10** **Appendix 12**
Water Resources	Martens and Associates	**Section 5.11** **Appendix 13**
Waste	Hanson Construction Materials Pty. Ltd.	**Section 5.12** **Appendix 14**
Greenhouse Gases	Vipac Engineers & Scientists	**Section 5.13** **Appendix 11**
Visual	Hanson Construction Materials Pty. Ltd.	**Section 5.14** **Appendix 15**

Hazards	Hanson Construction Materials Pty. Ltd.	**Section 5.15** **Appendix 16**
Rehabilitation	Hanson Construction Materials Pty. Ltd.	**Section 5.16** **Appendix 18**

Environmental Assessments

Land Resources

Land Resources Assessment

Assessment of soils at Brandy Hill Quarry indicate that the sandy loam soils are not dispersive. The site is not impacted by acid sulphate soils. However site soils do have a significant erosion potential due to the changed land use of existing vegetated areas. To mitigate increased erosion potential, site sedimentation basins have been designed using best management practice, to capture, recycle and reuse runoff.

Geology and Rock Formation

The Newcastle 1:100,000 Geological Sheet 9232 (Geological Survey of NSW, Department of Mines, 1975) identifies the site as being underlain by the Carboniferous Paterson Formation which consists of acid lava flows, crystal tuff, interbedded conglomerate and ignimbrite.

The northern side of the Hunter River supports a carboniferous rock which is separated from the younger Coal Measure geology to the south by a fault system, known as the Hunter Thrust. The area is highly faulted which cut off geological units abruptly.

Site Slopes

Brandy Hill Quarry is currently situated on the eastern slopes of Brandy Hill (approx. elevation 35 to 100 mAHD. Pre-quarrying slopes are approximately 10 – 30%, with slopes to the north of the site gradually increasing to steeper slopes of >50%.

Batter slopes of the current quarry benches range from approximately 60° to beyond 90° (average 80°). The overall average pit slope is 25°.

Topography and Quarry Landform

The existing quarry pit is positioned on the southern side of a hill approximately 900 m long, 380 m wide and 70 m deep. The quarry has 6 benches and 2 rehabilitated former benches on the uppermost slopes which are no longer used for quarrying. The current pit has elevations ranging from approximately 95mAHD at the uppermost bench to 31mAHD.

The crushing plant and stockpile area is approximately 420m long and 410m wide. The plant surface is mostly flat, and the haul road approximately 33 – 37 mAHD. Aggregate stockpile are located on three benches, elevations range from 31 0 45mAHD. The quarry floor and plant area is separated by a haul road up to 13 m above the current quarry floor.

Natural ground levels at the site range from approximately 111 mAHD north-west of the quarry to approximately 32 mAHD south of the processing area.

Land Slippage

Martens' Geotechnical Assessment identified land slippage hazards onsite were related to stability of pit slopes, benches and haul roads within the quarry. This is due to discontinuity within the rock mass. However risks of slope failure due to groundwater seepage inflows are considered to be low.

Potential hazards identified were rock toppling, rock fall, rock slide, and wedge failure. These failures are generally confined to individual benches. Complete bench failure is not expected to be a likely failure mechanism.

To mitigate these potential hazards, the Hanson has incorporated land slippage controls within quarry design and include trimming of batter slopes, bunds and drainage features. In conjunction with regular inspection and ongoing maintenance, these measures are considered adequate to control landslide risk.

Site Land Use Agricultural Capability

The site is surrounded by undeveloped bushland and agricultural land, with the town of Seaham approximately 3.0 km east. The quarry is situated in a predominately rural, residential, and environmental zoned land use area. The proposed expansion site has low agricultural capacity (most likely Class 5) and is suitable for the proposed purpose of the Project as confirmed by the NSW Department of Agriculture.

Potential impact and the reports in which they have been addressed is included in **Section 6.2** of the EIS.

Contamination

The Project Area has been used as a quarry since 1983 and an environmental site assessment identified localised soil contamination associated with fuel and lubricants. However the majority of this is considered minor and will be removed as the quarrying progresses and therefore a Stage 2 ESA is not recommended nor is any further testing proposed.

Ecology

A Biodiversity Impact Assessment of potential ecological impacts has been undertaken for the Project by Biosis Pty Ltd and is annexed as **Appendix 7** to this report.

The Project will involve clearance of 48.65ha of undisturbed vegetation. Of this, key ecological values identified by implementing the Biobanking Assessment Methodology include:

- 45.8 hectares of confirmed habitat for Koala *Phascolarctos cinereus.*
- Fauna habitat features including; hollow-bearing trees, understorey vegetation, ground cover, leaf litter and woody debris, foraging resources, rocky outcrops,

ephemeral waterways and dams of which provide suitable habitat for a range of common and TSC Act listed threatened fauna as well as EPBC Act Matters of National Environmental Significance (NES):
    - Grey-headed Flying-fox *Pteropus poliocephalus*
    - Spotted-tailed Quoll
    - Regent Honeyeater *Anthochaera phrygia*
    - Swift Parrot *Lathamus discolor*
- Despite lack of identification during targeted survey, potential habitat for EPBC Act matters of NES listed threatened flora;
    - Tall Knotweed *Persicaria elatior*
    - Small-flower Grevillea *Grevillea parviflora* subsp. *parviflora*
- Presence of NSW TSC Act listed Endangered Ecological Communities (EEC):
    - *17.11* hectares of *Lower Hunter Spotted Gum –Ironbark Forest in the Sydney Basin Bioregion* (Spotted Gum-Ironbark Forest).
    - 1.67 hectares *of Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast bioregions.* (Hunter Lowland Redgum Forest).
    - 0.67 hectares *of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions* (Swamp Sclerophyll Forest on Coastal Floodplains).
- 48.65 hectares of native vegetation forming Hunter-Macleay Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Coastal Swamp Forest.
- Connectivity with the surrounding landscape vegetation.

EPBC ACT

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Matters of National Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DoE 2013), was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required.

This assessment determined that two flora species and three fauna had a moderate likelihood of occurrence in the study area, with one additional fauna species (being the koala) having a high likelihood of occurrence in the study area. Koala presence was confirmed during the spring/summer sampling effort 12th – 14th November 2014, conducted by Biosis Pty Ltd. The presence of federally listed threatened species meant the Project was referred to the Department of the Environment for further assessment under the EPBC Act. Hanson commissioned Biosis Pty Ltd to complete additional koala field surveys to ensure accurate quantification of koala populations.

The referral assessment considers that the proposed action is likely to have a significant impact on listed threatened species and communities (sections 18 & 18A). Based on the referral, it is considered that the proposed action is likely to have a significant impact on the following matters of national environmental significance (MNES);

- Koala *Phascolarctos cinereus* (vulnerable) and Grey-headed Flying-Fox *Pteropus poliocephalus* (Vulnerable). The proposed action will result in the clearance of habitat critical to the survival of these species.

- Spot-tailed Quoll *Dasyurus maculatus maculatus* (SE mainland population) (Endangered). The proposed action will result in the clearanve of suitable foraging and breeding habitat for the Spotted-tail Quoll.
- Swift Parrot *Lathamus discolour* (Endangered) and Regent Honeyeater *Anthochaera Phrygia* (Endangered). The proposed action will result in the clearance of foraging habitat for the Swift Parrot, including key foraging and drought refuge habitat.

Further information regarding MNES and ecological site components is presented in **Section 6.2** of this EIS and also in **Appendix 7**. **Section 5.5** also presents the Project's Biodiversity Offset Strategy.

Traffic and Transport

Brandy Hill operates with its main access off Clarence Town Road Seaham, from which the primary haulage route is south via Brandy Hill Drive to Seaham Road to Adelaide Street, Raymond Terrace and then on to the Pacific Highway to Newcastle. A Traffic Impact Assessment was undertaken by Intersect Traffic Pty Ltd which assessed traffic volume, road capacity, intersection capacity, road safety for the existing operation and the proposed expansion of the quarry. Proposed traffic generation, concrete batching plant traffic, traffic efficiency, road capacity, amenity and cumulative impacts were additionally assessed for the proposed project. The primary findings are as follows;

Road Safety: Clarence Town Road/Brandy Hill Drive intersection and Brandy Hill Drive/Seaham Road intersection has suitable road geometry and the available sight distance exceeds Austroads requirements as specified within *Guide to Road Design (2009)*. However Sight distance to the east at the intersection was observed to be at minimum requirement.

Intersection Capacity: Modelling shows that intersections are currently operating with an good level of service.

Proposed Traffic Generation: Heavy vehicle traffic on the local road network around the site was found to be in the order of 14% to 25% of total traffic.

Table 2: Proposed Traffic Generation Increase

Traffic and Transport	Proposed Traffic Generation Increase (incl. quarry deliveries, employees, concrete batch plant)
Daily Vehicles	524 vehicle trips per day (vtpd).
Peak Hour Vehicles	66 vehicle trips per hour (vtph). i.e. a total of 150 vtph (84 + 66) from the site
8AM – 9AM period	56 vtph

Concrete Batching Plant Traffic: The concrete batch plant will generate approximately 11 deliveries per day. A 9 or 10 hour day would result in a peak trip generation of two deliveries per hour of 4 vtph.

Concrete Recycling: All material will be received as back loads on the quarry trucks delivering material from the quarry to the batching plants and therefore resulting in no additional traffic movements.

Traffic Efficiency: The Project is predicted to increase vehicle trips per day to 524vtpd or 66 vtph during peak days. It will not cause the two way mid-block technical capacity of the road network to be reached and therefore satisfactory levels of LoS will be experienced by motorists on the road network after the extension and future upgrading of the quarry.

Road Capacity: The existing road network has significant spare capacity to cater for traffic growth generated by additional development in the area. The average delay, levels of service and queue lengths for all movements remain well within the thresholds determined by the RMS as representing satisfactory operation for the Project.

Amenity:

Dust: the entire haulage route is sealed and as such dust generated from the haulage traffic will be insignificant provided all loads are covered as required by law in NSW. Other dust issues arise from internal quarry operations which are addressed in the Air Quality Impact Assessment (**Appendix 11**).

Noise: the operation of large haulage trucks can generate significant noise particularly when returning to the quarry empty. Likewise the internal operations of the quarry can also generate noise to off-site receptors. Each of these noise generating components will be addressed in the noise impact assessment detailed in (**Appendix 9**).

Cumulative Impacts: Martins Creek Quarry provided transport data for September 2014 which was used to assess cumulative impacts of the Project. Sensitivity analysis suggests that Martins Creek Quarry will not increase traffic on the local road network significantly and will not impact on the efficiency of the network.

It is considered unreasonable for the Bandy Hill Expansion Project to consider the traffic impacts of the Wallalong Investigation Area in this assessment as the Project has not been approved at the time of writing and should the Wallalong proposal proceed the roads would require major upgrade in which case additional traffic generated by the Brandy Hill Project would be insignificant.

Noise

Noise prediction modelling has been undertaken for each of the five (5) project operational stages of both the neutral and worst-case conditions during the day, evening and night periods by VIPAC Engineers and Scientists Ltd (Vipac). All predicted noise impact associated with the proposed expansion on the noise sensitive receivers ranged between 1 and 41dB(A), which is within the applicable Project Specific Noise Level criteria during the daytime, evening and night period.

Results of the predicted noise levels noise for the construction phases of the proposed quarry expansion also indicate that the proposed Project comply with the applicable noise criteria.

There are no third party sensitive receivers located on the parcel of land located to the southeast of the quarry between the quarry and Clarence Tow Road. It is understood that the owner of this land parcel does not reside on these premises.

Traffic

The predicted noise generated by the Brandy Hill Quarry Operations and Quarry Traffic on Brandy Hill Drive would comply with the daytime and night-time noise criteria provided the total number of truck movements on Brandy Hill Drive is kept within the acceptable limit of 584 truck movements during the daytime and 78 truck movements during the night-time periods respectively. Data is obtained from traffic counts undertaken in March 2015.

Results

Predicted noise levels associated with all other activities on-site at the proposed Quarry Expansion comply with the applicable noise criteria during the day, evening and night periods, therefore the Project is acceptable from an acoustic point of view.

Mitigation

No specific mitigation measures are required in conjunction with the proposed expansion phases of the quarry, however it is recommended that a Noise Compliance Management Strategy should be implemented for the Quarry. This should include the provision for a noise monitoring programme to monitor operation phase noise emissions Brandy Hill Quarry, in accordance with the requirement of NSW EPA.

Blast

An assessment of historical ground vibration and airblast overpressure measurements by Vipac determined blast impacts from the proposed quarry extension can be readily controlled within acceptable values using existing blast practices. Propagation of ground vibration and overpressure is adequately controlled due to the separation distance between the quarry pit and the closest receptor. Historical data shows that compliance with the environmental conditions has been achieved, and that future blast impacts can remain within acceptable levels using typical blast designs and good blasting practice.

Air Quality

A Level 2 assessment was applied to predict air pollutant concentrations in accordance with NSW guidelines and is based on computational modelling and determined controls where needed. The emission rates for individual mining activities were calculated in accordance with the *National Pollutant Inventory (NPI) - Emissions Estimation Technique (EET) Manual for Mining.*

The results of the modelling have shown that the Proponent's air quality emissions contribution fall within applicable criteria. However when modelled with background concentrations, 24 hour PM_{10} and annual $PM_{2.5}$ exceed applicable criteria in some stages due to high levels of background concentrations in 2013. For most sensitive receptors the maximum daily and annual PM_{10} concentrations are driven by the background concentrations obtained from Beresfield monitoring station on the 22/10/2013. Exceedances of annual $PM_{2.5}$ concentrations are driven by the high background concentration.

Modelling shows that efficiency controls applied to the processing plant in stage 4 significantly reduce the particulate emissions and impact on sensitive receptors.

The main air emissions from BHQ operations are caused by wind-borne dust, vehicle usage, materials handling and transfers. A major source of dust (albeit short term) will be from the

construction of an 18 m high bund at the southern boundary of the quarry, which once built will aid in reducing dust from exiting the site. Modelling is unable to take into account the positive benefits the 18 m high bund will create by protecting some sensitive receptors, especially those to the south of the quarry.

Blast Fume

Blast impacts generate both dust and also have the potential to generate noxious gases such as Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO). Assuming that the blasting requirements remain similar to the current situation; using the average quantity of explosives per blast (12,035kg) the resultant emissions are:

- NOx – 2,407 kg/blast or 28.9 tonnes/annum; and
- CO – 204, 600 kg/blast or 2,455.2 tonnes/annum.

Mitigation

Mitigation controls have been included in the quarry operation and design (stage 4 plant upgrade). Additionally mitigation measures considered in the Air Quality Impact Assessment include; watering of haul roads, enclosed screens, enclosed crushers, loading of stockpiles, enclosed conveyors, bund and the development of an Air Quality Management Plan for ongoing dust control.

Heritage

European Heritage

The *Historic Period Assessment and Statement of Heritage Impact Assessment* identifies whether archaeological remains exist within the Project area. A field inspection of the Project Area was undertaken to identify whether any historical items are present and to understand the heritage character of any potential heritage items. The field investigation also sought to more accurately determine the nature and extent of the archaeological resources.

This assessment has established that there are no listed heritage items present in the Project area, and further research and field inspection did not identify any new heritage items, values, or potential archaeological deposits present within the Project area. The Project area has been assessed as having no heritage significance. Accordingly, there is no potential for the proposed development to impact on any historic heritage items or values within the Project Area.

Aboriginal Cultural Heritage

An aboriginal cultural heritage assessment was undertaken in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010), which involves advertisement, search conducted by the Office of the Registrar, search conducted by the National Native Title Tribunal and registration of interest by Aboriginal groups. From here, registered Aboriginal parties (RAPs) whom provided comment on the Project Methodology were contacted to attend a site survey conducted on the 9 October 2014. Registered stakeholders were given the opportunity to review the draft ACHAR and Archaeological Reports, and comment on the significance of cultural heritage relevant to the Project Area. Comments were received from Lower Hunter Aboriginal Incorporated,

Maaiangal Aboriginal Heritage, Mur-roo-ma, Nur-Run-Gee, and Worimi LALC. No parties raised any issues with the draft reports, and all comments received are attached as an appendix to this report.

No Aboriginal sites and no areas of Potential Archaeological Deposit (PAD) were identified during the field survey within the Project Area and no previously recorded sites are located within, or in close proximity to the Project Area. The archaeological significance of the entire Project Area has been assessed as low. Overall, the Project Area has been assessed as having low Aboriginal cultural heritage significance. Accordingly, impacts to Aboriginal cultural heritage as a result of the proposed works are unlikely. It has been determined that no further Aboriginal archaeological or cultural heritage assessment is required prior to the proposed works commencing.

Water Resources

Surface Water

Impact Assessment

Potential impacts associated with the proposed project include;

- Reduction in downstream water quality due to changes to catchment land use
- Reductions to off-site surface flows due to catchment loss
- Increased stormwater runoff from the proposed quarry and increased flow impacts
- Changes in surface water supply to adjacent users
- Changes to regional water supply and associated infrastructure

Water Quality

Annual sediment loads will be changed due to changed land use of existing vegetated areas. Sediment loads will be managed through site sediment and erosion control plans and conservative design of site sedimentation basins to ensure the capture and treatment of stormwater flows and that sediment loads discharged from the site do not increase.

Water Quantity

A reduced catchment size will result in a reduction in volume of water passing through the drainage lines during storm events. There will be negligible change to Deadmans Creek catchment, and no consequent alteration in flow rates and volumes to the creek. Overall the reduction in the catchment area drainage line 2 represents approximately 2% of the entire Deadmans Creek catchment to Williams River and henceforth changes to the Williams River will be negligible. There will be a reduction in the catchment size of drainage line 2 and 3 which drain onto grassed depressions and will have no environmental consequence.

Pit dewatering of collected stormwater runoff and groundwater inflow will increase overall flows to downstream drainage lines.

Flooding

Flood flows up to and including the Probable Maximum Flood will not increase flows from the project in comparison to existing flows. The depth of the pit below ground level is lower than18m for all stages, therefore containing any flood flows within the void. Additionally

discharge flows will be controlled using a pump and will therefore not increase over existing discharge flow rates.

Adjacent Users

The project will have no impact on the basic landholder rights (Harvestable Rights) of adjacent users to collect 10% of site runoff due to the proposed development.

There are no online dams downstream of any of the three site drainage lines. Minor changes to discharge volumes and frequencies will have no impact on downstream licences users.

Regional Water Supply

Seaham Weirpool, located on the Williams River 6km upstream of the confluence with Deadmans Creek, is the major offtake point for Newcastle's water supply. Therefore any changes to surface water flows due to the proposed development will have no impact of the quality or quantity of regional water supplies.

Groundwater

The Project can proceed with an acceptable level of impact to other stakeholders, both environmental and licenced bore users. Licenced bore GQ51309 is modelled to be subjected to >2m drawdown as a result of the Project. Further groundwater level monitoring at this bore is recommended prior to proposed quarrying progression below existing approved quarry floor level.

It is anticipated that water licencing for the taking of water will be required with the sufficient share component for the taking of water. Water taken from a water source that is regulated from a Water Act regulated source must be authorised by appropriate water licencing.

There is no net groundwater outflow from the quarry void when at equilibrium conditions. Therefore no permanent groundwater licencing is required. It is predicted that reaching equilibrium shall take of the order of 165 years after quarrying is completed, after which time no permanent groundwater licences are required.

Modelling reveals that the project will not impact in the local hydrogeological system by causing significant detrimental effects for nearby groundwater users or ecological systems during project life and during ongoing rehabilitation. The hydrogeological impacts of the proposed project are considered acceptable.

Waste

A Waste Management Impact Assessment has been conducted by Hanson using the Department of Environment, Climate Change and Water (DECCW) *Waste Classification Guidelines 2008.* Management of waste at BHQ follows the established hierarchy under the *Waste Avoidance and Resource Recovery Act 2001* which ensures that resource management options are considered with primary priority given to avoidance, followed by resource recovery and lastly waste disposal.

The following forms a list of wastes currently managed at BHQ and proposed management during the life of the Project.

1. Domestic Waste
2. Sewage

3. Oil and Grease
4. Batteries
5. Sediment
6. Tyres
7. Metal
8. Overburden
9. Construction waste

To mitigate Project waste, it is proposed to implement a general recycling program, concrete washout material recycling and improve employee awareness of site waste management goals.

It is considered that all waste can be effectively managed in accordance with relevant criteria and management plans for the life of the Project.

Greenhouse Gases

A greenhouse gas (GHG) assessment has been undertaken for this project. This assessment determines the carbon dioxide equivalent (CO_2-e) emissions from the project according to international and Federal guidelines.

Greenhouse gases include water vapour, carbon dioxide (CO_2), methane, nitrous oxide and some artificial chemicals such as chlorofluorocarbons (CFCs). These gases vary in in respect to their effect and longevity in the atmosphere. Scientists have developed a system called Global Warming Potential to allow GHGs to be described in equivalent terms to CO_2, called equivalent carbon dioxide emissions (CO2-e). A unit of one tonne of CO2-e (t CO2-e) is the basic unit used in carbon accounting. An emissions inventory, or 'carbon footprint', is calculated as the sum of the emission rate of each greenhouse gas multiplied by the global warming potential.

The scope that emissions are reported, as defined by the National Greenhouse Accounts Factors Workbook is determined by whether the activity is within the organisation's boundary (Scope 1 – Direct Emissions) or outside the organisation's boundary (Scopes 2 and 3 – Indirect Emissions). Emission factors used in this assessment have been derived from either the Department of Environment, site-specific information or from operational details obtained from similar emission sources.

Calculating the GHG emissions for the life of the BHQ, based on an extraction rate of 1.5 Mtpa for 30 years the following GHG emissions are expected:

1. Scope 1 emissions: : 296,072.5 tonnes CO2-equivalent;
2. Scope 2 emissions: 85,426.5 tonnes CO2-equivalent; and
3. Scope 3 emissions: 41,242.5 tonnes CO2-equivalent.

ANFO

Scope 1 emissions are also produced by ANFO. The Mining Association of Canada provides an emission factor of 0.189 tonnes carbon dioxide per tonne. Based on information provided by Hanson relating to the amount of area blasted at Brandy Hill at present, it has been calculated that for 1.5 Mtpa, 8 tonnes of explosive will be used per annum. The calculated CO_2 emissions are 1.5 tonnes per annum and 45 tonnes CO_2 over the 30 year life of the quarry.

Visual

The visual assessment adopted the commonly accepted visual methodology which consists of the identification of potential viewing platforms, photographic recordings, photomontage composition, and a visual impact assessment from these identified visual receptors. The assessment accounted for vegetation characteristics and location, land form geomorphology, view quality, visual absorption capacity and visual impact significance. This visual impact assessment methodology enables definitive predictive determination of visual impacts pertaining to the Project.

All views to the Project area were categorised as very low, low, or moderate. No views to the Project were classified as high. Mitigation measures will significantly reduce visual harm, and where possible the Proponent will commit to the maintenance of the existing vegetative buffer.

Hazards

A hazard analysis was conducted for the Project with emphasis placed on preventing or minimising major hazardous incidents on-site, such as fire and explosion or the release of significant quantities of toxic or biologically harmful chemicals that could result in significant off-site effects.

SEPP 33

Consideration has been made as to whether the Project should be considered a hazardous or potentially hazardous industry under State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33). All materials on site are stored in accordance with relevant standards and do not trigger *Applying SEPP 33* thresholds. Additionally, in all cases, the transportation of dangerous goods and hazardous materials to the project site would be below the *Applying SEPP 33* thresholds.

Bushfire

The land is subject to bushfire risk as identified by bushfire mapping prepared by Port Stephens Council. Most of the existing quarry pit is not bushfire prone land, however the perimeter of the disturbed quarry areas are mapped as vegetation buffer -100m & 30m.

The nature of the proposed development will not increase or adversely impact on the potential or severity bushfires in the locality. The proposed development involves the clearing of land mapped as Vegetation Category 1. This will result in a reduction in bushfire fuel loads.

Social and Economic

The Brandy Hill Quarry Expansion Project is anticipated to generate considerable economic benefits at each government tier, whilst simultaneously minimising and mitigating any potential social impacts on the regional and local amenity.

Economic

The most significant economic benefit is the solidification of the security of construction materials in local and regional markets to enable the development of vital infrastructure associated with planned regional development. The Project will enable the quarry to primarily meet the demand from the Central Coast, Hunter and Newcastle regional markets,

and secondly allow Hanson's other metropolitan quarries (Kulnura and Bass Point) to meet the demands from the Sydney Metropolitan markets. The estimated cost for the quarry expansion is approximately $22.5 M and will inject economic benefits into the local economy as well as providing 30/31 employment positions upon completion of project stage 5.

Social

Potential social issues primarily relate to the way in which the Project may impact on the local amenity. An agglomeration of noise and vibration, air quality, visual and traffic impact assessment combine to generate a measure of social amenity impact in the local environment. The social impact assessment identifies;

- **Traffic**: Current and projected traffic increases are with the road capacity/safety criteria.
- **Noise**: The noise impact assessment determines that the Project will comply with relevant noise criteria provided the total number of truck movements is within the acceptable limit of 584 during the daytime and 78 truck movements during the night-time periods. Additionally on-site activities comply with acceptable noise criteria.
- **Visual:** Visual impact valued at very low- moderate, with an overall visual assessment value of low.
- **Air:** TSP, dust deposition and RSC prediction compliance. Exceedances in annual $PM_{2.5}$ due to high background concentrations and PM_{10} 24 hour exceedances due to background concentrations from the Beresfield monitoring station on the 22/10/2013.

Provided the applicable criteria are met, and mitigation measures implemented, social impacts will be effectively managed throughout the life of the Project. Where ever reasonable and feasible the Proponent will maintain and engage community involvement.

Rehabilitation

A key physical constraint on possible final land form is the location and topography. For rehabilitation purposes, a quarry void with a base floor level 78 metres below sea level will either be back filled with water from rainfall and any groundwater seepage, or alternatively be filled with other materials such as putrescible or non-putrescible waste depending on the suitability of the geology and other factors, including the community need, that would make this a viable option.

The following areas will be addressed during rehabilitation works to enable closure;

- Infrastructure Area
- Redundant Roads and Tracks
- Fencing
- Revegetation
- Direct Seeding
- Weeds
- Pest Management
- Bushfire Management

Progressive rehabilitation

Progressive rehabilitation is already practiced at the quarry where extraction has reached terminal areas on the north-western benches and is proposed to continue throughout the life of the Project. A mixture of native trees and shrubs endemic to the area will be sown onto the majority of the reshaped and benched pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank.

Benefits of Proposal

Primarily the main benefit of the proposal is securing the ongoing supply of high quality construction materials in local, regional and state markets. This will enable flow on regional growth and development in conjunction with the Port Stephens Planning Strategy. The Project is in a strong geographic location to supply materials to identified regional growth corridors in the Newcastle region, thereby enabling planned regional growth.

The Project is associated with an estimated expansion cost of approximately $22.5 M over five broad project stages. Ongoing operation expenditure and employee expenditure will inject further economic benefits into the local and regional economies for the life of the Project. Additional immediate benefits of the proposal include maintaining and generating employment positions to service the Project. Flow-on benefits initiated by the Project include the creation of employment positions in the construction industry.

Expanding the current quarry by maximising the quarry operating life delays the need to develop a Greenfield site and therefore reduces environmental impacts and the dispersion of potential social impacts generated by quarry operations. The quarry is located close to regional and state road networks which promote efficient transfer of construction materials reducing the dispersion of transport impacts on the local road network.

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Brandy Hill Expansion Project

Environmental Impact Statement

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Abbreviations

Abbreviation	Details
AHD	Australian Height Datum
ACHAR	Aboriginal Cultural Heritage Assessment Report
ANZECC	The Australian and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
BAR	Biodiversity Assessment Report
BHQ	Brandy Hill Quarry
BMP	Biodiversity Management Plan
BOS	Biodiversity Offset Strategy
CCC	Community Consultative Committee
CFCs	Chlorofluorocarbons
CKPoM	Port Stephens Comprehensive Koala Plan of Management
CO_2	Carbon Dioxide
DA	Development Application
DCP	Development Control Plan
DECCW	Department of Climate Change and Water
DGR	Director General Requirements
DO	Dissolved Oxygen
DP&E	Department of Planning and Environment
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPA	Environment Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EPL	Environmental Protection Licence
ESA	Environmental Site Assessment
GDEs	Groundwater Dependent Ecosystems
GHG	Greenhouse Gases
Hanson	Hanson Construction Materials Pty Ltd
JORC code	Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves
km	Kilometres
LHRS	Lower Hunter Regional Strategy
LoS	Level of Service
m	Metre/s
MCQAG	Martins Creek Quarry Action Group
MNES	Matters of National Environmental Significance
NOW	NSW Office of Water
NPI	National Pollutant Inventory
OEH	Office of Environment and Heritage
PACM	Potential Asbestos Containing Material
PEA	Preliminary Assessment Report

PM10	Particulate matter less than 10 microns in size
PM2.5	Particulate matter less than 2.5 microns in size
PSSC	Port Stephens Shire Council
PVC	Primary Visual Catchment
RAPs	Registered Aboriginal Parties
RCS	Respirable Crystalline Silica
RMS	Roads and Maritime Services
SEAR	Secretary Environmental Assessment Requirements
SSD	State Significant Development
t	Tonne
TSS	Total Suspended Solids
VSD	Variable speed drives
vtpd	Vehicle trips per day
vtph	Vehicle trips per hour
WCL	Worimi Conservation Lands
24/7	24 hours per day, 7 days per week

This is to certify that this Environmental Impact Statement (EIS) has been prepared in accordance with *Environmental Planning and Assessment Regulation 2000* and that the EIS is neither false nor misleading in accordance with the Regulation.

Prepared By	**Qualification**
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Introduction

Section 1

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

1.1 Introduction

1.2 The Proposal

1.2.1 Introduction

Hanson Construction Materials Pty Ltd (Hanson) currently operates Brandy Hill Quarry (BHQ), located in the Port Stephens Council (PSC) Local Government Area. Brandy Hill Quarry currently operates under Development Consent No 1920. The site lies on Clarence Town Road and is 3.5 km east of Seaham, 15km northeast of Maitland and 30km north of Newcastle **(Figure 1.1.1**). BHQ is a hard rock quarry which has been in operation since 1983. The quarry produces a range of building materials including concrete aggregates, road base material and sealing aggregates.

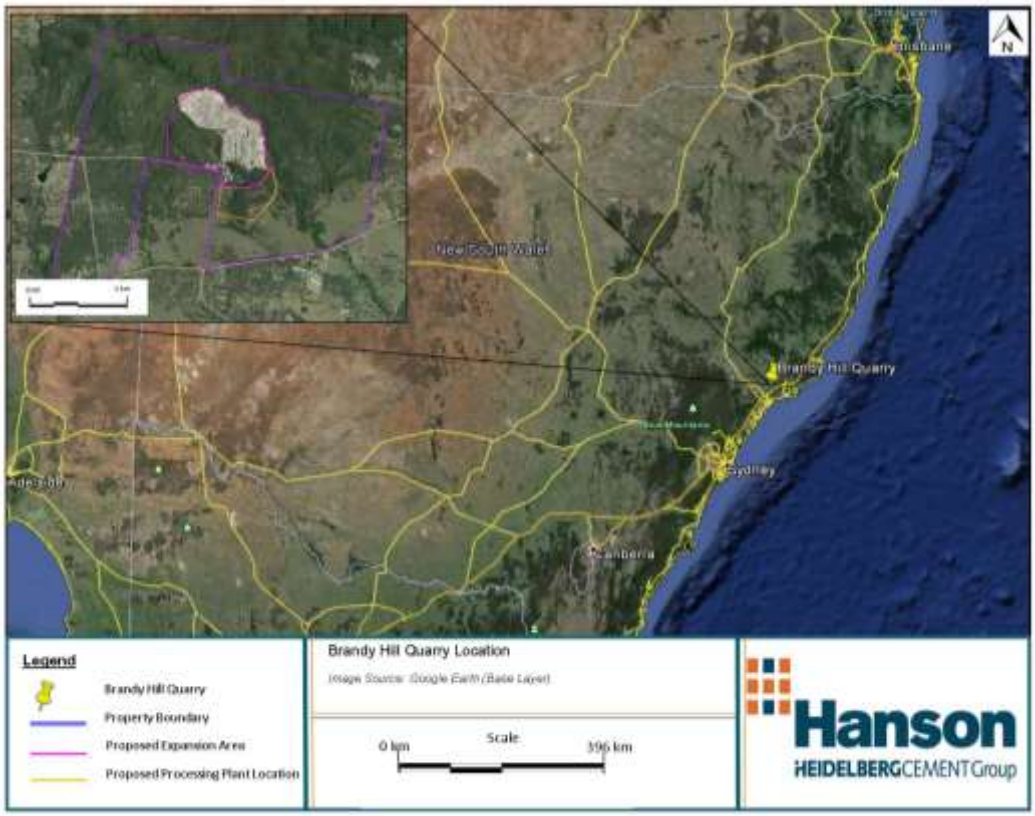

Figure 1.1.1: Brandy Hill Location within NSW

1.2.2 The Proponent

Brandy Hill Quarry is owned and operated by Hanson, which is part of the, HeidelbergCement Group. Hanson is a major supplier of aggregates, sands and premixed concrete to the civil, industrial, residential, and commercial construction industries. Hanson and its subsidiaries operate over 70 quarries and more than 300 concrete plants throughout Australia, employing over 3000 people nationwide. Hanson operates to ISO/AS 14001 to reduce the impact its operations have on the environment. BHQ has an Environmental Management System in place and strives for continual improvement in all aspects of its environmental performance.

BHQ operates to a mine plan and is externally accredited by British Standards Institution (BSI) Group to AS14001 for its Environmental Management System, AS4801 for its Safety

Management System and to AS9001 for its Quality Management System. BSI group is a Standards Body and founding member of the International Organization of Standardization (ISO), providing quality, health and safety accreditation. Currently BHQ operates under Environmental Protection Licence (EPL) number 1879 issued by the Environment Protection Authority (EPA) under the Protection of the Environment Operations Act 1997 (POEO Act).

BHQ has strict safety, environmental and quality systems in place to comply with the following Acts and Regulations:

- Work Health and Safety Act 2011
- Work Health and Safety Regulation 2011
- Mine Health and Safety Act 2004
- Mine Health and Safety Regulation 2007
- Explosives Act 2003
- Explosives Regulation 2005
- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (General) Regulation 2009
- Protection of the Environment Operations (Waste) Regulation 2005
- Protection of the Environment Operations (Clean Air) Regulation 2010
- Waste Avoidance and Recovery Act 2001

1.3 Background and Objectives

BHQ, as shown in **Figure 1.1.3**, is nearing the limits of its currently approved extraction area. The extraction of resources has occurred at the site, since the current development consent (Development Application No 1920) was granted by PSSC to Hunter Valley Mining Corporation Pty Ltd, in 1983. Hanson currently operates BHQ and produces up to 700,000 tonnes of products per year, from a source material that is primarily ignimbrite.

1.3.1 Current operations

The current operation extracts material through drill and blast activities within the current extraction area of 19.45ha to RL 30m (AHD). This shot rock material is loaded by excavator into dump trucks and hauled to a fixed crushing plant located onsite at BHQ. The fixed plant consists of various crushers, screens and conveyors that separate material into the desired products. All material that is extracted is turned into useable products; there is zero waste of the extracted resource. This material is stockpiled onsite, before being loaded with a front end loader into road trucks to be delivered to customers. The quarry employs 20 full time staff including management and full time contractors.

BHQ strives to maintain a safe working environment and stresses the importance of sound environmental management on all operational sites. This is achieved through staff training and management plans. At Brandy Hill, these include:

- Mine Safety Management Plan
- Crisis Management Plan
- Environmental Management Plan
- Blast Management Plan
- Water Management Plan
- Pollution Incident Response Management Plan

1.3.2 Products

Brandy Hill currently produces a range of products for application in construction purposes, summarized in **Table 1.3:1**.

Table 1.3:1 Brandy Hill Products Produced

Product	Approximated Percentage (2015 Calandra Year)	Examples of product Applications
Concrete Grade Aggregate	34%	Application in concrete, uses include; - Residential Houses - Commercial structures - Footpaths
Fill Material	21%	Bulk earthworks and landscaping
Manufactured Sand	24%	Concrete Production
PreCoat	4%	Roads
Road Base	10%	Roads Infrastructure
Gabion/Armour Rock/Ballast	7%	Marinas Retaining walls
Drainage	1%	Highways Residential Infrastructure

1.3.3 Quarry life

Hanson aims to extend the life of the quarry by 30 years, providing 31 employees with full time work for duration of the quarry's life. A concrete batching plant will be built on the site, capable of producing 15,000m^3 per year. Timing of the concrete plant being built will depend upon demand within the local region. Concrete recycling will also take place at BHQ and the site will receive up to 20,000t per annum of unused concrete material and concrete plant washout material. This recycled concrete product will be used primarily in road base products to reduce the amount of raw materials used making this product and reduce landfill waste.

1.3.4 Proposed production limits and concrete sales

The proposal aims to provide ongoing supplies of building materials to the Lower Hunter Region. The *Hunter Regional Plan 2036* identifies that increasing population levels will require investments in dwellings, roads and infrastructure. Increasing the allowable extraction quantity from 700,000 tonnes per annum to 1.5 million tonnes per annum, is sought to accommodate for increasing demand for concrete, road building and quarry materials over the 30 year life of the quarry.

The quarry's expansion will enable government and industry to meet housing and infrastructure needs of the region's growing population. Having a concrete plant in the area will be beneficial due to anticipated heightened demand in Maitland and Raymond Terrace resulting from population increase. BHQ will complement existing concrete plants currently servicing these centres, which are unlikely to meet demand of urban growth planning in the region. This plant will also serve the local area and provide jobs for local residents.

1.3.5 Proposed operating hours

Under the existing development consent Brandy Hill Quarry is permitted to operate sales and production 24 hours per day, 7 days per week. The quarry is proposing to maintain this capability to retain flexibility to accommodate demand for aggregates. **Table 1.3:2** outlines current and proposed operating hours for the proposed project.

Table 1.3:2: Current and proposed operating hours for BHQ.

Activity	Current Approvals		Proposed Major Project Consent	
	Day	**Time**	**Day**	**Time**
Construction works	N/A	N/A	Monday-Friday	5am-8pm
			Saturday	5am-5pm
			Sunday and Public Holidays	None
Blasting	Monday-Friday	8am-5pm	Monday-Friday	8am-5pm
	Saturday, Sunday and Public Holidays	None	Saturday, Sunday and Public Holidays	None
Load and Haul	Any day	24hrs	Monday-Saturday	5am-12am
			Sunday and Public Holidays	None
Primary Crusher	Any day	24hrs	Monday-Saturday	5am-1am
			Sunday and Public Holidays	None
Secondary and Tertiary Plant	Any day	24hrs	Any day	24hrs
Sales and dispatch	Any day	24hrs	Any day	24hrs
Maintenance	Any day	24hrs	Any day	24hrs

1.3.6 Extraction boundary

To access the identified resources, the quarry is proposed to have an extraction area of 78.5ha (including the current disturbance area) from the currently approved depth of RL30mAHD to proposed extraction depth of RL -78m (AHD). This requires a detailed EIS, to assess the risks associated with expanding into undisturbed areas, increased production, increased sales and transportation, as well as changes to the final rehabilitated form of the quarry. This EIS has been prepared to assess the impacts of the proposal to expand the current extraction boundaries to access required materials. The proposed extraction boundary is shown in **Figure 1.1.3** and further discussed in **Section 2.1.**

1.3.7 Project Infrastructure Components

Proposed infrastructure includes:

- Concrete Batching and recycling Plant: Facility developed for the purpose of batching and recycling concrete for application in residential houses, commercial structures, footpaths, sporting facilities etc.
- Pre-Coat Plant: used in the application of asphalt to roads during their construction.
- Pug Mill: used to mix materials for application of road base.
- Processing Plant: used in the crushing, grinding and separating of rock into various sizes of aggregate.
- Weighbridge: used to measure the weight of sold product and track orders in accordance with internal systems. Records are used to ensure compliance with relevant transportation requirements.
- Office: administration area for quarry personal.
- Workshop: site maintenance and repairs as required for quarry machinery.

1.3.8 Brandy Hill Quarry Regional Location

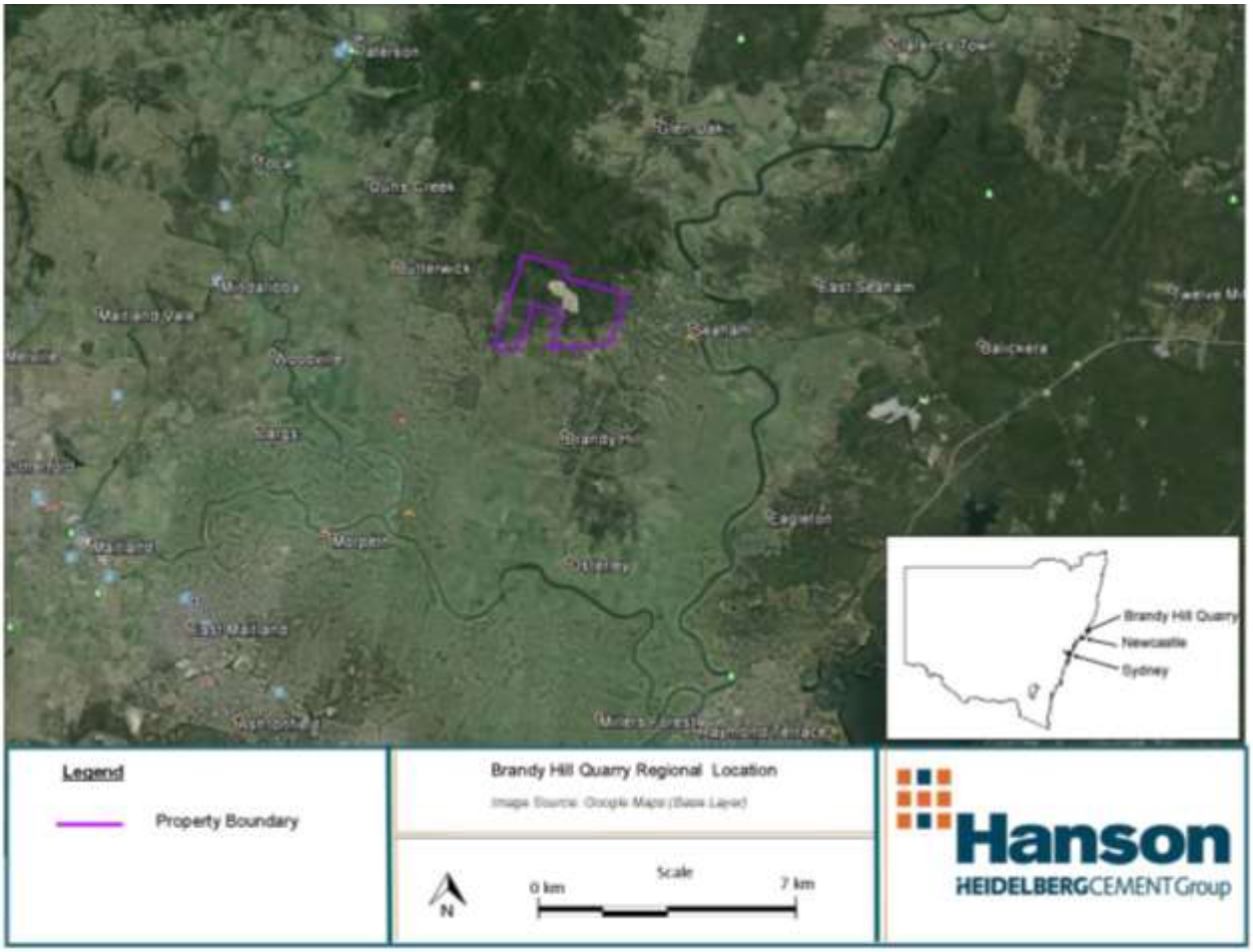

Figure 1.1.2 Location map of the area surrounding BHQ.

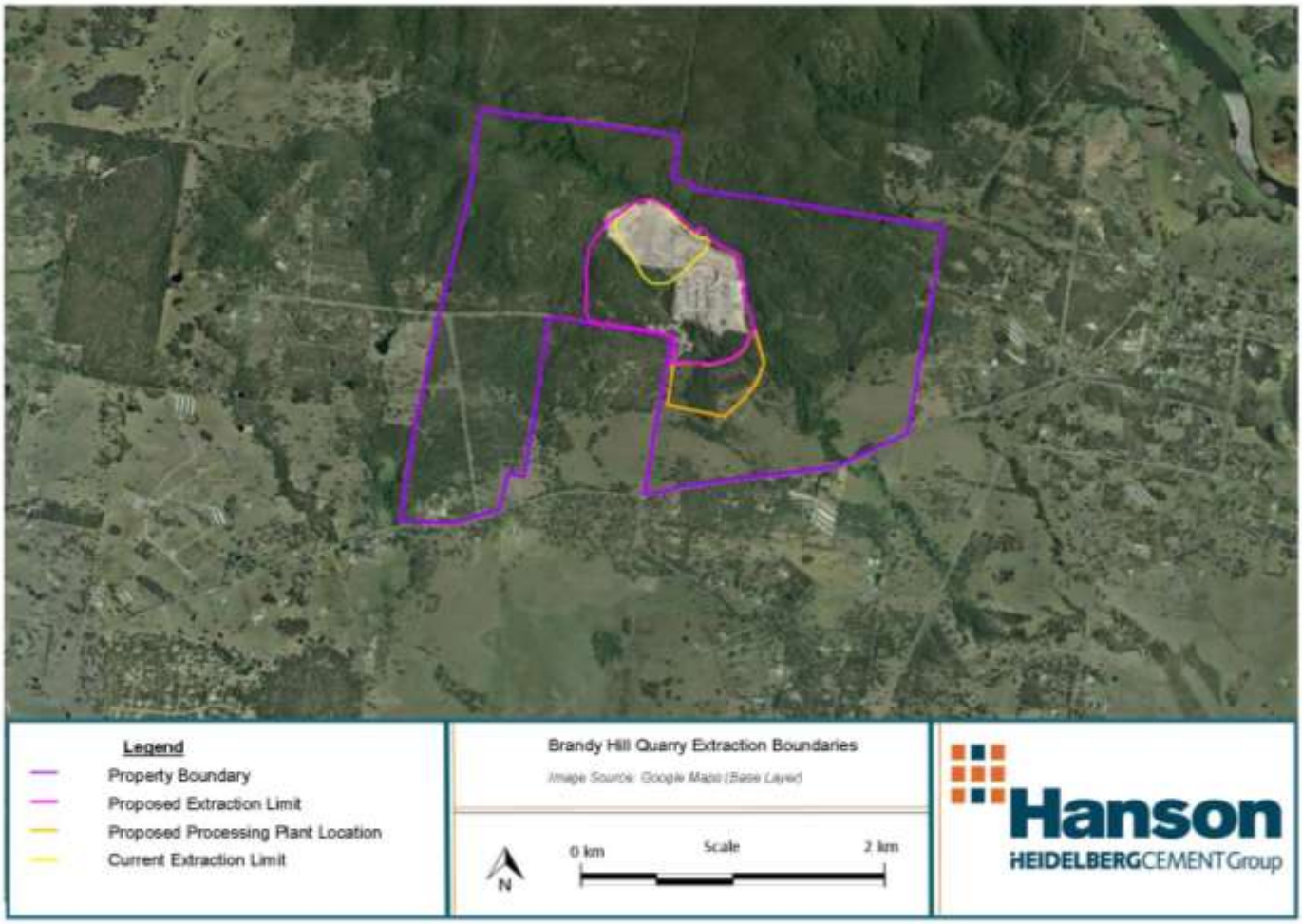

Figure 1.1.3: BHQ extraction boundaries.

Current extraction limit (yellow), proposed extraction limit (pink) and proposed infrastructure relocation area (orange).

1.4 Statutory Requirements

The Secretary's Environmental Assessment Requirements (SEARs) stipulate general requirements that the Brandy Hill Environmental Impact Assessment (EIS) is required to address (this document). The points below outline these requirements.

SEARs Requirements

A detailed description of the development, including:

- need for the proposed development;
- alternatives considered;
- likely components and staging of the development - including construction, operational stage/s and rehabilitation;
- plans of any proposed building works; and
- the likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site (such as the Martins Creek Quarry).

This Environmental Impact Statement (EIS) has been prepared to support a Development Application (DA) (SSD 5899) (**Appendix 3**) that Hanson has submitted for BHQ. The application seeks approval to continue operations at BHQ and to increase production from 700,000 tonnes per annum to 1,500,000 tonnes per annum. This requires accessing new resources, in an area that isn't currently within the allowable extraction limit. The expansion area proposed contains suitable resources for a full range of quarry products (see **Table 1.3:1**), identified through a comprehensive geological assessment (**Appendix 5**) of the hard rock resource. From this geological assessment, it has been identified that in excess of 78 million tonnes of hard rock is available for extraction.

As the development proposes to extract over 500,000 tonnes of material per annum and also proposes to access more than five million tonnes of reserves. Therefore the development meets the criteria listed within schedule 1, clause 7 (1)(a) and (b) of the State and Environmental Planning Policy (State and Regional Development) 2011 for assessment as a 'state significant development' under section 89C (2) of the *Environmental Planning and Assessment Act 1979* (the EP&A Act).

The Planning Minister has the power to determine all SSD projects under section 89D of the EP&A Act. However, the Minister can delegate consent authority for SSD project applications lodged by private developers to the Planning Assessment Commission (PAC) and Department of Planning and Environment.

Hanson seeks consent to install a concrete batching plant at BHQ as part of this application. The concrete plant would be capable of producing up to 15,000m^3 of pre-mixed concrete annually. Permission is sought to receive up to 20,000 tonnes of waste concrete annually to be recycled on site. A new pre-coat plant will be required to replace the current plant and a

mobile pug mill will be used to replace the existing pug mill in the future. Current production and sales are allowed to operate 24 hours a day 7 days a week, this is proposed to be retained by Hanson.

This Environmental Impact Statement has been prepared to meet the requirement of Section 78A, Clause (8A) of the EP&A Act. The EIS outlines the process taken to identify all potential environmental impacts of the BHQ proposal. All identified issues have been addressed by this document. A list of the Secretary's Environmental Assessment Requirements (SEARs), often referred to as Environmental Assessment Requirements (EARs), and is provided in **Appendix 1**. A table has been compiled in **Section 6.1** of this EIS, which indicates where each SEAR has been addressed.

1.4.1 Key Personnel Involved in the Environmental Assessment

The Environmental Assessment Team consists of Hanson staff and external consultants as detailed in **Table 1.4:1** below.

Table 1.4:1: Key Personnel Involved in the Environmental Assessment

Environmental Assessment Issue	Environmental Assessment Team
Heritage Impact Assessment	Biosis Pty. Ltd.
Biodiversity Impact Assessment	Biosis Pty. Ltd.
Water Impact Assessment	Martens and Associates Peer Reviewed by Dr. Noel Merrick
Noise and Vibration Impact Assessment	Vipac Engineers & Scientists
Air Quality Impact Assessment	Vipac Engineers & Scientists
Traffic Impact Assessment	Intersect Traffic
Socio-Economic Impact Assessment	Hanson Construction Materials Pty. Ltd.
Visual Impact Assessment	Hanson Construction Materials Pty. Ltd
Hazard Impact Assessment	Hanson Construction Materials Pty. Ltd
Waste Impact Assessment	Hanson Construction Materials Pty. Ltd
Rehabilitation	Hanson Construction Materials Pty. Ltd.
Geological Assessment	Peter Browne (Hanson Construction Materials).

1.4.2 EIS Report Structure

Executive Summary: provides an overview of key information pertinent to the Project, a brief description of consultation with relevant stakeholders, significant findings of the environmental impact assessment and any relevant commitments;

Section 1 Introduction: introduces the Project, background information of Hanson, Project objectives, details the environmental assessment team and documents the structure of the environmental assessment;

Section 2 Description of Proposal: provides a site description, available and accessible resources, detailed description of the proposal including staging and site area, project justification, and an assessment of alternatives to the proposed project;

Section 3 Consultation: describes the consultation process with key stakeholders including relevant government agencies and Aboriginal groups;

Section 4 Planning Context: describes relevant legislative controls applicable to the project at Federal, State and Local tiers;

Section 5 Environmental Assessment Including a Risk Assessment and Interactions: Provides a comprehensive environmental impact assessment for key environmental issues relevant to the Project and details interactions with other projects and an Environmental Risk Assessment for the Project;

Section 6 SEAR checklist: contains a SEAR checklist detailing where each SEAR is addressed within the EIS;

Section 7 Statement of Commitments: contains Hanson's statement of commitments proposed to mitigate potentially detrimental project impacts on the environment.

Section 8 Conclusion and Justification: conclusion and justification; and

Section 9 References: references.

Proposal Description and Project Justification

Section 2

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

2 Description of Proposal

The SEARs dictate that the EIS must include:

> A detailed description of the development, including:
>
> - need for the proposed development - see **Section 2.8**;
> - alternatives considered – see **Section 2.9**;
> - likely components and staging of the development - including construction, operational stages and rehabilitation – see **Section 2.3**;
> - plans of any proposed building works – See **Section 2.4** and
> - the likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site (such as the Martins Creek Quarry) – See **Section 5.2.**

2.1 Brandy Hill Quarry

The quarry is located in Seaham, which is a rural locality within the Port Stephens Local Government area in the Hunter Region of New South Wales. The quarry is located on a property that is approximately 554 hectares in area. The surrounding area is predominately zoned RU2 Rural Landscape. Minimal primary production occurs within proximity of the site.

The Brandy Hill community lies to the south and is zoned as a large lot residential area. Seaham lies to the east and is zoned as a low density residential area. To the west and northwest of the BHQ extraction area, within the property boundary, the land is zoned as an environmental management area. The area zoned environmental management will not be disturbed by the proposed development; all disturbed areas will be within rural landscape zoned areas. To the north is a property zoned property zoned as an environmental conservation area.

The proposed extraction area sits wholly within the RU2, Rural Landscape zone, and can be utilised for extractive industries with consent, as noted in the land use table in the Port Stephens Local Environment Plan 2013.

Private road access to BHQ runs north off Clarence Town Road at the intersection with Brandy Hill Drive.

2.2 Proposed land impacts

A geological report is attached at **Appendix 5** and details the available resource quality, quantity, and potential uses. Justification for the extraction limit boundary as the proposed extraction area and alternatives to this proposal are identified in **Section 2.6**. All lots proposed to be disturbed are shown in **Figure 2.1**, are zoned RU2 Rural Landscape.

The current extraction area is approximately 19.45 hectares, marked by a yellow line on **Figure 2.2**, to an allowable depth of RL 30m (AHD) on the following lots:

- 1 DP 47313
- 101 DP 712886
- 56 DP 752487

Hanson seeks approval to expand the extraction boundary to cover approximately 78.5 hectares (including existing disturbed areas), marked by a pink line in **Figure 2.2,** to an allowable depth of RL -78m (AHD) in the aforementioned lots as well as lots:

- 12 DP 264033
- 19 DP 752487
- 2 DP 752487
- 36 DP 752467

It is proposed to relocate the existing processing plant to allow the resource to be extracted below the plant's current footprint. The final location for the fixed plant and stockpile area will be 18.5 hectares, marked by an orange line in **Figure 2.2**. This area will be screened from view from the road by an earth bund wall. Planned staging of pit development will provide sufficient time to rehabilitate the new bund to fully screen the fixed plant and stockpile area from Clarence Town Road. The final plant area will encompass the following lots:

- 1 DP 737844
- 19 DP 752487
- 20 DP 752487
- 21 DP 752487
- 236 DP 752487
- 36 DP 752467

The current quarry pit will be expanded into the existing plant and stockpile area. This area comprises 21ha of already disturbed land.

The greenfield areas (pit expansion and infrastructure relocation), to be included in the overall project area total 48.7 hectares; 18.5 hectares of this has been allocated for the final fixed plant position which lies within the orange infrastructure boundary as shown in **Figure 2.2.**

Figure 2.1: Lot numbers of Brandy Hill Quarry

2.1 Extraction boundaries

During the preliminary stages of the environmental investigation for the development, an area of 42 hectares was proposed for the new extraction area. This area was included in the Preliminary Environmental Assessment, 2013 (PEA) which is marked by the red outline in **Figure 2.2**. This area was selected based on a drilling campaign conducted in 2012 (**Appendix 5**).

Another drill campaign was conducted in 2014 which included seven diamond core drill holes (**Figure 2.2**). This geological assessment included testing of aggregate produced from the diamond cores, which determined availability of the resource to define an appropriate extraction boundary and infrastructure area appropriate for a 30 year project life.

After the geological assessment was completed the total area of disturbance for the project was reduced to 97.7 hectares, with the extraction boundary consisting of 78.5 hectares (including the existing approved disturbance area) of the total area of disturbance.

The extraction boundary proposed allows sufficient distance between the nearest sensitive receptors to maintain quarry pit operations within relevant noise and air quality requirements. The closest neighbouring resident to the proposed pit boundary will be over 880 metres away.

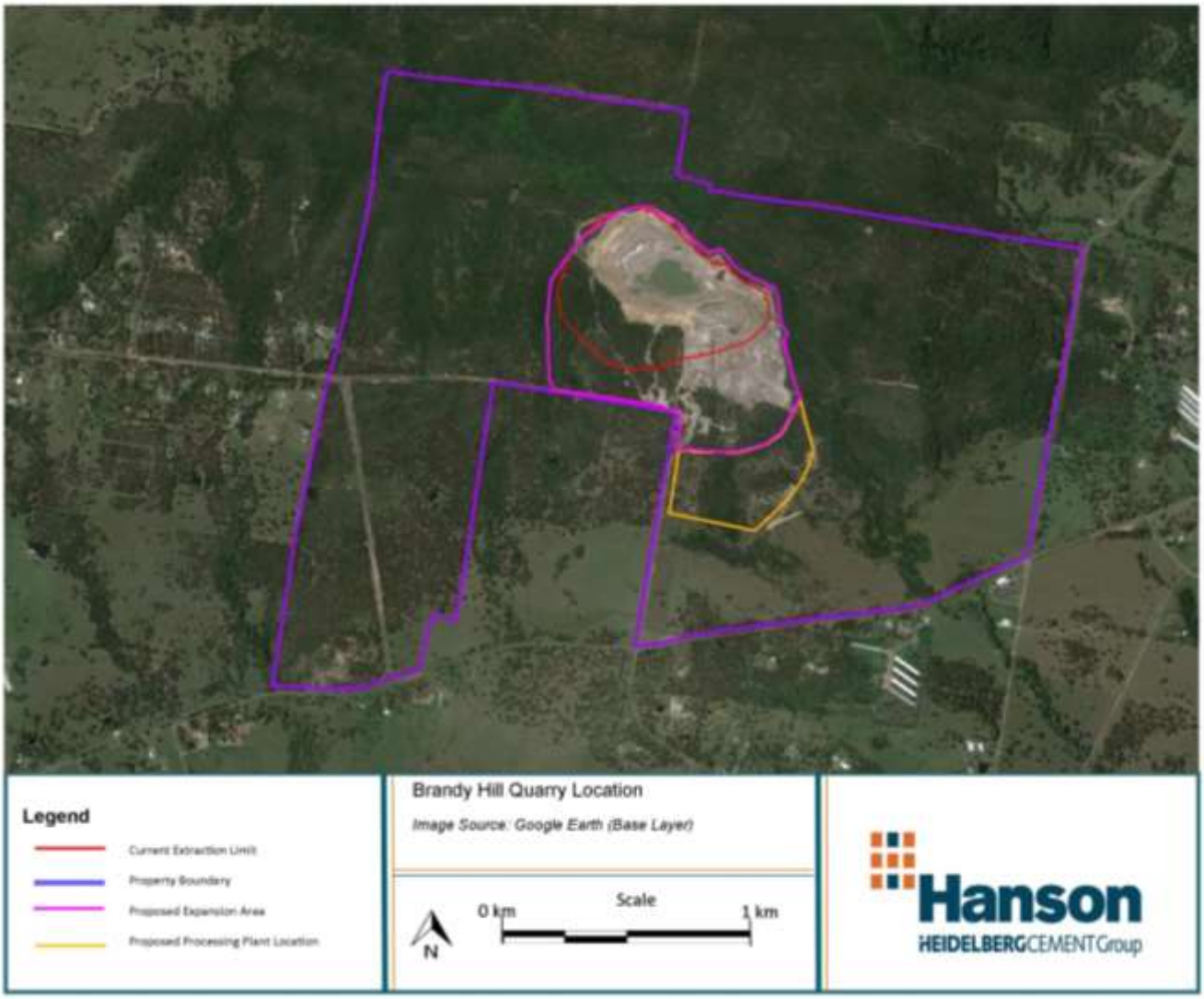

Figure 2.2: Brandy Hill proposed extraction area of disturbance throughout DA process and location of diamond core holes drilled in 2014.

Current approved extraction limit (yellow), PEA proposed extraction limit (red), final extraction limit based on revised geological assessment (pink) and final plant and stockpile area (orange).

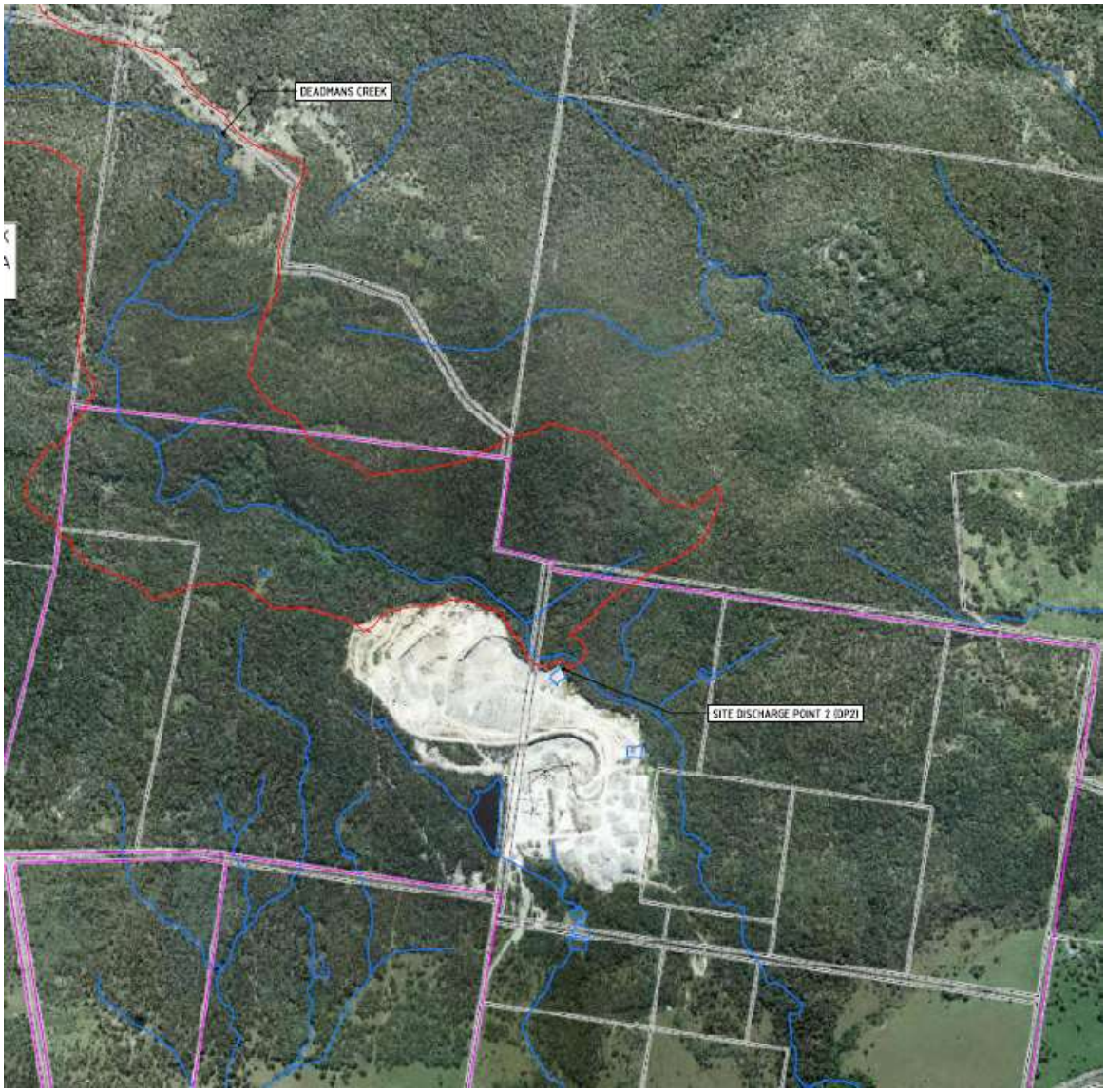

Figure 2.3: Location of Deadman's Creek

2.2 Vegetation and natural environment

The property is dominated by Brandy Hill which rises to 180m above sea level. To the north of the quarry extraction area runs Dead-man's Creek. The creek is ephemeral and runs easterly through a steep valley to the north of Brandy Hill, along the northern edge of the quarry before following the quarry in a southerly direction, before turning to the southeast until it passes under Clarence Town Road. Dead-man's Creek marks the northern and eastern edge of the quarry.

The surrounding landscape consists of farmland, primarily used for cattle grazing and poultry broiler sheds, that lie on a large floodplain. Tributaries flow from the surrounding area into the Hunter River which is 7km south of the quarry. The property consists predominantly of Hunter-Macleay Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Coastal Swamp Forest.

The proposal includes a comprehensive Biodiversity Offset Strategy (BOS) which has been prepared as part of the ecological impact assessment to compensate for the removal of six different Plant Community Types (PCTs) and threatened species present within the study

area. Offset requirements and proposal is explored further in **Appendix 7** and **Section 5.5.8** The BOS will be finalised in consultation with OEH and the Department of Planning and Environment post submission of the application and as part of the assessment process.

2.3 Geology of Brandy Hill Quarry

The Newcastle 1:250,000 geological map (Map) of the site provides information on the geology of the region, and has been specifically reviewed for the Brandy Hill Quarry Project Site. This Map describes the site as “acid lava and crystal tuff”. Specifically the project area is defined as overlain by the Seaham Glacial beds and underlain by the Mt Johnstone Formation compromising volcanic tuff and sandstones. See **Figure 2.4.**

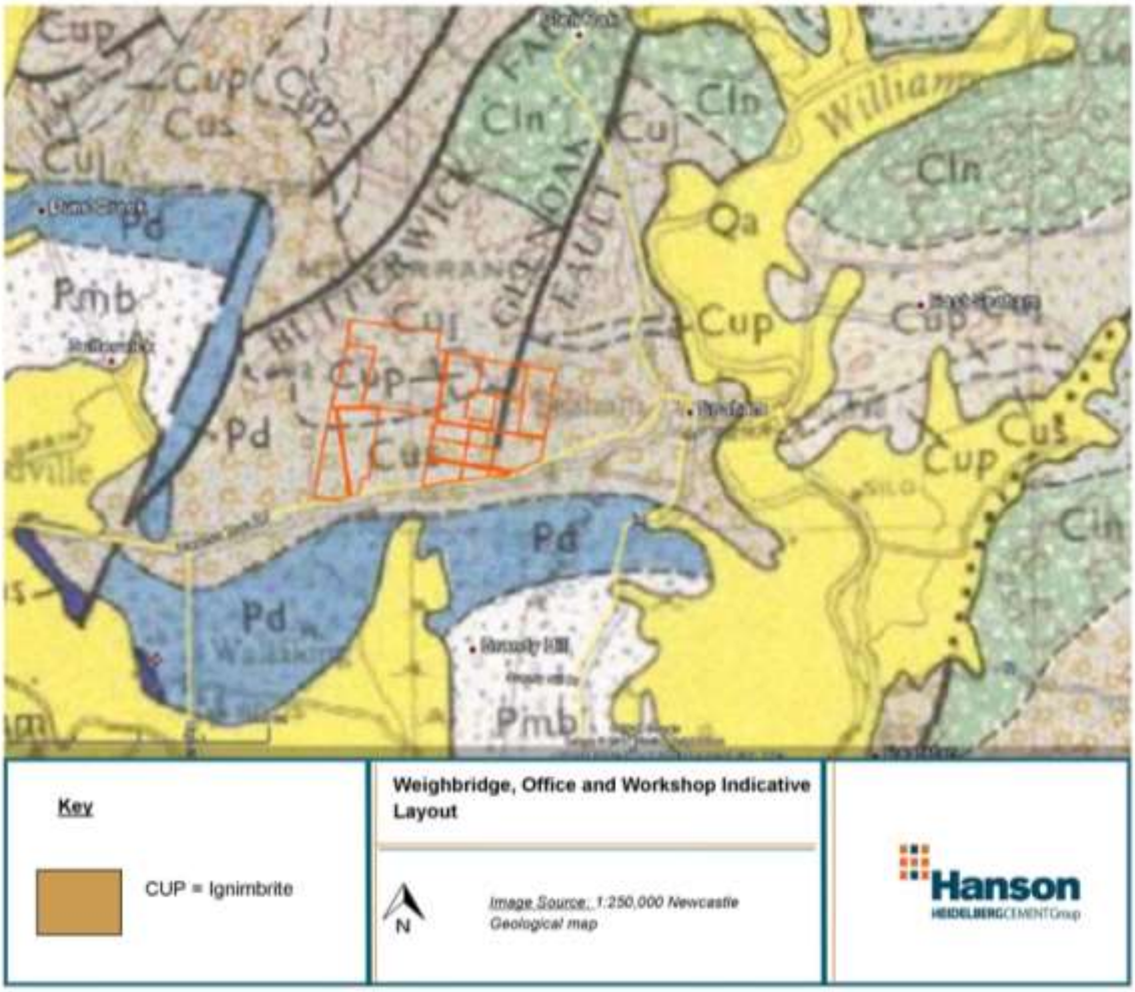

Figure 2.4:Extract from the 1:250,000 Newcastle Geological map.

"Cup" shows where ignimbrite is located.

A transformation fault is located on the south eastern corner of the site which is based around the outcrops of the Patterson Volcanic. See **Figure 2.5.**

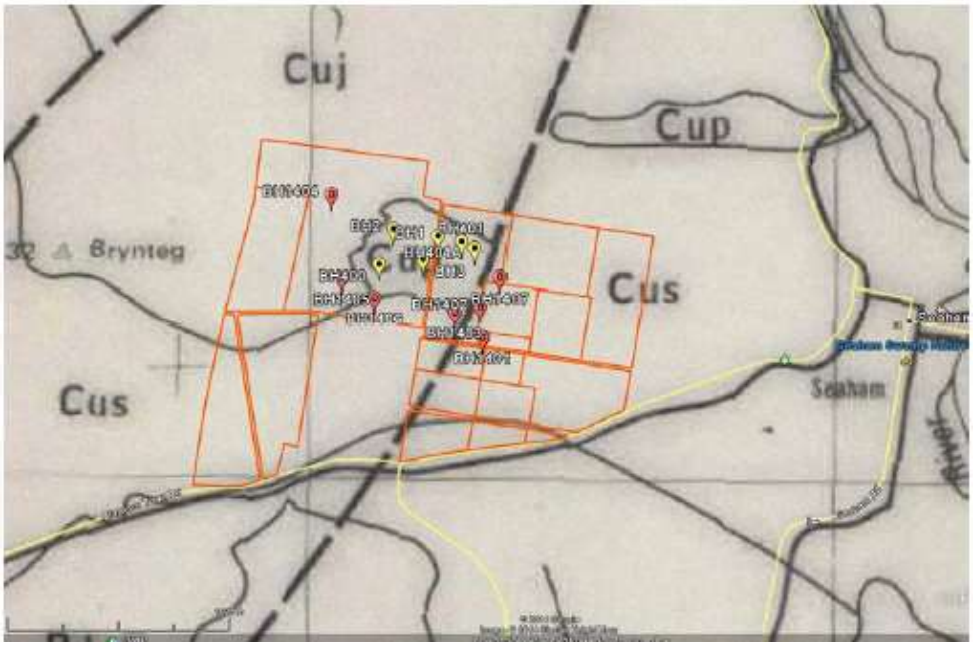

Figure 2.5: Extract from the 1:100,000 Newcastle Geological map.

Cup is the ignimbrite. It shown the approximate location of the fault and drill hole locations. The Hanson properties are shown in orange outline.

A Geological Assessment of the project site was completed in 2014 (**Appendix 5**), which confirms the site geology, from the base of Mt Johnstone sediments, comprising mainly fine grained mudstone and sandstone to the Patterson Volcanics and finally the Seaham Glacial Beds comprising sandstone, mudstone and conglomerate.

The ignimbrite of the Patterson Volcanics are up to 60 meters thick but thin to the east and west. Additionally the 2014 drilling campaign indicated that these volcanics continue at depth past the mapped fault and further to the east than previously known.

The northern side of the Hunter River supports a carboniferous rock which is separated from the younger Coal Measure geology to the south by a fault system, known as the Hunter Thrust. The area is highly faulted which has cut off the geological unity abruptly.

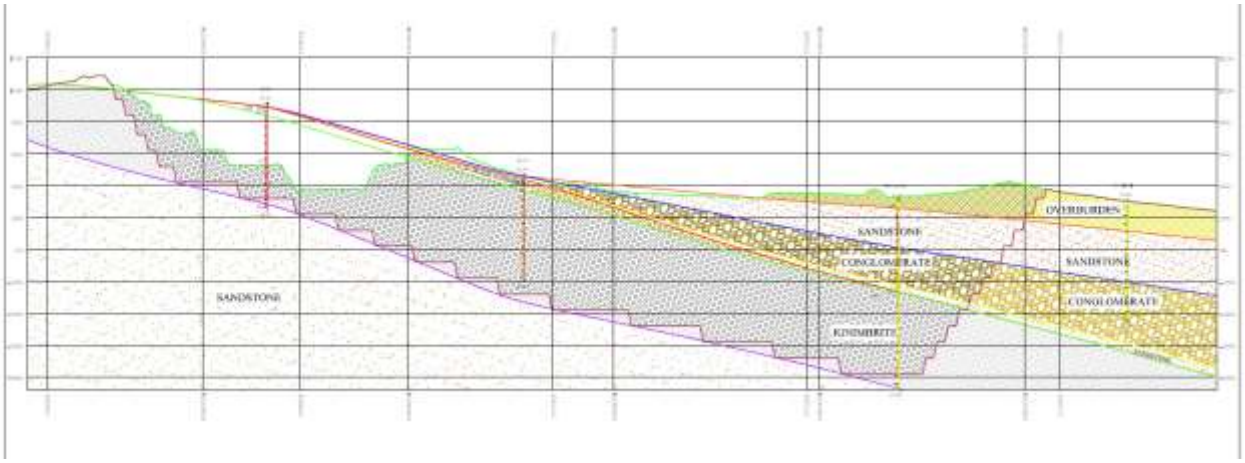

Figure 2.6: North West to South East Cross Section. Not to scale. Vertical exaggeration 2 times.

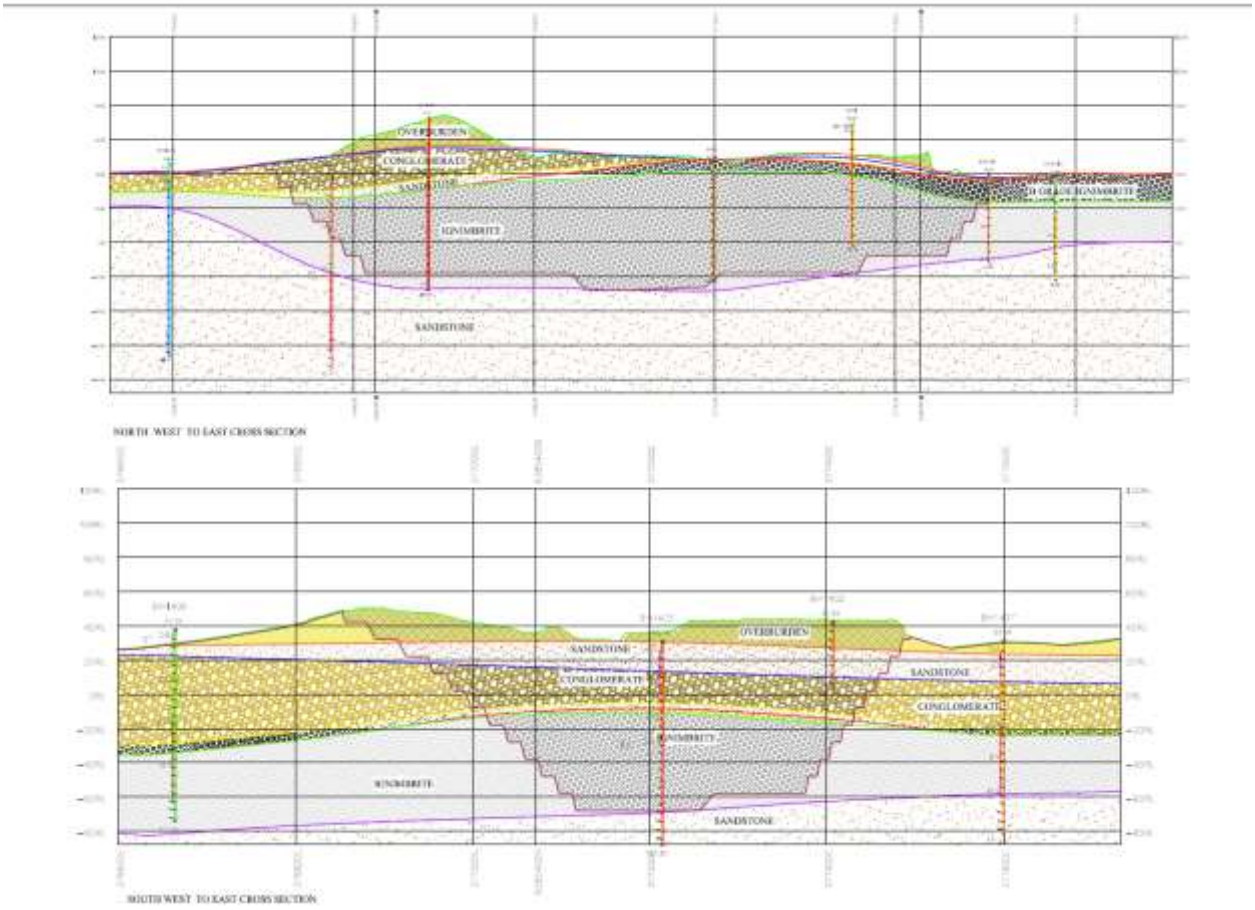

Figure 2.7: West to East Cross Sections. Not to scale, vertical exaggeration 2 times.

2.2.1 Resource available for extraction

The total available resource has been calculated based on the topography surface to the base of the ignimbrite (hard rock being quarried). The total volume in the proposed pit area is 39.7 million cubic metres[1].

The overburden has been modelled on the clay or deep weathering in the upper part of each drill hole. The depth varies over the site. The overburden volume based on drill hole lithology depth is 2.021 million bank cubic metres (**Appendix 5**).

Table 2.3:1: Production Resource Tonnage

JORC Classification	Type	Cubic metres (x'000)	Tonnes (x'000)	Reason for classification
Proven reserve	Overburden	4		The drill holes and interpreted basement indicate a body of Ignimbrite dipping to the south east. A loss factor of 10% is used here as most material is sold.
	Sandstone		83	
	B Grade		88	
	Ignimbrite		1,465	

[1] a volumetric term commonly used in mining to define a **cubic metre** of rock or material in situ before it is drilled and blasted

Sub total			**1,636**	
Measured resource	Overburden	2016		This relates to the resource below RL 30, the current approved limit and the extension of the pit to the south.
	Sandstone		7,182	
	Conglomerate		12,953	
	Sandstone		2,134	
	B Grade Ignimbrite		54,197	
Sub total			**76,466**	

Based on the information obtained during the drilling program in 2014, there are 78.1 million tonnes of ignimbrite, sandstone and conglomerate resource in the relevant resource areas.

2.3 Quarry Development

The planned development of BHQ has been broken into five stages, developed to optimise extraction of the available ignimbrite. The 30 year life of the quarry may vary due to extraction based on product demand. The five staged, pit development plans will be progressively prepared, reviewed and updated as required. Each stage plan will identify the part of the quarry pit to be worked annually, to remain aligned with longer-term planned stages. The pit development plans allocate overburden placement to avoid double handling and identify areas where rehabilitation is able to commence.

2.3.1 Stage 1

The initial stage expands the western end of the quarry towards the south and extends existing benches running southwest to northeast and deepens the quarry pit floor from RL 32 m to RL 22m (AHD) as indicated in **Figure 2.8**. Overburden from this area will be used to create a bund wall at the southern end of the final plant location. This will allow sufficient time to rehabilitate the area to act as a visual shield from residences and traffic along Clarence Town Road when the plant is moved during stage four.

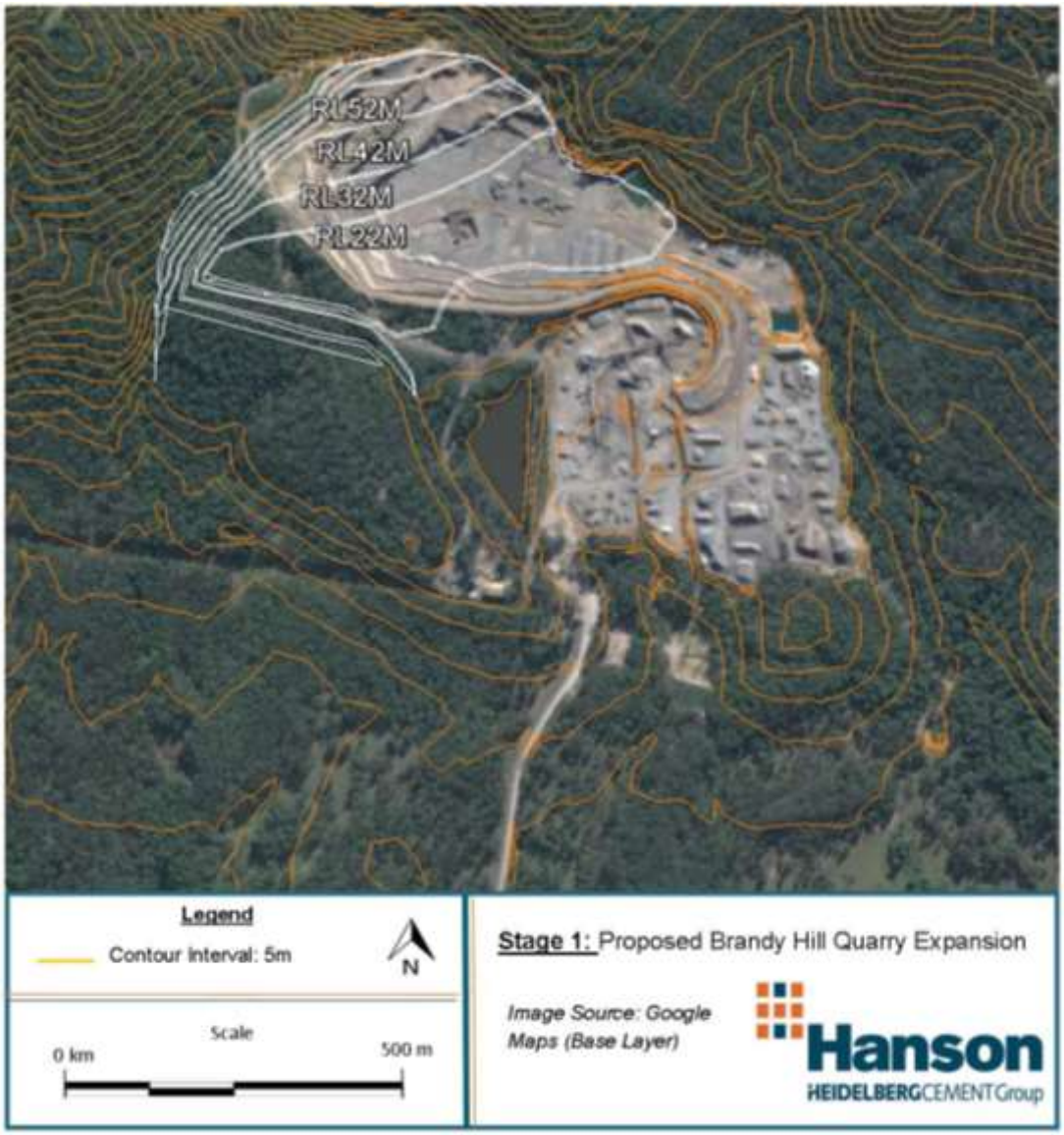

Figure 2.8: Stage 1 of the proposed quarry expansion.

2.3.2 Stage 2

Stage 2 further expands the existing western end of the quarry southwards to the proposed quarry-expansion boundary and creates seven broad benches. Bench heights will typically be around 10-12 metres. The quarry pit floor from RL 22 m to RL -8m (AHD) as indicated in **Figure 2.9.**

Overburden from this area will again be used to build the bund wall at the southern end of the final plant location. Topsoil will also be used to rehabilitate the upper benches above RL 20m (AHD) as these benches will remain exposed upon completion of quarry rehabilitation. Rehabilitation will be continual from stage two onwards and all final form areas will be planted with self-sustaining native vegetation communities and native grasslands. These communities will be selected based on the adjoining undisturbed areas as described in the Biodiversity Assessment Report (**Appendix 7)**.

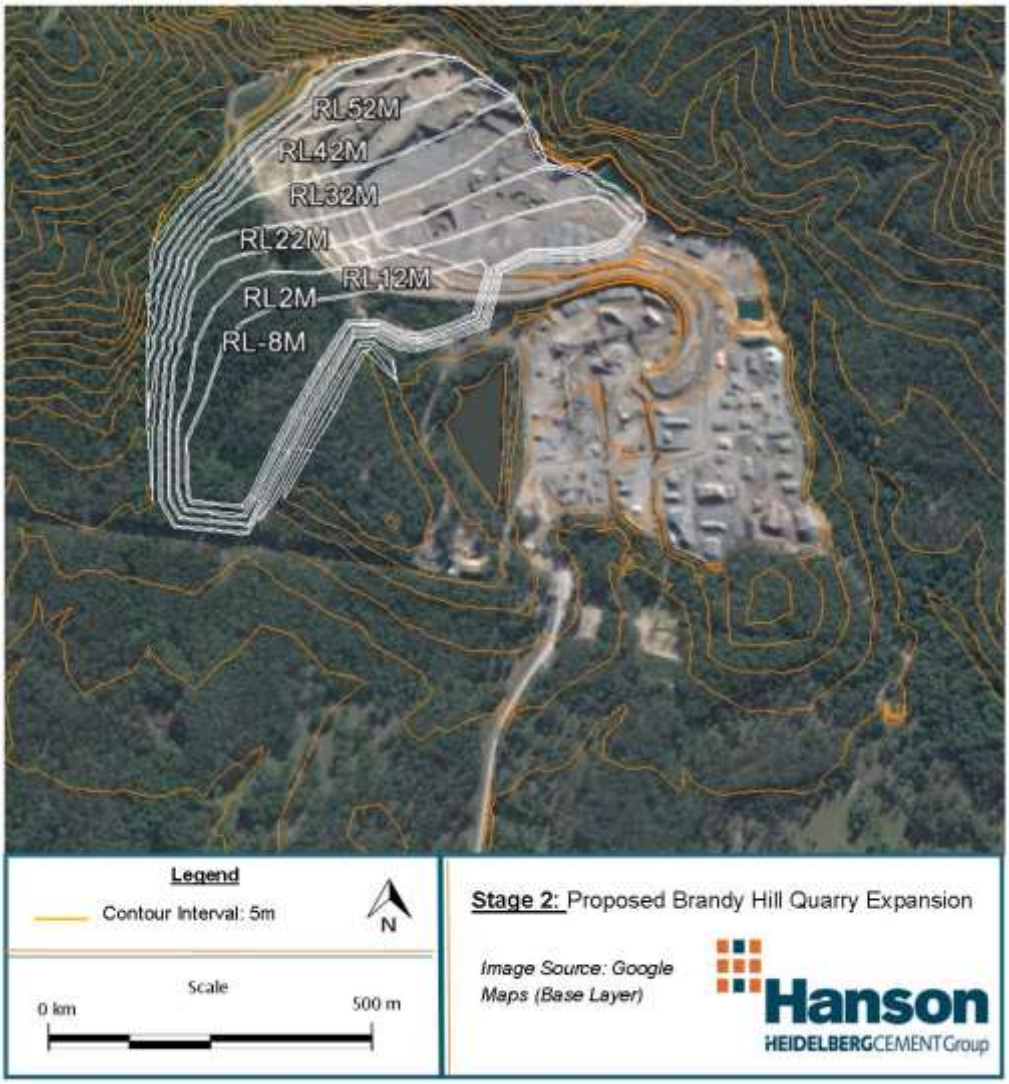

Figure 2.9: Stage 2 of the proposed quarry expansion

2.3.3 Stage 3

Stage 3 expands the quarry along the southern extraction boundary towards the existing plant infrastructure. The western dam is removed and ten broad benches are created with the pit floor lowered from RL -8 in stage 2 to RL -38m (AHD), see **Figure 2.10.** Overburden will be used for completing the bund wall and for rehabilitation of benches that have reached their final form. A water storage sump will be located on the quarry floor to replace the western dam upon its removal.

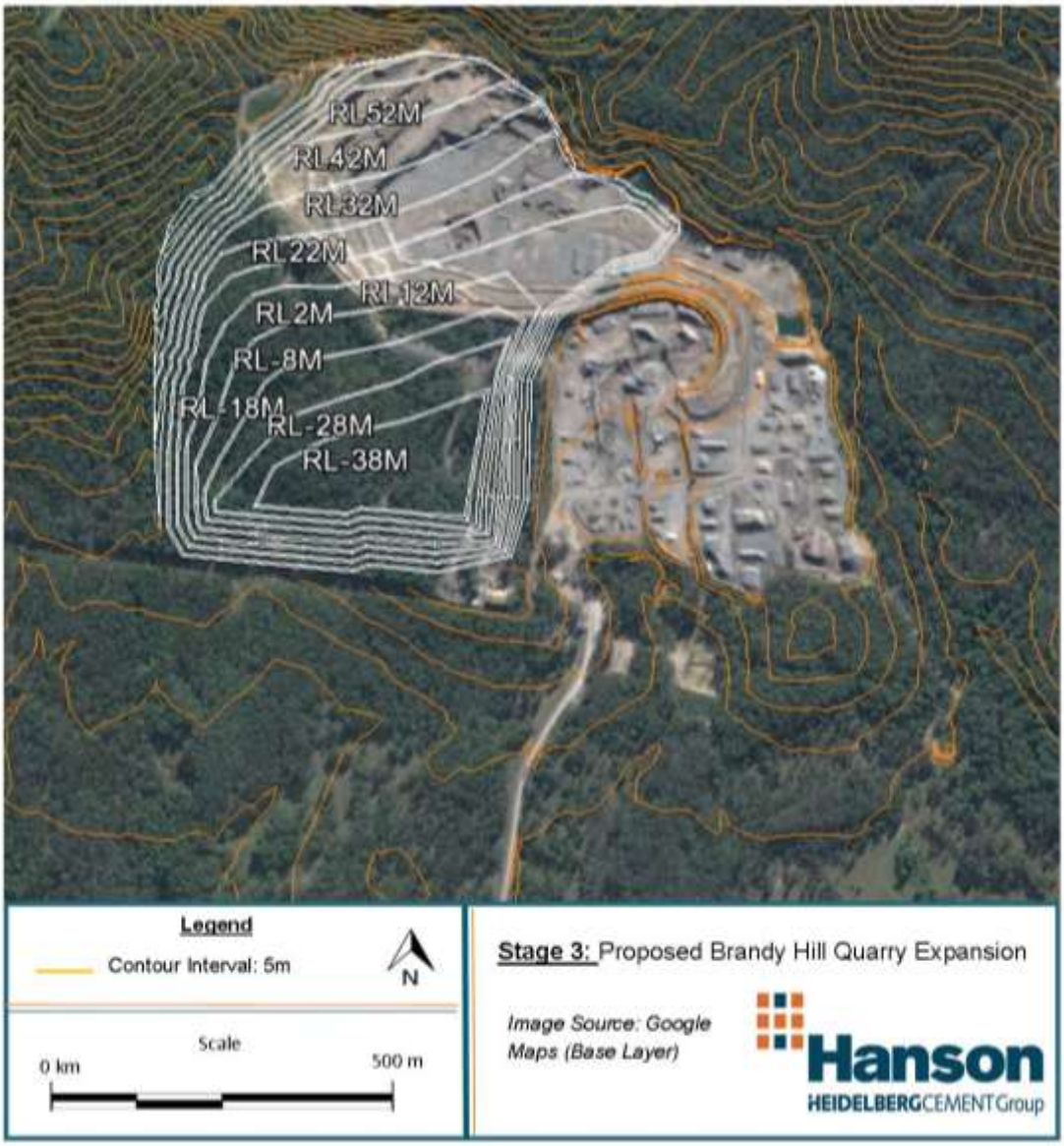

Figure 2.10: Stage 3 of the proposed quarry expansion.

2.3.4 Stage 4

Stage four entails widening and deepening the benches towards the eastern extraction boundary. This stage will involve moving the existing fixed plant and stockpiles to the area allocated as the final plant location. The weighbridge, amenities and maintenance building will be relocated to suit the pit form (refer **Figure 2.13)**. At this stage there will be twelve benches, some of which will be active and others at progressive or final stages of rehabilitation. The quarry pit floor will be lowered from RL – 38 (AHD) to RL -58m (AHD), see **Figure 2.11**. This is the final stage, where previously undisturbed land will be stripped to allow access to the resource material and to relocate the fixed plant and stockpile area.

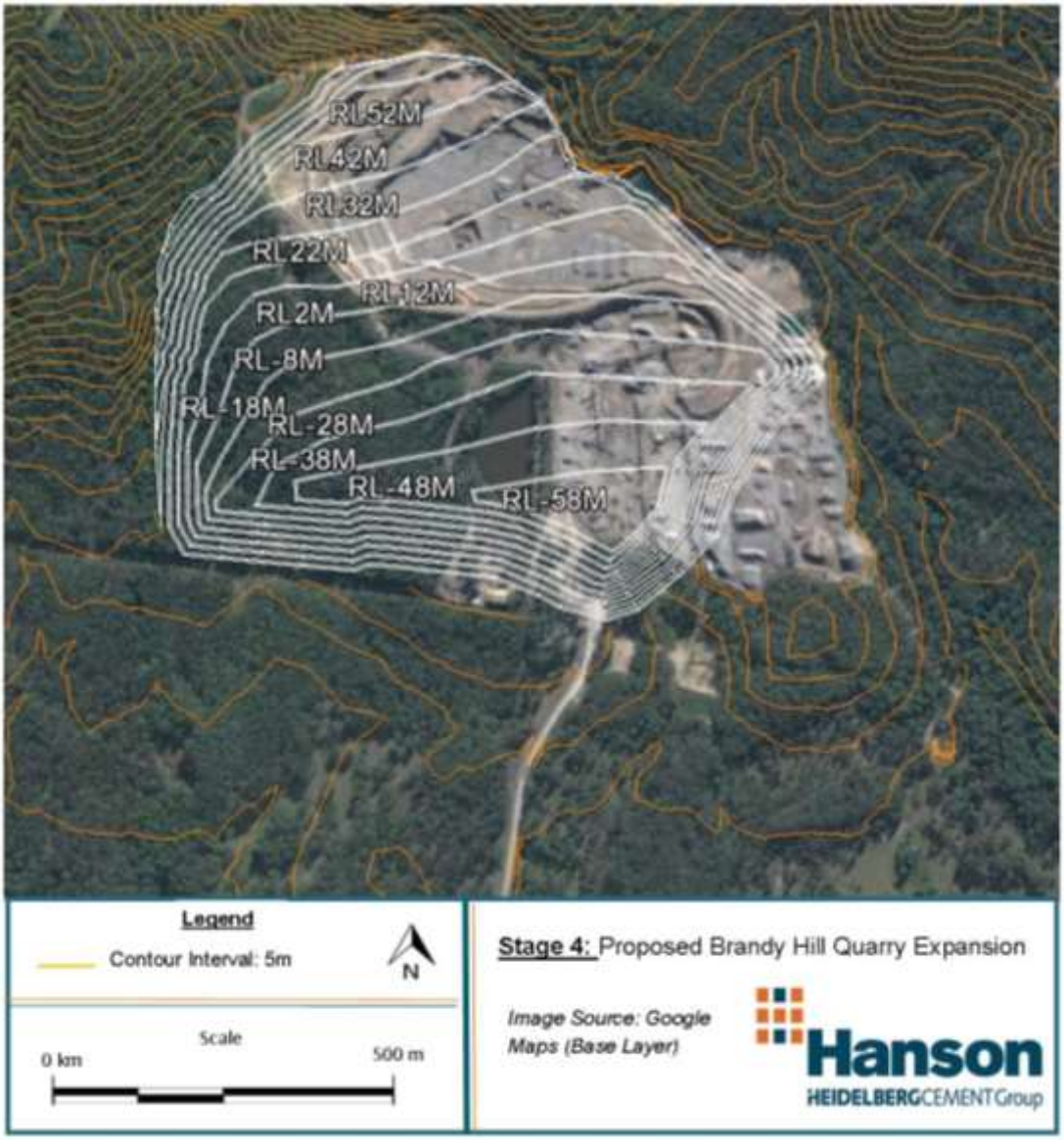

Figure 2.11: Stage 4 of the proposed quarry expansion

2.3.5 Stage 5

The final stage of the planned pit realises the final form of the quarry. This stage expands the quarry to the proposed extraction boundary at the eastern and southern end. The final pit will consist of fourteen benches and the quarry pit floor will be lowered from RL -58 AHD in

stage 4 to RL -78m (AHD), see **Figure 2.12**. The rehabilitation plan is outlined in detail in **Section 5.16**.

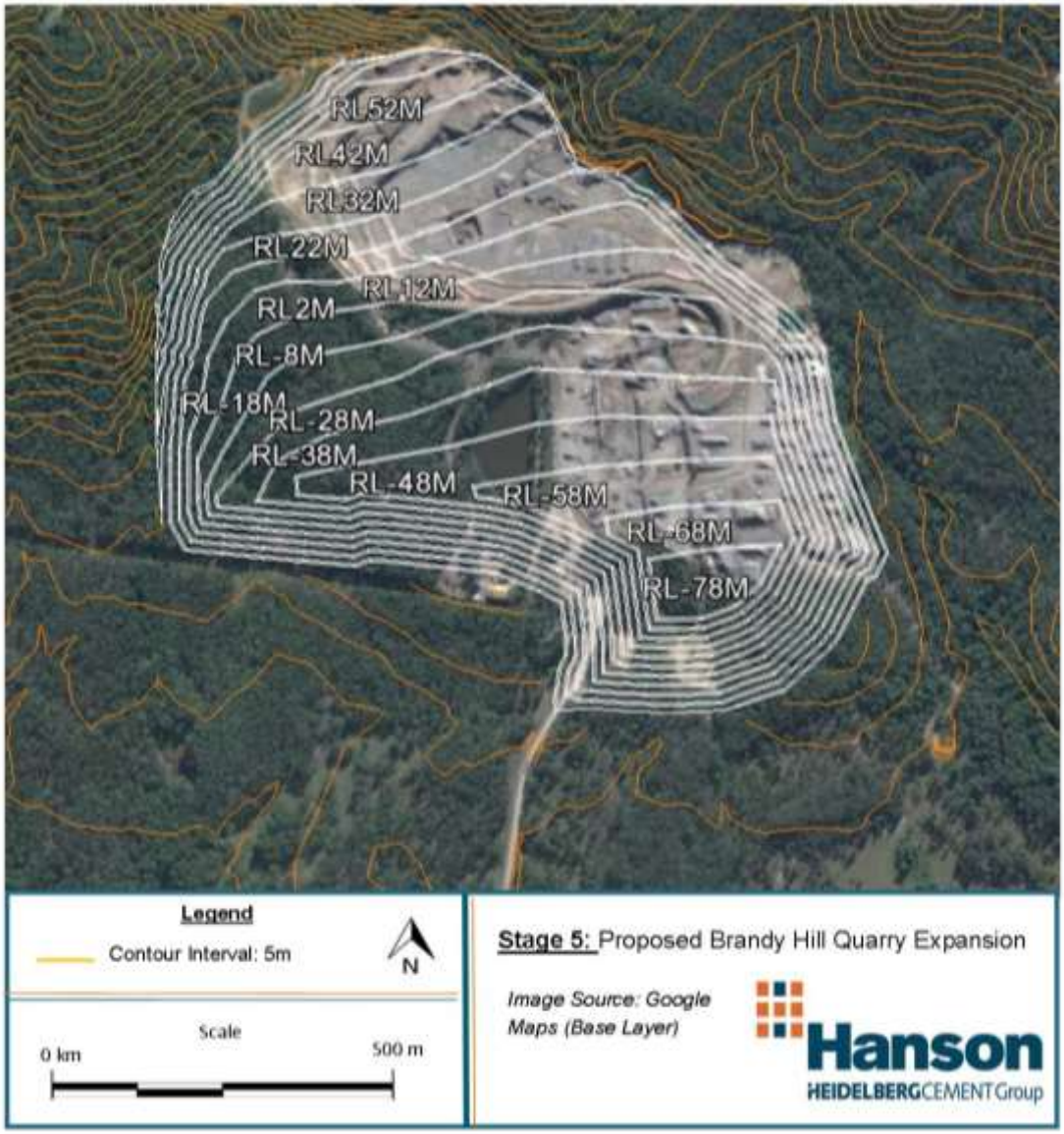

Figure 2.12: Stage 5 of the proposed quarry expansion.

Progressive rehabilitation will occur from Stage 2 – Stage 5 as detailed in **Figure 2.13** below.

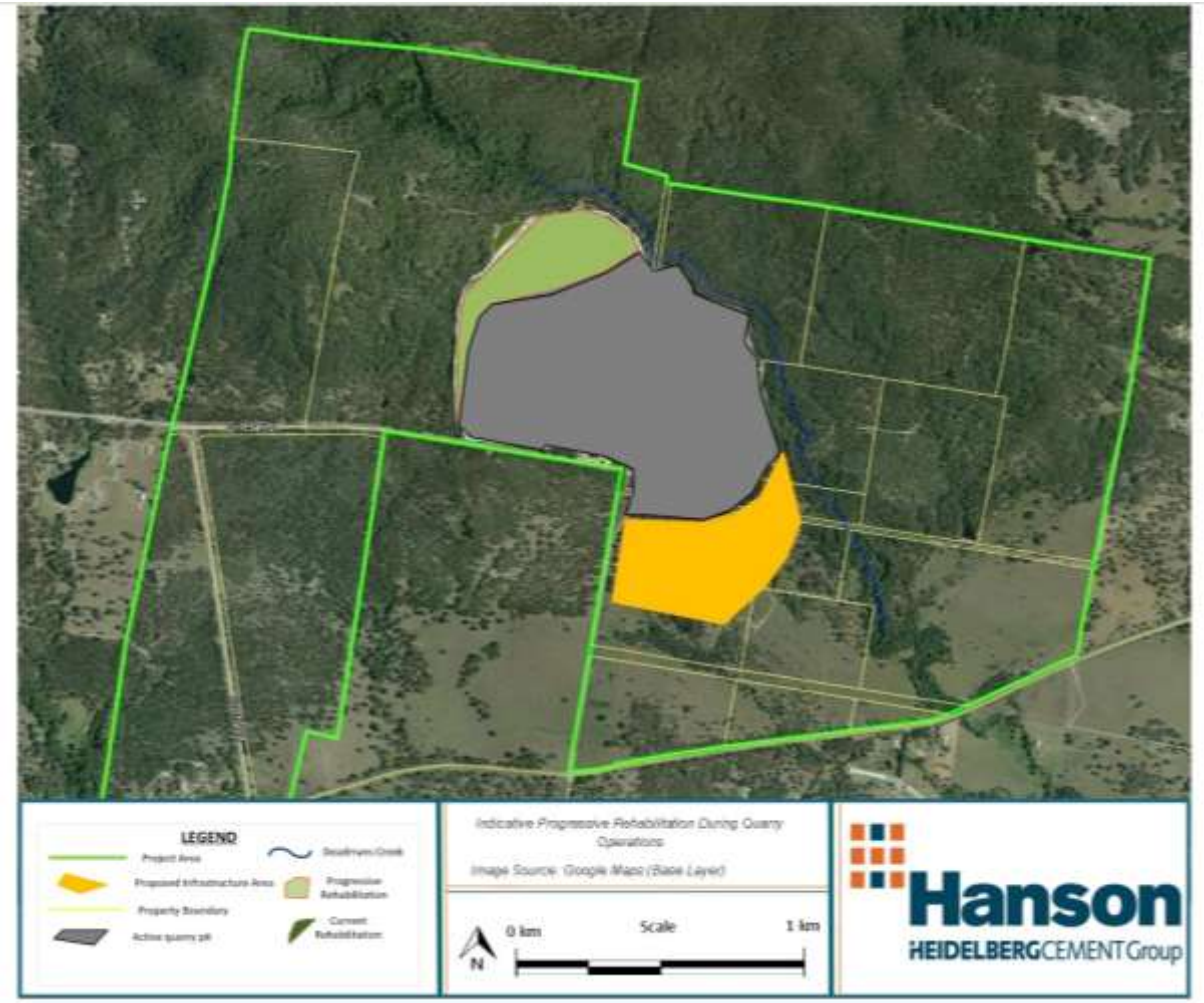

Figure 2.13: Indicative Progressive Rehabilitation during Quarry Operations

2.4 Layout of the Proposed Development and Plan for Building Works

Hanson proposes to relocate the existing processing plant, offices, ancillary structures, pre-coat plant and stockpiles to the infrastructure area location within the orange section of **Figure 2.14**. The infrastructure area, shaded in orange, is also proposed to include a recycled concrete processing plant and concrete batching plant. Hanson has developed a preliminary building and works layout plan for this area (**Figure 2.14**). Relocation and construction is anticipated to be completed in stage 4. This will allow the recycling and concrete plant to be built beforehand if needed. The exact layout may be altered in response to advances in technology, building design, stockpile layout and weighbridge location. Hanson will design an 18m high screening bund to shield views of the 'orange' infrastructure area and the pit. This is fully examined in full in the *Visual Impact Assessment* **(Appendix 15).**

An indicative development layout is shown **Figure 2.14 - Figure 2.20** below;

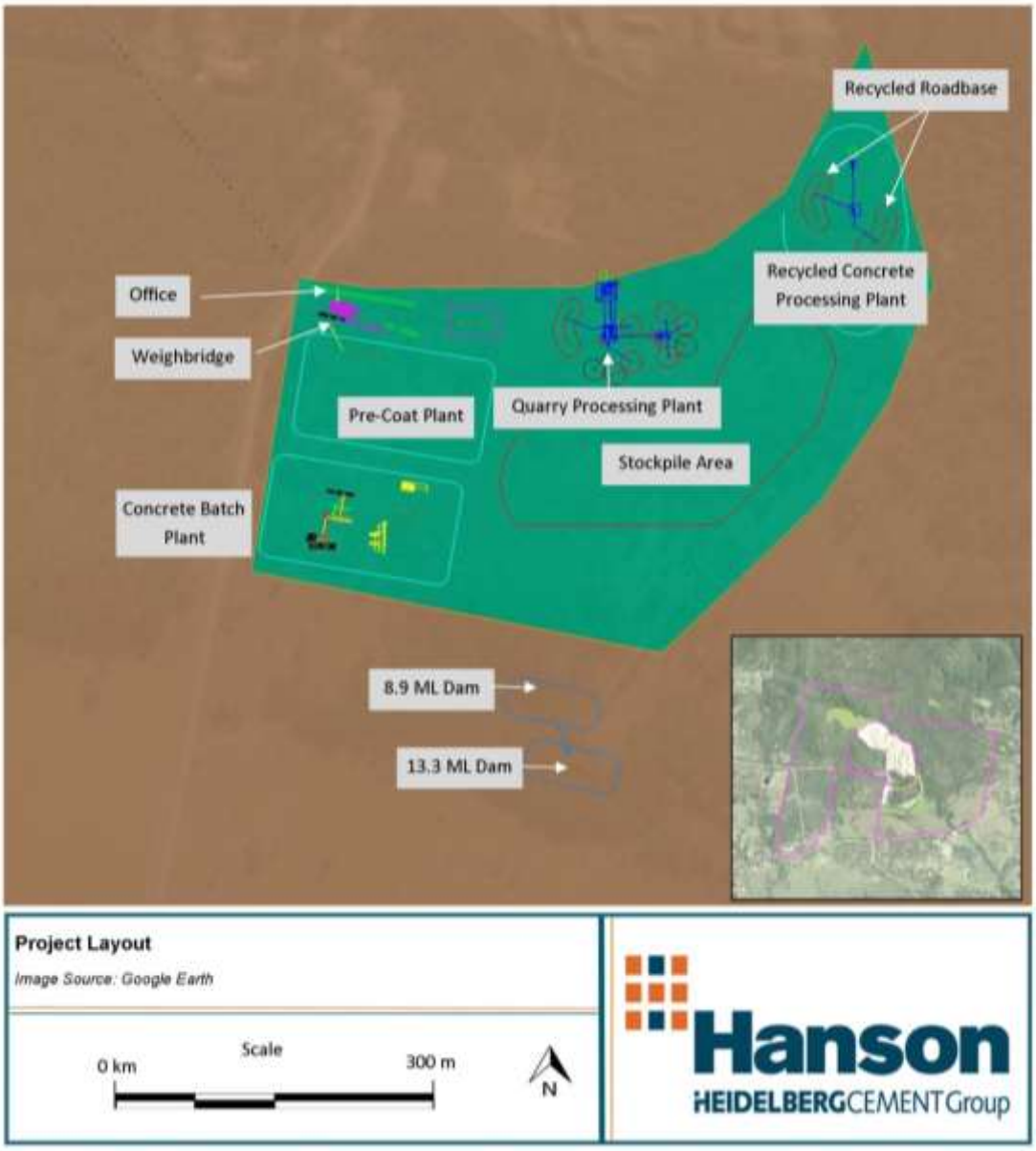

Figure 2.14: Indicative Layout

Additionally, the key components of the infrastructure area have been re-produced in the following sub plans.

Concrete Batch Plant

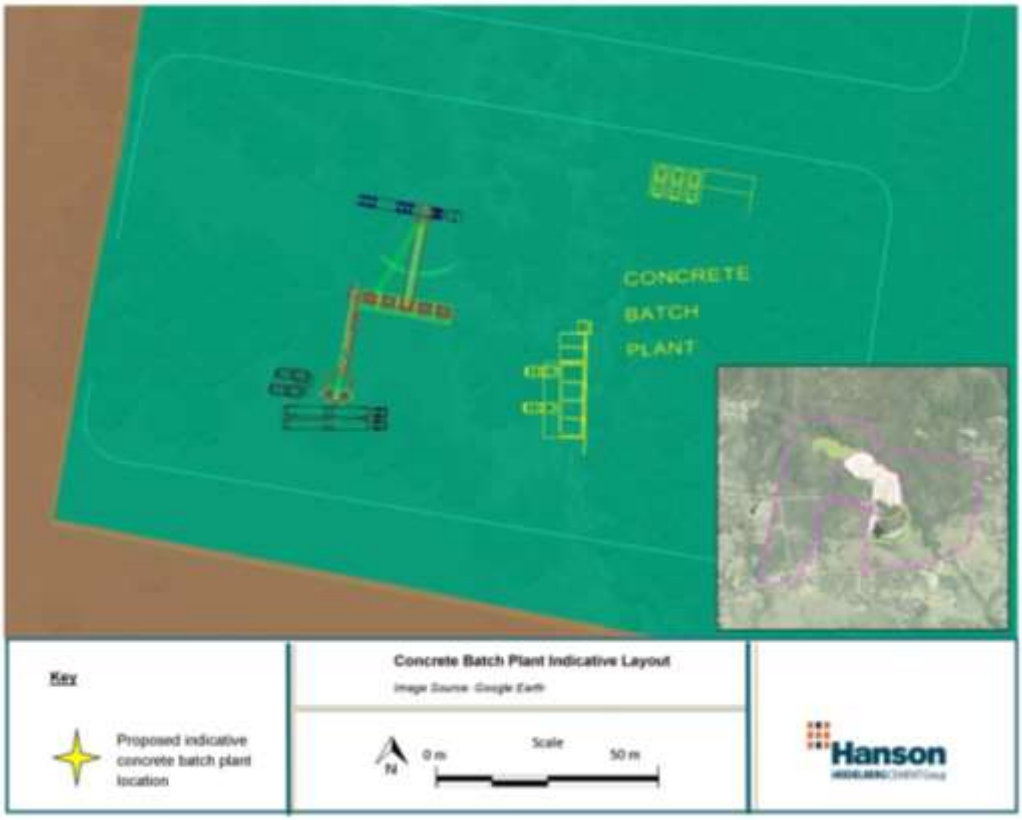

Figure 2.15: Concrete Batch Plant Indicative Layout

Pre-Coat Plant

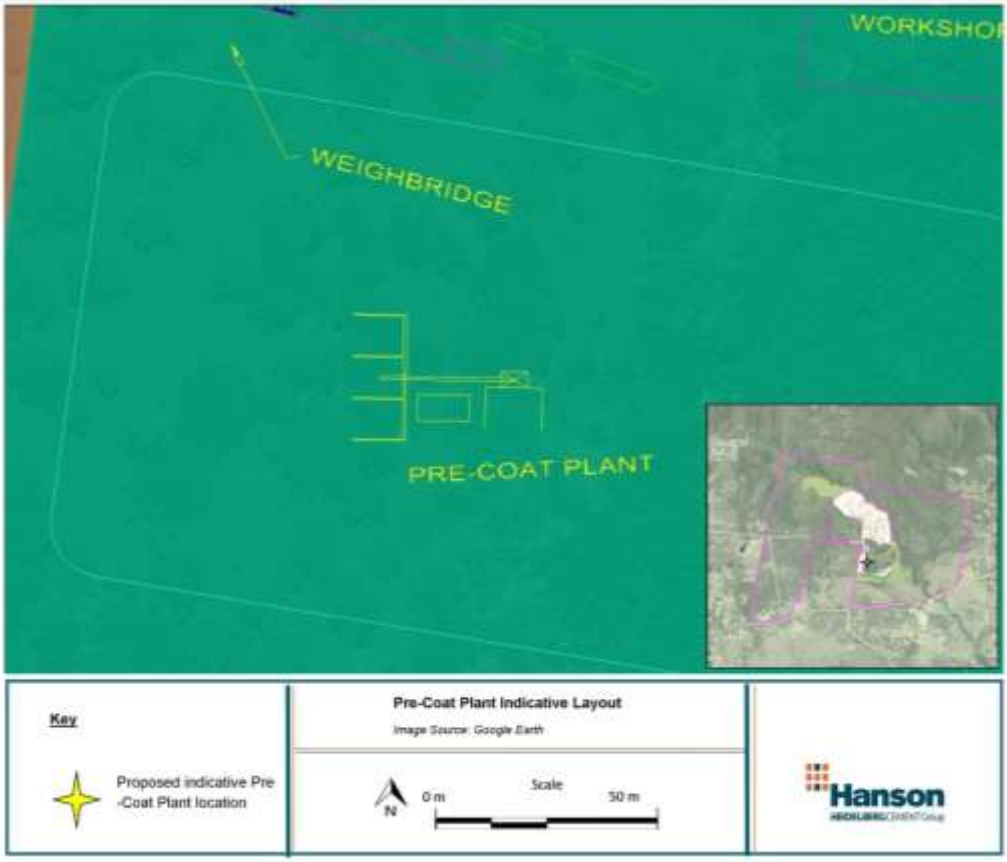

Figure 2.16: Pre-Coat Plant Sub Plan

Workshop, Office and Weighbridge

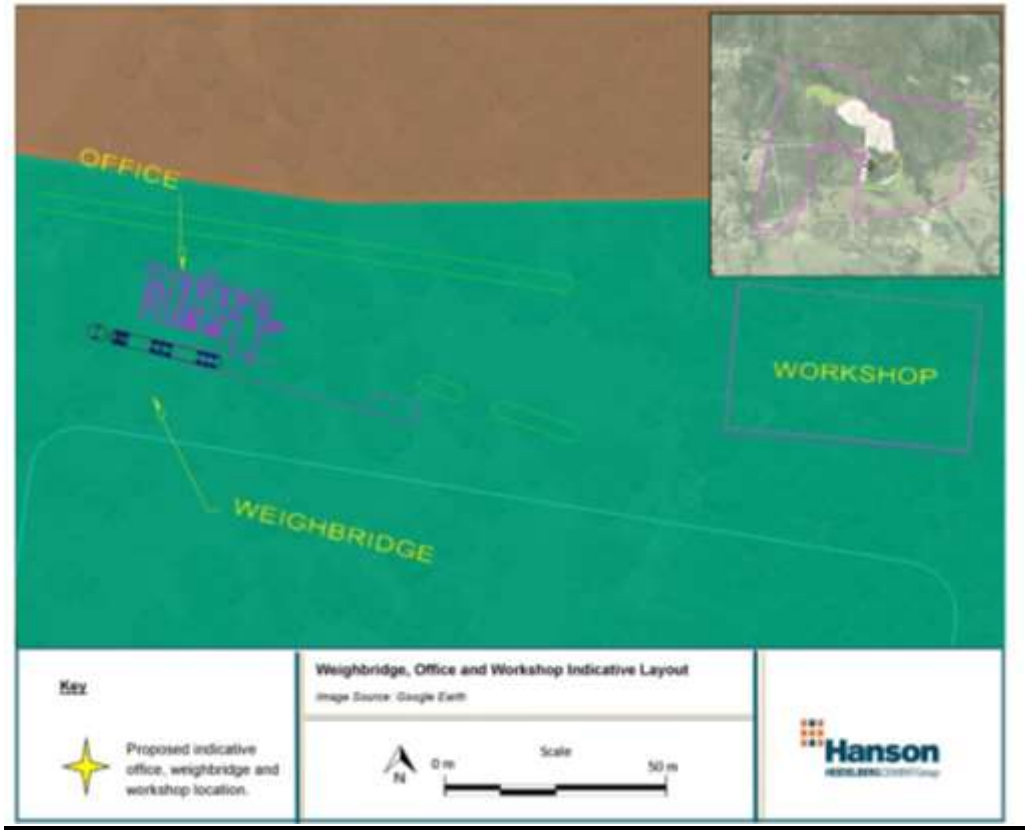

Figure 2.17: Office, Weighbridge and Workshop Sub-Plan

Quarry Processing Plan

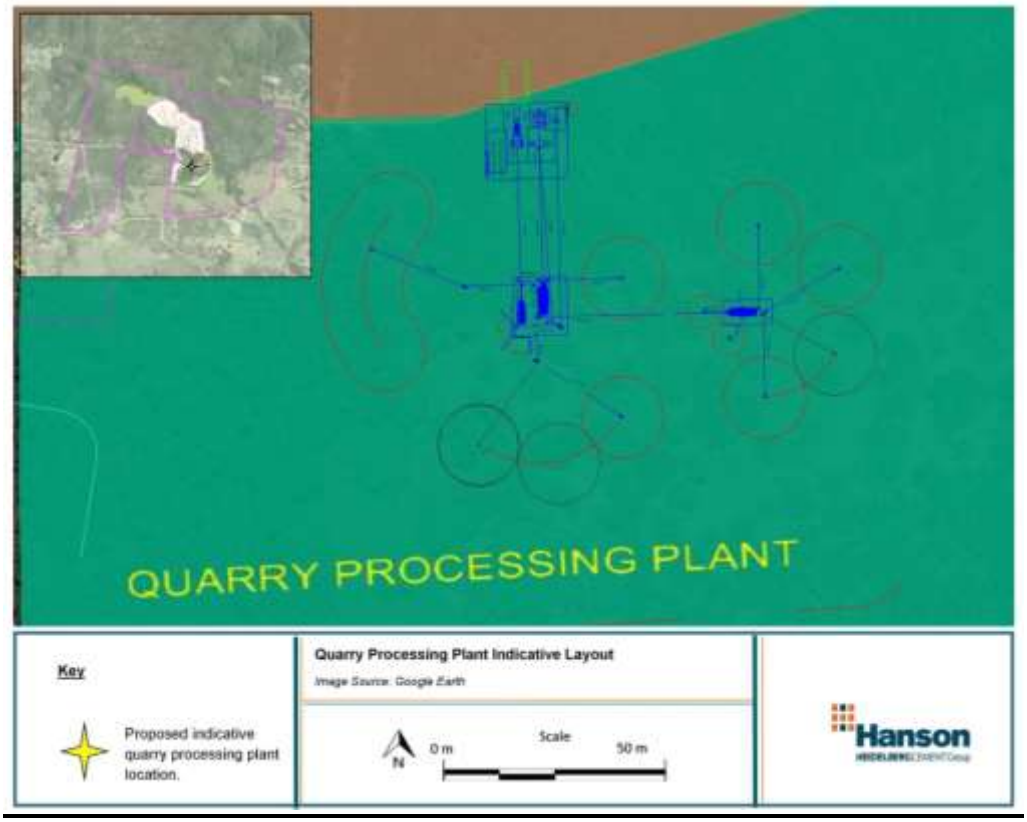

Figure 2.18: Quarry Processing Plant Sub-Plan

Concrete Recycling

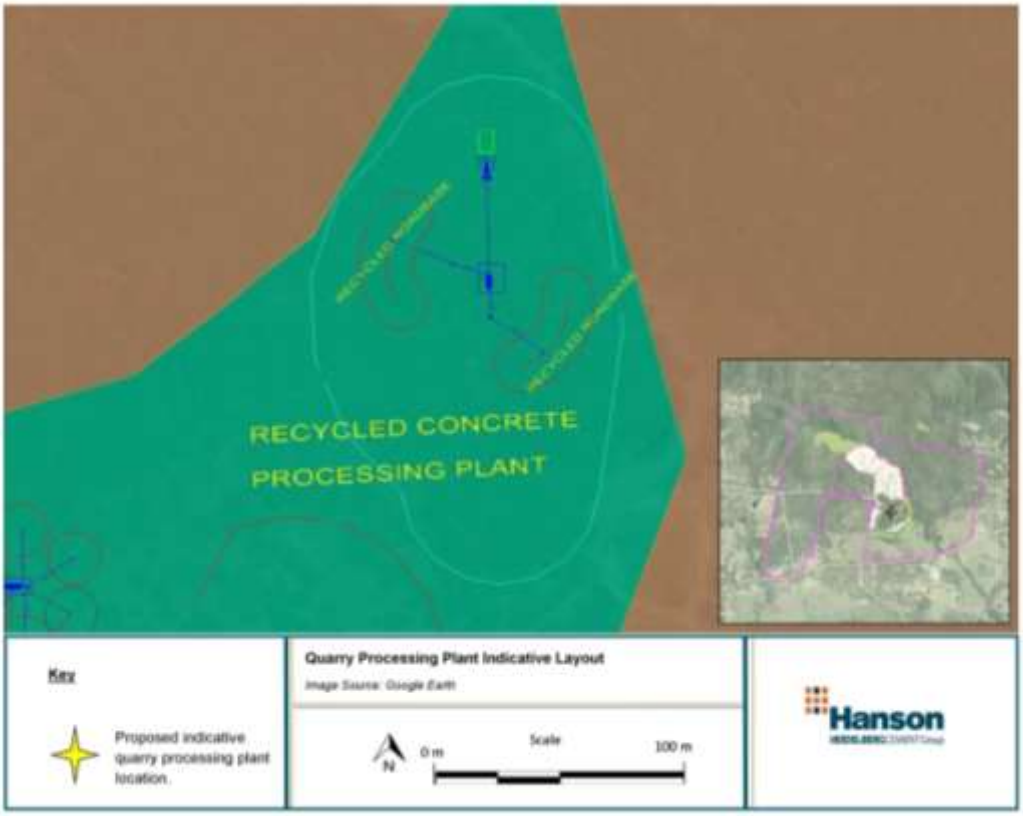

Figure 2.19: Concrete Recycling Sub Plan

Stockpile Area

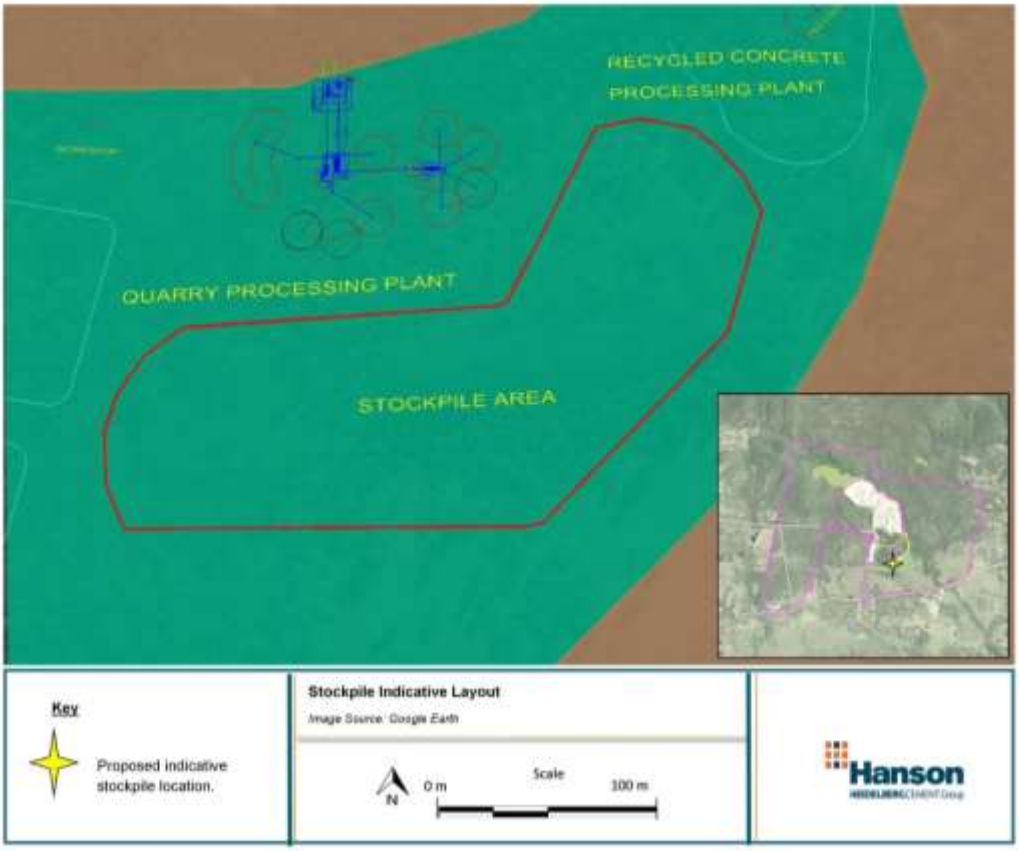

Figure 2.20: Stockpile Location Sub-Plan

2.5 Infrastructure and equipment

Current quarry operations utilise mobile equipment shown in **Table 2.5:1- Table 2.5:3.**

Table 2.5:1 Infrastructure and Equipment

Type of equipment	Brand	Model
Front End Loader	Komatsu	WA500-6
Front End Loader	Komatsu	WA500-6
Front End Loader	Volvo	L250G
Dump Truck	Caterpillar	773B
Dump Truck	Caterpillar	773E
Excavator	Komatsu	PC600
Excavator	Komatsu	PC450
Water Cart	Caterpillar	773B

Current quarry operations utilise the following fixed plant:

Table 2.5:2: Fixed plant components used in current operations

Type of equipment	Brand	Model
Crusher	Jaques	48" x 42" double toggle jaw
Crusher	Jaques	4' gyratory
Crusher	Allis Chalmers	60" gyratory
Crusher	Kawasaki	1200 cone
Crusher	Rotorpactor	MKII
Vibrating screen	Jaques	4' x 10' double deck
Vibrating screen	Jaques	6' x 16' double deck
Vibrating screen	Jaques	8' x 20' triple deck
Vibrating screen	Malco	8' x 20' triple deck
Vibrating screen	Malco	8' x 20' triple deck
28 conveyor belts		
Pug mill plant	Arran	200
Pre coat plant	No brand	

Miscellaneous equipment used on site includes:

Table 2.5:3: Miscellaneous equipment used on site

Type of equipment	Brand	Model
2" pump electric	Orange pumps	C1850
2" pump electric	DAB	n/a
4" diesel pump	Australian pump industry	Type B4KQ-4/st
4" diesel pump	Gorman – Rupp	T series
6" diesel pump (hired)	Yakka	150

Other equipment is hired as needed. The above items are the primary equipment used on site. Mobile plant or fixed plant will likely be replaced, upgraded or complemented by new equipment purchased throughout the planned 30 year life of the quarry. These purchases would be standard capital expenditure over the life span of any quarry.

The proposed concrete batching plant at BHQ entails installing aggregate bins, cement storage silos, a batching office and a staff amenities building.

Hanson proposes to receive wash-out pit waste concrete from other plants to be processed on site into a recycled road-base product. The benefits of this include re-using and recycling waste materials and avoiding waste material being placed into landfills. No new

infrastructure would be required to facilitate recycling the concrete. The fixed plant will crush the unused concrete material to make a final product. The unused concrete material will be stockpiled on site until a suitable quantity is available, this will then be crushed along with quarry material to make a road base product.

2.6 Employment at Brandy Hill Quarry

By extending the life of BHQ by 30 years, the current workforce of 20 operators, contractors, supervisors and management will be retained. Should consent be granted to increase production to 1.5 million tonnes per year, a larger workforce of around 30 employees would be employed.

The concrete plant will employ up to five (5) concrete agitator truck drivers, one (1) batcher and one (1) concrete plant manager.

Concrete waste recycling will employ two drivers to transport the unused concrete from Hanson concrete plants to BHQ for stockpiling while waiting to be crushed. This recycled product would be used at BHQ and may also be transported to other Hanson quarries to produce more environmentally sustainable road base materials throughout the region. The Brandy Hill Expansion Project is anticipated to inject vital economic benefits into the local economy. Employment opportunities will be created in the labour and trade employment sectors. Additional benefits include employment opportunities during the construction and operation phases' of the Project, and flow on effects to the local economy.

Increasing BHQ workforce, due to rising production levels, along with the addition of the concrete plant and associated employment opportunities, is further discussed in the Project's *Socio-Economic Impact Assessment* (**Appendix 17**).

2.7 Hours of Operation

The proposed hours of operation are outlined in **Table 1.3:2.**

Blasting

Hanson is proposing to blast between 8am and 5pm Monday – Friday only.

Load and Haul

Load and haul is one of the essential activities to quarrying in which blasted material is transported from the quarry pit to the primary crushing plant. Although the quarry is currently permitted to operate quarrying activities 24/7, including load and haul, Hanson is proposing to limit this particular activity to occur between the hours of 5am to 12am Monday-to-Saturday. There would be no load and haul operations occurring on Sundays or public holidays.

Primary Crusher

Historically the primary crusher has been operated outside of normal business hours from time-to-time. There are a number of factors that have influenced the need for this to occur. Primary crusher downtime for repairs and maintenance has been the dominant cause of the quarry having to operate for extended hours in order to catch-up on lost production.

Other factors that combine to require night-time crushing revolve around safety requirements and conducting major repairs and maintenance. Examples of this include repairs to the

grizzle feeder, liner changes and crane work. To comply with work place health and safety requirements, the quarry must conduct maintenance activities during daylight hours.

For these reasons, enabling primary crushing operations at all hours is a key factor to the quarry being able to meet production demands in a safe and efficient manner.

Secondary and Tertiary Plant

The secondary plant involves the further crushing of raw feed from the primary through a secondary and tertiary crusher to further reduce the size of the rock into typical usable aggregate sizes and shape.

This process also involves sorting the different aggregate sizes through a series of screen houses which are then sent to stockpile by stacking conveyors.

The secondary and tertiary crushing and screening process is a far more intensive process than the primary crushing system.

This is due to the ratio of rock size reduction as well as the targeted aggregate size screening process. The shape of the aggregate is a further factor affecting the performance of these materials in concrete, road base, and asphalt products. These factors add significant complexity to quarrying operations.

For these reasons secondary and tertiary crushing and screening processes normally have lower production rates than load and haul and primary crushing operations. BHQ production rates for the secondary and tertiary plant are typically half that of the primary crusher.

To meet the projected demand of 1.5 million tonnes per annum of quarry products from the quarry, secondary and tertiary plant needs to operate continuously for 144 hours per week. Combined with a higher level of repair and maintenance required due to the amount and complexity of equipment involved, these factors require the secondary and tertiary plant to operate on a 24 hour, 7 days per week basis.

Sales and dispatch

The bulk of quarry products are generally sold and transported during the hours of 5am to 6pm weekdays, and 5am to 3pm on Saturdays. Historically there have been occasions where customers will require quarry products outside these normal hours. A primary example is materials used for road construction and maintenance or airport upgrades.

Concrete and asphalt plants also receive aggregate materials outside normal business hours. The factors for this are related to travel times from quarry to concrete batch plant during the day and truck congestion within the plants.

Maintenance

To maintain 24/7 quarry production it will be essential for repairs and maintenance to be able to occur at any time. It is also necessary to have a system of scheduled maintenance and breakdown repairs so as to minimise quarry processing plant stoppages so that production is not delayed which causes delays in deliveries to customers and disruption to employee productivity.

Implications of not operating as per Table 1.3:2

Not operating as proposed hours would have the following implications.

1. Projected demand of 1.5 million tonnes per annum of aggregate products would not be met. To do so, Brandy Hill Quarry's secondary and tertiary plant must operate continuously for 144 hours per week. This allows a 24 hour window per week for repairs and maintenance.

   The cost of not being able to operate 24/7 would manifest in loss of annual production and sales which in turn would result on a lower operating income and return on investment. Other consequences of this outcome would be the reduction in employee numbers and loss of business not only for the quarry but the quarry's customers.

2. As detailed above there are certain primary crusher repairs that for Occupational Health and Safety (OH&S) reasons are considered to be only safely undertaking during daylight hours. The cost of juggling the competing interests of crushing and repair work during daylight hours would result in a loss of primary crusher production and inability to meet annual projected demand. Again this would manifest in loss of annual production and sales which in turn would result on a lower operating income and return on investment. Other impacts include a reduction in employee numbers and loss of business not only for the quarry but the quarry's customers.

   The logical scheduling of quarry tasks best suited to certain times of the day is an important consideration in the orderly and efficient management of quarry operations.

3. In relation to 24/7 sales and dispatch there are benefits to be gained by reducing the peak day time demand for quarry products. Allowing customers to receive goods after hours because they prefer to optimise use of their transport fleet or because their projects are restricted to night work only is an essential and pragmatic response.

2.8 Project Need and Justification of Project Scale

Trade in extractive and agricultural resources from the Hunter and surrounding regions has driven investment in transport networks and gateways within the region.

2.8.1 Maximum Production Capacity

BHQ produces up to 700,000 tonnes of products per year, from a source material that is primarily ignimbrite. This annual production and sales limit is governed by the maximum quantities prescribed in the quarry's Environmental Protection License. Over the past five years, Hanson has had to restrict production and sale of quarry products to keep within this limit.

The recent closure of Wallgrove and Penrith quarries has increased pressure on Hanson's Kulnura and Bass Point (Shellharbour) quarries to meet the demands of the Sydney market. Historically the Kulnura quarry met the supply demands for the Central Coast and Newcastle areas. Brandy Hill Quarry is increasingly utilised in Newcastle and Central Coast markets and will supplement the previous supply form the Kulnura quarry.

The increase in the proposed annual production limit is essential for the Lower Hunter to plan for the ongoing productive use of extractive resource lands. Population forecasts by the NSW Department of Planning and Environment predict that the Lower Hunter and Central Coast regional populations are expected to grow by 42% over the next 15 years. This

increase in population will also see 47% increase in housing demand, which will require an additional 156,300 dwellings.

Table 2.8:1: Population projections for the Lower Hunter and Central Coast Regions.

Source: NSW Department of Planning.

	2016	2031	% change
Total Population	738,050	1,050,600	42%
Total Households	298,000	435,700	46%
Implied Dwellings	330,050	486,350	47%

According to the Cement, Concrete and Aggregates Association (CCAA) a typical house requires 110 tonnes of crushed rock and 53m^3 of concrete, which in the case of the Brandy Hill quarry this would amount to 90 tonnes of concrete aggregates, totalling 200 tonnes of hard rock quarry products per dwelling built.

The quarry is currently under pressure to increase its annual production volume above 700,000tpa (tonnes per annum). It is evident through population growth and the demand for new dwellings that by 2031 the quarry will be required to produce in excess of 1 million tonnes per annum (1Mtpa). As population projections are not available from 2031 to 2046 and based on current forecasts, a 47% increase from 2031 to 2046 would see the Brandy Hill quarry demand increase from 1Mtpa to over 1.5Mtpa.

Given the projected future demand for housing alone (not taking into consideration the amount of supporting infrastructure that would require quarry and concrete products) the proposed increase in an annual production and sales volume of 1.5M tonnes is justified.

2.8.2 Site footprint

The principal objectives for the proposed development are to deepen and extend the extraction area, to extend the life of the quarry and to maximise winning of an important and valuable resource, enabling Hanson to continue to produce a range of high quality aggregate and road construction materials.

The BHQ site was clearly identified in the Lower Hunter Regional Strategy 2006 (LHRS) **(Figure 2.21)** as important for extractive resources. The LHRS stressed the importance of protecting extractive resources for their optimal economic use and not sterilising land suitable for extractive purposes by enabling inappropriate land use. According to the LHRS and the more recently adopted Hunter Regional Plan 2036 (HRP) there needs to be careful consideration when planning land use to maintain access and sustainable use of the resources. Additionally urban and rural housing encroachment into identified extractive resource areas should be avoided. Housing development in accordance with the LHRS and the HRP should not impact on strategic or important extractive resource viability.

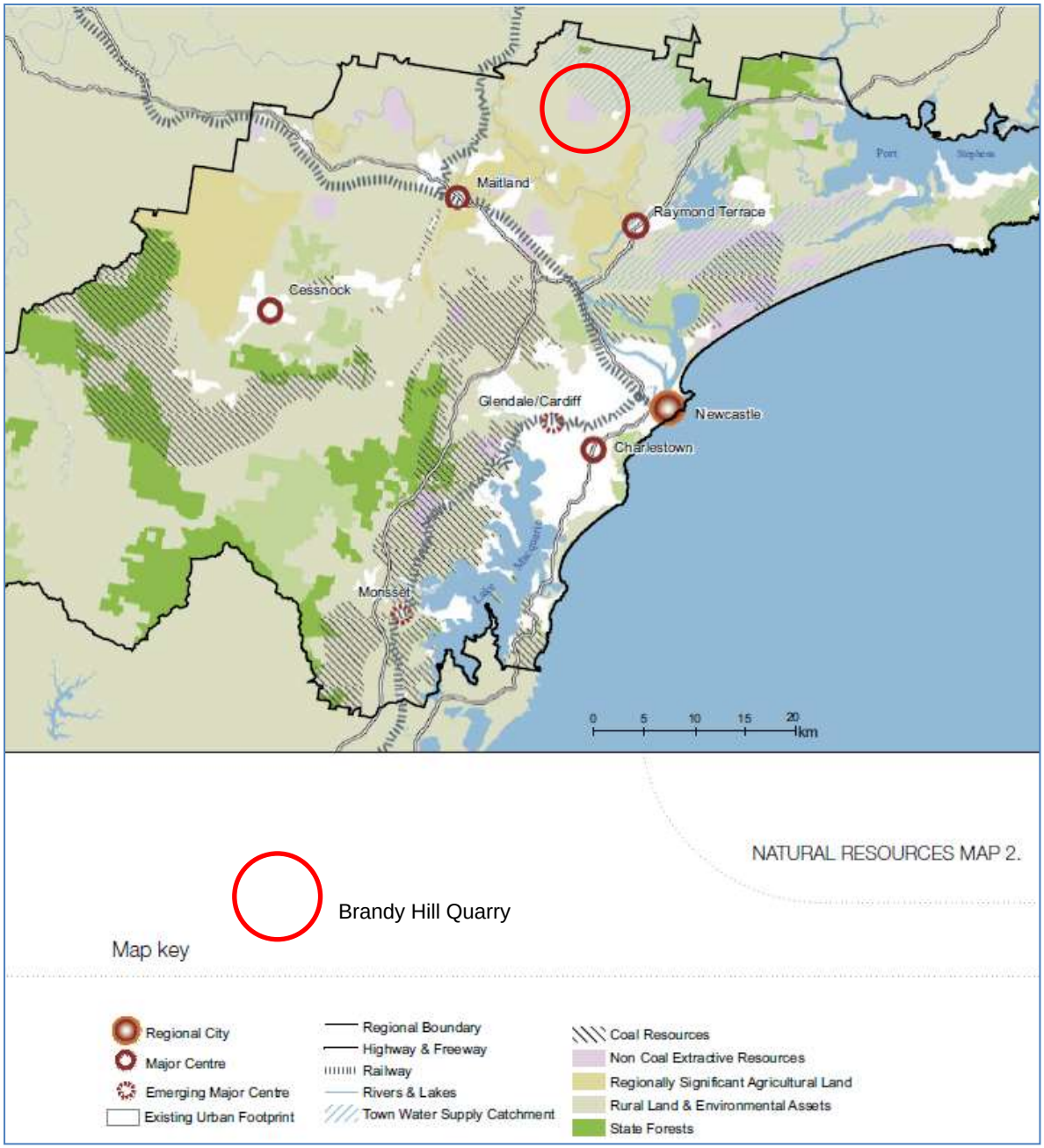

Figure 2.21- Lower Hunter Regional Strategy Natural Resources Map

The proposed development aims to extend the life of the quarry and increase the volume of material produced, resulting in the winning of a long term, valuable resource which has axiomatic benefits to the local and regional economies.

Extension of the existing quarry (rather than opening a new quarry in a nearby location) provides an efficient use of existing resources and infrastructure (access haul routes, shipping facilities etc.) whilst minimalising impact on adjoining lands.

The development provides an efficient and long term supply of construction grade aggregates to concrete batching plants, to the construction industry and for use in road base. In this respect the proposal will ensure continued and ongoing support to the

construction industry across the Hunter, Newcastle, and Central Coast regions providing high quality construction aggregate and hard rock materials for a range of purposes.

The site has excellent locational and strategic characteristics in respect to direct established access to the Pacific and New England Highways and access to the primary road network of the region and NSW.

2.8.3 Development Life

The Newcastle, Central Coast and Hunter regions will continue to experience land development resulting from population and economic growth. The main goals of the Hunter Regional Plan 2036 are as follows:

1. **The leading regional economy in Australia**
2. **A biodiversity-rich natural environment**
3. **Thriving communities**
4. **Greater housing choice and jobs**

Proposed expansion of the BHQ will support these goals. The unviability of these options prove to be the key drivers of the project as outlined below.

The measured and known resource of BHQ equates to approximately 54 million tonnes of ignimbrite which is the site's dominant hard rock resource used in concrete and asphalt products. Should the projects proposed reserve of 1.5 million tonnes per annum be approved, the resource of ignimbrite would last a maximum of 36 years. This is commensurate with the maximum period of 30 years which quarries are currently permitted to operate under a major project approval.

2.9 Alternatives to the Final Proposal

The following alternatives have been considered during the planning process. The lack of viability of these options prove to be the key drivers of the project, as outlined below.

2.9.1 Alternative material

BHQ is the only Hanson owned quarry in the Hunter Region. By road the nearest Hanson owned hard rock quarries from Brandy Hill are at Kulnura (130km) on the Central Coast and at Sancrox (220km) at Port Macquarie. Delivering products to the region from either of these quarries would be unviable due to excessive transport costs. Increasing prices to mitigate this would make Hanson less competitive within the region and lead to increases in construction costs for all industries.

Purchasing materials from other companies would mean paying higher costs for aggregates resulting in less profit. Hanson would become reliant upon external companies resulting in a loss of control in the production of aggregates and consequently increasing the risk of being unable to attain the required quantities of aggregates.

Regional roads are predominately sealed with aggregate which is produced at BHQ. As a building product concrete is still the cheapest and most widely used building material available. Concrete has very low embodied energy; this factor makes it a more sustainable product than many other building materials.

2.9.2 Alternative site

BHQ sits at the top end of a sloping ignimbrite resource, as identified in the *Geological Report 2014* (**Appendix 5**). The quarry is positioned between two faults which results in the resource being shallow enough to be financially viable to extract. Finding other resources of this nature close to Newcastle is a difficult prospect. Land holdings with adequate area to open a new quarry would be are expensive to acquire and develop; and are not readily available. Developing new infrastructure and developing a new and/or Greenfield site would undoubtedly cause potentially greater environmental impact than expanding the existing quarry site at Brandy Hill.

The existing quarry has operated and co-existed with the surrounding environment for 30 years. Given the resource at BHQ is readily accessible with functioning extraction and processing infrastructure in place, expanding the existing site was identified as the most ecologically sustainable development option available at this point in time.

2.9.3 Alternative quarry footprint

The quarry footprint proposed was selected based on results of extensive exploration drilling undertaken at BHQ. The Preliminary Environmental Assessment (PEA) initially identified an area of 47.2 hectares due to a drilling campaign undertaken in 2012. Resultant of the findings of the comprehensive geological assessment, a final quarry footprint of 97.7 hectares is proposed (**Figure 2.2**).

2.9.4 Alternative offset sites

A comprehensive Biodiversity Offset Strategy (BOS) has been prepared and will be finalised in consultation with the OEH, DP&E and Department of Environment as part of the assessment process. This BOS will compensate for the removal of Plant Community Types (PCT) and threatened species. A comprehensive review of the ecological impact of the Project is outlined in **Appendix 7** – *Biodiversity Assessment Report (BAR)*. The BOS has addressed proposed offset sites to mitigate vegetative losses. The Biodiversity Offset Strategy Proposal is detailed further in **Section 5.5.8** however is based on provision and purchase of credits to offset the clearance of native vegetation.

2.9.5 Alternative to 24 hours 7 days a week sales and production

Hanson has designed restricted hours of operations for the following as outlined in **Section 1.3.5**Error! Reference source not found.;

- Construction
- Blasting
- Load and Haul
- Primary crushing

Community concern regarding BHQ maintaining the right to operate 24 hours per day, 7 days per week was noted throughout community consultation committee proceedings. The quarry has rarely operated sales or production outside regular hours of operation. Therefore restricting operating and sales hours was identified as an alternate option during the planning stages of the Project.

However, there are several key factors that justify Hanson's proposal to maintain 24 hours a day 7 days a week operations. Firstly, certain projects dictate a window for works to take place. The provision of materials for application in road works is prime example. Hanson would require 24/7 operations to enable trucks out the gate during night-time periods. Should 24/7 approval not be sought, Hanson would be unable to bid for such projects, having a detrimental impact on competition in the market, and potentially generating adverse cumulative impacts on the efficiency of night time construction works, with negative economic impacts not only on Hanson, but also on the efficiency and cost of infrastructure projects. There is therefore a broader public interest that BHQ continue to be allowed to operate on a 24 hours, 7 days per week basis.

Secondly, approval for 24/7 operations is sought to enable delivery of aggregates to both concrete plants and external customers after business hours. Transporting raw materials during night time periods is sporadically required to ensure Hanson owned concrete plants have suitable supplies for the following day. Often trucks are utilised to meet customer demands during the peak day time periods, which leaves little time to meet internal requirements. This has additional benefits in distributing truck movements over the 24 hour period and thereby reducing congestion on the roads.

Lastly, the transportation of material during the night has a significant impact in reducing road congestion by reducing non-essential truck movements during the peak day time periods. This can have a positive effect in reducing traffic waiting times as well as general efficiency on the road network. Further details regarding the modelled impact of the project on the road network is presented in the transport study in **Appendix 8.**

A more detailed explanation of the proposed hours of operation is described in **Section 2.7.**

2.9.6 Alternative of continuing with existing production limit

Current operations at BHQ extract up to 700,000 tonnes of material annually. The option of continuing with this level of production was proposed when identifying the required production limit for the future. Increasing production will allow BHQ to remain competitive and allow for the provision of materials to meet with increasing levels of demand due to growth in the region.

The ability to tender for larger jobs also allows Hanson to provide competition within the Hunter region, and reduce prices for large scale infrastructure works. This has a flow on effect by allowing cost effective investment opportunities within the greater Hunter region.

2.9.7 Alternative of not proceeding with the development

If the development of BHQ does not proceed, construction within the lower Hunter region will suffer. Increased costs of supplying aggregates to the area will have a flow on effect to concrete prices. Increased prices of concrete may lead to a reduction in new construction taking place within the region.

Employment opportunities for 30 years for up to 26 staff will be lost if the proposal does not proceed. 20 current employees of BHQ would be laid off and Hanson would not employ another 6 tipper drivers to cart the material to customers. Economic reasons for carrying out the development are listed in **Appendix 17**. The overall effects of not proceeding are detrimental to local, regional and state communities.

2.10 Existing Consents

Brandy Hill Quarry currently operates under Development Consent No 1920 approved by Port Stephens Council in December 1983 under the *Environmental Planning as Assessment Act, 1979*. The Development Consent was granted for a hard rock quarry and processing plant on the site. Details of this consent are provided in **Appendix 1D**. Hanson has operated in accordance with this consent since 1983.

The current consent includes provision for an extraction site (pit) and infrastructure area which Hanson has complied with. These areas are included within the proposed project as detailed in **Figure 2.2.** The proposed expansion and infrastructure area extend south, a large proportion within the existing pit.

Should the proposed project receive consent, the Company will surrender the existing consent and comply with the consent conditions as determined by the consent authority within 12 months of project approval being granted.

Consultation

Section 3

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

3 Consultation

Identification of significant environmental issues is a priority when preparing a comprehensive environmental impact statement (EIS). Consultation with Federal, State and local government agencies as well as the local community, is essential. An EIS was prepared in 1983 which was reviewed to ensure issues brought to light in the 1983 EIS were either resolved or further investigated. The current operation was reviewed and environmental risks were identified and included in this document as required by relevant policies and guidelines.

Consultation with specific government agencies and community groups is dictated in the SEARs;

Commonwealth Agencies

Department of Environment

State Agencies

Office of Environment and Heritage (including the Heritage Branch)

Environment Protection Authority

Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services

Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, and Crown Lands division)

Roads and Maritime Services

Local Agencies

Hunter Local Land Services

Dungog Shire Council

Maitland City Council

Port Stephens Council

Community groups including, but not limited to:

Bolwarra Heights Community Group

Brandy Hill and Seaham Action Committee

Voice of Wallalong and Woodville

Additionally the EIS must provide details of consultation undertaken regarding issues pertinent to the EIS.

The EIS must:

- describe the consultation process used and demonstrate that effective consultation has occurred;
- describe the issues raised by public authorities, service providers, community groups and landowners;
- identify where the design of the development has been amended in response to issues raised; and
- otherwise demonstrate that issues raised have been appropriately addressed in the assessment.

3.1 Government consultation

Government agencies contacted by Hanson or the specialist consultants either directly or through other parties prior to or during the preparation of the EIS includes:

- The Department of Planning and Environment;
- Commonwealth Department of the Environment;
- Environment Protection Authority;
- The Office of Environment and Heritage;
- NSW Office of Water;
- NSW Department of Trade and Investment, Regional Infrastructure and Services;
    - Resource and Energy Division;
    - Primary Industries Division;
- Hunter Water Corporation;
- Port Stephens Shire Council;
- Transport for N.S.W.;
- Department of Primary Industries;
    - Agriculture division;
    - Catchment and Land (Crown Lands) Division;
- Hunter-Central Rivers Catchment Management Authority;
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities;
- NSW WorkCover;
- Hunter Local Land Services;
- Dungog Shire Council; and
- Maitland City Council.

Agency responses contributed to the issues identified in the Environmental Risk Assessment and informed the Environmental Impact Assessment process.

Agency responses to the Project request for SEARs are annexed in **Appendix 1.** The SEARs (issued 26 April 2013) provided further guidance regarding direct consultation. To ensure adequate consultation, Hanson sent targeted letters on 26th September 2014 to select agencies to provide a progress update for the EIS. A copy of this letter and received agency correspondence is detailed in **Appendix 4**.

3.1.1 Revised SEARs

Upon receiving the revised SEARs for the Project on 9th July 2015, Hanson noted the following agency additions to the SEARs consultation list. These being identified below;

- Hunter Local Land Services
- Dugong Shire Council
- Maitland City Council

The method of contact is presented in **Table3.2:1** to **Table 3.3.2:3**.

Identified issues are addressed in **Section 5**. Any impact, both instant and cumulative, is detailed in relevant appendices. A summary of findings and methodology to investigate these potential impacts are outlined in **Section 5.**

A brief summary of consultation is outlined in **Table 3.1:1**. Complete documentation of consultation with parties listed in the SEARs is documented in **Sections 3.1, 3.2, 3.3, 3.4 & 3.5** below.

Table 3.1:1 Consultation Summary

Agency/Community Group	General Details of Consultation	Date Initiated
Department of Planning and Environment	Request for DGRs from the DP&E. Adequacy correspondence.	15 March 2013 – ongoing at the time of submission.
Environment Protection Authority	In response to the request for SEARs (**Appendix 1**). See **Section 3.2.3.**	Released in DGRs 26 April 2013 (approximate) 2nd December 2014
Office of Environment and Heritage	In response to the request for SEARs (**Appendix 1**). See **Section 3.2.2.**	12 April 2013 Consultation in 2016 regarding offsets.
Department of Primary Industries	In response to the request for SEARs (**Appendix 1).**	26 April 2013
NSW Office of Water	NOW: See **Section 3.2.5.2**	18 April 2013
NSW Trade and Investment – Resources and Energy. Agriculture, Fisheries, and Mineral Resources Branches.	In response to the request for SEARs **(Appendix 1**). DRE: See **Section 3.2.4.** Agriculture: See **Section 3.2.5.1** Headings – this was mentioned previously	11 April 2013 10 December 2014
Hunter Water Corporation	In response to the request for SEARs (**Appendix 1**).	Released in DGRs 26 April 2013 (approximate)
Commonwealth Department of Environment.	Submission of a referral **(Appendix 7).** See **Section 3.2.1.** Biosis discussed the survey	Referral submitted 25 March 2015. November 2014

	requirements and matters relating to EPBC referral.	
Department of Primary Industries – Catchment and Lands (Crown Lands)	Letter sent to department outlining the EIS progress (**Appendix 4**). Consultation with Crown Lands regarding request to close and purchase a land parcel at Brandy Hill Quarry.	26 September 2014 20 January 2015
Hunter-Central Rivers Catchment Authority.	Letter sent to Hunter-Central Rivers Catchment Authority (**Appendix 4**).	26 September 2014
Port Stephens Council;	Ongoing consultation particularly through the Cessnock City Council (**Appendix 4).** See **Section 3.2.10**	Ongoing consultation
Transport for NSW (RMS).	In response to request for DGRs Letter sent to Transport for NSW and response received (**Appendix 4)**. See **Section 3.2.6**	20 May 2013 26 September 2014
Hunter Local Land Services	Contacted as part of the Heritage Impact Assessment by Biosis Pty Ltd. Contacted by Martens and Associates. See **Section 3.2.7**	18 July 2014 17 September 2014 – 2 October 2014
Bolwarra Heights Community Group	Campaign Group made contact with Dungog Shire Council on behalf of Hanson via email and telephone (**Appendix 4)**. See **Section 3.2.11**	10 December 2014
Brandy Hill and Seaham Action Committee	Ongoing consultation through the informal Community Consultation Committee, email correspondence, phone correspondence (**Appendix 4)**. Campaign Group made contact with Maitland City Council on behalf of Hanson via email and telephone (**Appendix 4)**. See **Section3.2.12**	18/12/13 – 5/11/15 10/12/14
Dungog Shire Council	Campaign Group made contact with Dungog Shire Council on behalf of Hanson via email and telephone (**Appendix 4)**. See **Section 3.2.8**	10/12/14
Maitland City Council	Campaign Group made contact with Maitland City Council on behalf of Hanson via email and telephone (**Appendix 4)**. See **Section 3.2.9**	10/12/14
Clarence Town and District Progress Association.	Campaign Group made contact with Clarence Town and District Progress Association of behalf of Hanson via email (**Appendix 4)**.	10/12/14
Seaham Scouts	Campaign Group made contact with Seaham Scouts contacted via telephone on behalf of Hanson (**Appendix 4)**.	10/12/14
Lions Club (Clarence Town)	Campaign Group made contact with Lions Club (Clarence Town) of behalf of Hanson via email (**Appendix 4)**.	10/12/14
Lions Club (Raymond	Campaign Group made contact with	10/12/14

Terrace)	Lions Club (Raymond Terrace) on behalf of Hanson via email (**Appendix 4)**.	
Rotary Raymond Terrace	Campaign Group made contact with Rotary Raymond Terrace on behalf of Hanson via telephone (**Appendix 4)**.	10/12/14
Martins Creek Quarry Action Group (MCQAG)	Campaign group made contact with Martins Creek Quarry Action Group (MCQAG) of behalf of Hanson via telephone and email (**Appendix 4)**. See **Section 3.2.12**	10/12/14
Voice of Wallalong and Woodville	Campaign group made contact with the Voice of Wallalong and Woodville on behalf of Hanson (**Appendix 4)**. See **Section 3.2.11**	10/12/14
NSW WorkCover	Written correspondence through Martens and Associates as part of the contamination assessment (Appendix 6).	22/10/15

3.2 Consultation with Parties listed in the SEARs

3.2.1 Commonwealth Department of Environment

Hanson submitted a referral (19 March 2015) to the Department via email and mail for the project (see **Appendix 7**). Consultation with the Department included email correspondence between Hanson and the Department on 27th April 2015, 29th May 2015, 3rd June 2015, 5th June 2015, 9th June 2015, 16th June 2015 and 22 June 2015. There has been no further correspondence since.

Further discussions were held with the Department of Environment by Biosis in November 2014. Contact was made through the Department's, to confirm survey requirements and matters relating to the EPBC Referral preparation for threatened species, mainly the Koala. Given the identification of a koala at the quarry during EIS surveys, Biosis were advised to take a precautionary approach and to prepare an EPBC Referral in accordance with the *EPBC Act* Referral Guidelines for the Vulnerable Koala (Commonwealth of Australia 2014). Following this discussion Koala surveys were conducted and a further EPBC Referral was submitted to the Department March 2015.

Additional phone conversations were had with officers from the Department of Environment by Hanson on the 5th of June 2015 and a follow up phone conversation. Both email and telephone correspondence included discussions of the bilateral assessment process, expected timeframes, and assessment fees/payments.

The DoE produced Guidelines for *Preparing Assessment Documentation relevant to the EPBC Act.* These are provided in **Appendix 1** and addressed in **Section 5.5** of this EIS**.**

There has been no consultation since. Further consultation is expected during the bilateral assessment process when the EIS is on public exhibition and during the assessment phase.

3.2.2 Office of Environment and Heritage

Consultation with the OEH was initiated upon receiving DGRs (now SEARs) for the Project on 12 April 2013. The OEH provided direction on environmental issues in response to Hanson's request for SEARs (see **Appendix 1**) on the 12th April 2014. OEH requested that information be provided regarding;

- Size, scale and type of activity / development: addressed in **Section 2**
- All anticipated environmental impacts, both direct and indirect, including level of vegetation / habitat clearing: addressed in **Section 5.5** and **Appendix 7**
- Threatened species, populations, ecological communities and/ or habitats impacted upon: addressed in **Section 5.5/Appendix 7**
- The staging and timing of the proposal: addressed in **Section 2.3**
- The proposals relationship to any other proposal and/or development: addressed in **Section 5.2**
- Aboriginal and Cultural Heritage: addressed in **Section 5.10/Appendix 12**
- Biodiversity: addressed in **Section 5.5/Appendix 7**

Biosis Pty Ltd consulted with the OEH during the preparation of the Heritage Impact Assessment via mail on 18th July 2014. Biosis requested the details for any Aboriginal people or organisations that hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or Places in the Seaham/Brandy Hill area. The OEH responded with a list of Aboriginal parties and additional points of which full details are provided in Appendix 2 of the *Heritage Impact Assessment* (**Appendix 12** of the EIS). No further correspondence has occurred on this matter.

Martens and Associates, project water management engineers, also corresponded with the Senior Natural Resource Officer from OEH regarding the flooding components of the Water Impact Assessment on the 20th October 2014– 14th November 2014 via email correspondence. Complete details are documented in Appendix F of the Water Impact Assessment (**Appendix 13** of the EIS). No further correspondence has been made with the OEH on this matter.

The OEH has additionally been consulted in respect to biodiversity offsets by both Hanson and Biosis. A meeting was held in the OEH Newcastle Office in the 13th May 2016 & 17th June 2016 regarding Hanson's offset requirements. Emails between OEH, Biosis and Hanson occurred during this time centred on the Project's Biodiversity Offset Strategy.

3.2.3 Environment Protection Authority

Consultation with the EPA was initiated upon receiving DGRs (now SEARs) for the Project on the 3rd April 2013. Correspondence was received through the DP&E whom issued responses to the SEARS to Hanson. The EPA requested the following environmental issues to be addressed in the Project EIS, these being;

- General impacts: addressed in **Section 2**

- Environmental Impacts: addressed in **Section 5**

- Licensing requirements: Licence variation will be submitted pending Project Approval.

- Air issues: addressed in **Section 5.9** / **Appendix 11**

- Noise and Vibration Issues: **Appendix 9, Appendix 10 / Section 5.8, Section 5.7**

- Waste and chemical: **Appendix 14 / Section 5.12**

- Water and soils: **Appendix 13 / Appendix 6 / Section 5.11 / 5.4**

- Monitoring programs: detailed in mitigation measures in each environmental assessment (**Section 5**) and Statement of Commitments (**Section 7**).

Appendix 4 contains complete details of this correspondence.

Martens and Associates contacted the Regional Operations Unit – Hunter Region of the EPA on 20th October 2014 regarding the proposed methodology for the surface water modelling and assessment for the proposed Brandy Hill quarry expansion EIS. The EPA advised it did not have resources available at the time, to comment on such methodologies and proposed approaches to the assessment process. The EPA will assess the Environmental Impact Assessment when it is referred by the DP&E. This documentation was received on the 8th December 2014 via mail and is documented in Appendix I of the Water Impact Assessment (**Appendix 13** of the EIS). No further correspondence has been made with the EPA on this matter.

3.2.4 Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services

Consultation with the DRE was initiated upon receiving DGRs (now SEARs) for the Project. The response from NSW Trade and Investment (Agriculture, Fisheries, and Mineral Resource Branches provided direction on environmental issues in response to Hanson's request for SEARs (see **Appendix 1**) on the 11th April 2014 via the DP&E. Specifically the DRE have requested that the EIS include;

- A resource assessment: **Appendix 5**
- Health and safety issues: operational
- Mineral Ownership: Not applicable – hard rock resource.
- Aquatic Habitat Protection Requirements: assessment of Deadman's Creek included in the Biodiversity Impact Assessment (**Appendix 7, Section 5.5**)

3.2.5 Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, and Crown Lands division)

Hanson sent an EIS information sheet to DPI on the 26th September 2014 via mail. No response was received from the DPI. This has not been actioned further. Full detail and a copy of this correspondence have been included in **Appendix 4.** The NSW Office of Water has several specific points requiring attention for the development;

1. Water Supplies
2. Site water demands
3. Adjacent licensed water users
4. Potential to intercept and/or impact groundwater and predicted dewatering volumes, water quality and disposal/retention methods.

3.2.5.1 Agriculture

Martens and Associates contacted the Resource Management Officer from the Department of Primary Industries, Agricultural Land Use Planning Unit on the 10th December 2014 via email regarding the Land Capacity Assessment. This is documented and addressed in full in **Appendix 6** of the EIS.

3.2.5.2 NSW Office of Water (NOW)

Consultation with the NOW was initiated upon receiving DGRs (now SEARs) for the Project. The response from the NOW provided response to the request for input into DGR water impact assessment in response to Hanson's request for SEARs (see **Appendix 1**) on the 26th April 2014 via the DP&E.

Martens and Associates contacted the Manager Strategic Stakeholder Liaison for the NSW Office of Water, within the Department of Primary industries on the 19th December 2015 – 20th January 2015 (via email). Discussions queried surface water licencing.

Hanson contacted the NSW Office of Water, within the Department of Primary industries. Discussions were centred around comments on the groundwater assessment for the BHQ EIS.

Hanson proposed a meeting and review of groundwater assessment strategy for NOW's perusal. Discussions took place between the Development Manager (Hanson), Strategic Stakeholder Liaison Manager (NOW) and Water Regulation Officer (NOW) from the 6th November 2013 – 11 March 2014 via email.

3.2.6 Roads and Maritime Services

Consultation with the RMS was initiated upon receiving DGRs (now SEARs) for the Project. The response from RMS stated that the requirements included in the SEARs relating to Traffic and Transport are considered generally satisfactory and will provide further comment on the project on receipt of the EA (see **Appendix 1**). Correspondence was provided through the DP&E and was received by the Department of Planning in 20 May 2013.

Hanson sent an EIS information sheet to Transport for NSW on the 26th September 2014 via mail. The Land Use Planning and Development Manager from the Transport for NSW Planning and Programs division responded to this document with a letter requesting inclusion of the traffic and transport routes and hours of road operations. This is included in **Appendix 8** – *Traffic and Transport Assessment*. A copy of the Transport for NSW correspondence is included in **Appendix 4.**

3.2.7 Hunter Local Land Services

Biosis Pty Ltd consulted with Hunter Local Land Services during the preparation of the Heritage Impact Assessment via mail on the 18 July 2014. Biosis requested the details for any Aboriginal people or organisations that hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or Places in the Seaham/Brandy Hill area. Full details are provided in Appendix 2 of the Heritage Impact Assessment (**Appendix 12** of the EIS).

Martens and Associates contacted the acting District Coordinator of the Lower Hunter – Hunter Local Land Services via email 17th September 2014 – 2 October 2014. Local Hunter

Land Services stated that they do not provide comment on SSD documents. No further correspondence on this matter has been made. Details included in Appendix F of the Water Impact Assessment (**Appendix 13** of the EIS).

3.2.8 Dungog Shire Council

Campaign group, who is a specialist public and community relations company, on behalf of Hanson consulted with Dungog Shire Council via email and telephone on an ongoing basis. This is documented in **Appendix 4**. No further action has made or required.

Below is a summary of contact with Dungog Shire Council;

Table3.2:1: Consultation with Dungog Shire Council

Stakeholder	Details and Method of Consultation	Issues Raised
CEO (Hunter Councils)	Contact is ongoing with nominated officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings. Council was provided a summary of the year's activity with CCC and local community by the Communications Officer on 10/12/2014.	Nil
Mayor	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil
Deputy Mayor	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil
Councillors (x7)	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil

3.2.9 Maitland City Council

Campaign group on behalf of Hanson consulted with Dungog Shire Council via email and telephone on the 10 December 2014. This is documented in **Appendix 4**. No further action has made or required.

Table 3.2:2: Maitland City Council

Stakeholder	Details and Method of Consultation	Issues Raised
CEO (Hunter Councils)	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings. Council was provided a summary of the year's activity with CCC and local community by the Communications Officer on 10/12/2014.	Nil
Mayor	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil
Deputy Mayor	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil
MCC Manager Infrastructure Planning & Development, Engineering Infrastructure & Works	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil
Councillors (X11)	Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil

3.2.10 Port Stephens Council

Consultation with Port Stephens Council in respect to the Project was initiated upon receiving DGRs (now SEARs) for the Project. The response from Council provided direction on issues including traffic, environment, and planning (see **Appendix 1**). Correspondence was provided through the DP&E and was received by the DP&E in 18 April 2013.

Martens and Associates corresponded with Port Stephens Council regarding the provision of information pertinent to the Contamination Assessment (Titled Stage 1 Environmental Site Assessment, **Appendix 6).** Correspondence was via email on the 1st October 2014 – 7th November 2014 and is addressed in full in **Appendix 6**. No further action is required.

Biosis Pty Ltd consulted with Port Stephens Council during the preparation of the Heritage Impact Assessment via mail on the 18 July 2014. Biosis requested the details of any Aboriginal people or organisations that hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or Places in the Seaham/Brandy Hill area. Port Stephens Council provided contact details for Worimi Aboriginal Lands Council. Full details are provided in Appendix 2 of the Heritage Impact Assessment (**Appendix 12** of the EIS).

Hanson's Operations Manager for Aggregates met with Port Stephens Council Civil Assets Engineer and another Port Stephens Council engineer on the 1st April 2015 to discuss the options for installing a footpath along Brandy Hill Drive (See **Appendix 4**). This is ongoing consultation and discussed in **Section 3** of the EIS and Section 9.2.1.2 of the Socio-Economic Impact Statement (**Appendix 17**).

Port Stephens council officers attended CCC meeting four (19th September 2014) and meeting eight (24th September 2015) where discussions occurred over the option of construction a footpath along Brandy Hill Drive. Complete details are included in **Appendix 4** of this EIS**.** Consultation is ongoing and discussed in **Section 5.1.2** and **Section 5.3** and the *Socio-Economic Impact Statement* (**Appendix 17**).

Table 3.3.2:3: Port Stephens Council Correspondence

Stakeholder	Details and Method of Consultation	Issues Raised
Mayor	Contact is ongoing with nominated Officers.	Nil
Deputy Mayor	Supportive of Hanson and requested future information be emailed.	Nil
Councillors (X3)	Attended the Seaham public meeting 18/7/13. Contact is ongoing with nominated Officers and directly with Quarry Manager. All Councillors are emailed regular updates and invited to attend	Nil

	CCC meetings.	
Port Stephens Council, Community Engagement	Would like emails and copies of all information for office. Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings. Council was provided a summary of the year's activity with CCC and local community by the Communications Officer on 10/12/2014.	
Port Stephens Council, Section Manager, Development	Emailed invitation to CCC - 3/9/2014. CCC members invited Council to formally attend meetings from 2014. Council member attended CCC meeting on the 10/2014. Additional 3 council members attended meeting number 8 on 24/09/2015.	Nil
Port Stephens Council, Development Officer	Emailed Fact Sheet - 10/2013 Contact is ongoing with nominated Officers and directly with Quarry Manager. All officers are emailed regular updates and invited to attend CCC meetings.	Nil

3.2.11 Bolwarra Heights Community Group

The Bolwarra Heights Community Group submitted a response to the Department of Planning and Environment on the 4th August 2014 and was made available to Hanson via the DP&E's website. The Bolwarra Heights Community Group is particularly concerned with the use of roads including safety issues, noise pollution, and vibration of heavy vehicles, air pollution, and dust, deterioration of the road surface, social effects and the provision of an independent traffic audit. Hanson has addressed these concerns in the Traffic Impact Assessment (**Appendix 8**), the Noise and Blast Impact Assessment (**Appendix 9** and **Appendix 10**), the Air Quality Impact Assessment (**Appendix 11)** and the Socio-Economic Impact Assessment (**Appendix 17**).

The project also supports an informal community consultative committee (CCC) which regularly discusses these community based concerns. A member of the Bolwarra Heights

Community Group sits on the CCC (see **Appendix 4** for full details). Multiple contacts have been made with this representative from early 2014 via the CCC and ongoing. This is documented in **Appendix 4**.

3.2.12 Brandy Hill and Seaham Action Group

Contact with community groups is generally via the CCC, Communications Officer and Quarry Manager. The Brandy Hill and Seaham Action Group was provided with a summary of the year's activity with CCC and local community by Hanson's Communications Officer on 10th December 2014; followed up on the 15th December 2014 and spoken to by telephone on 23rd December 2014.

Additionally, Hanson engages in regular open and ongoing consultation with the Brandy Hill and Seaham Action Group via the CCC. Representatives from this group sit on the Project's CCC and actively engage in the meetings expressing concerns regarding (but not limited to) traffic, traffic noise, and the provision of a footpath. These discussions are documented in the CCC minutes**.** However issues raised include operational hours, traffic and truck movements, and the proposal to construct a footpath along Brandy Hill Drive. This is detailed in **Appendix 4** and **Appendix 17**.

3.2.13 Voice of Wallalong and Woodville

The Voice of Wallalong and Woodville (VOWW) group is an incorporated non-profit and non-partisan community organisation run by volunteers. VOWW states that it exists solely to represent and make heard the interests of residents. Wallalong (population 900) and Woodville (population 600) are neighbouring rural and village communities in the lower reaches of the Paterson and Hunter rivers, in Hunter region of NSW.

Potential Key Issues

VOWW emerged in response to an announcement in August, 2012, by a small group of property developers (known as Wallalong Landowners Group [WLG]) of plans to build a mini-city covering 630 hectares of farmland and small rural lots adjoining the existing village of Wallalong. The WLG concept plan involved rezoning and subdivision into 3,700 residential lots, including medium-density townhouse-style buildings. The developers then announced their intention to submit a rezoning application to Port Stephens Council.

A group of residents formed to oppose WLG rezoning and other issues. Core group of volunteers meet regularly and use their own funds to support VOWW.

Whilst the WLG rezoning is the key focus of VOWW a story in the Port Stephens Examiner in late July 2013 regarding Hanson's application to increase production provided another focus. Subsequent to this approximately 135 people attended a public meeting at Seaham on 18th July 2013, called by residents to discuss the proposed doubling of production by the quarry. The meeting agreed the following next steps:

1. To form a residents committee with representation from all areas potentially affected by the quarry. A group of 6-10 people was recommended. This group will liaise with the quarry and all other agencies during the life cycle of the NSW state planning process.
2. To approach the Wallalong group VOWW regarding becoming members of that group, to gain the protection of operating under an incorporated organisation without having to set up another and to use their experience.

3. To follow up some issues raised during the meeting specific to Council.

Contact

Contact with interest groups is via the CCC and directly via telephone, newsletter updates and via their website by the Hanson Communications Manager. VOWW has been very interactive and responsive since 2013 to ongoing contact. The Group was provided a summary of the year's activity with CCC and local community by the Communications Officer on 10/12/2014 via email and telephone.

Issued Raised

Environmental impacts, traffic and truck movements, resident impacts, noise, air quality, safety concerns.

Addressed in EIS

The Voice of Wallalong of Woodville (VOWW) submitted a response to the DP&E regarding the Martins Creek Quarry expansion project on the 14th August 2014. The response was made available to Hanson via the Department of Planning and Environment's website. The VOWW is particularly concerned with the impacts of traffic and noise associated with the increased road haulage of quarry products. Of additional concerns are road safety and noise considerations particularly of a cumulative nature. Hanson has addressed these concerns in the Traffic Impact Assessment (**Appendix 8**), the Noise and Vibration, and Blast Impact Assessment (**Appendix 9** and **Appendix 10**), the Air Quality Impact Assessment (**Appendix 11**) and the Socio-Economic Impact Assessment (**Appendix 17**). The project also supports an informal community consultative committee which regularly discusses these community based concerns (see **Appendix 4** for a copy of the minutes and agenda).

3.2.14 Martins Creek Quarry Action Group

Hanson was advised of this group through consultation in the CCC. Hanson's Community Officer contacted in December 2014 and January 2015 via telephone with no return phone call. No further action has been taken and no further consultation has been made.

3.3 Community consultation

3.3.1 Historic Community Involvement

3.3.1.1 Targeted Community Engagement

BHQ has been actively involved within the local community for a long period through sponsorships, donation of construction materials, and provision of uniforms and equipment for local community groups. Specifically, Hanson has donated;

- Seaham Cricket Club: Materials and equipment/clothing
- Local Community Group: clothing/equipment
- Tenambit Soccer Club: sponsorship and clothing
- Seaham Netball Club: uniforms and sponsorship
- Seaham Park Committee: Materials and shelter
- Mount Kanwary School: Materials
- Seaham School: Materials, concrete path, multipurpose basketball/netball court, raffle donation
- Seaham Preschool: bike track
- Hunter River High School: materials

Brandy Hill Quarry intends to continue to assist the local Brandy Hill/Seaham community into the future by donations of a similar nature. Hanson Heidelberg as an overarching company practices similar engagement at other sites, and is committed to continuously developing positive collegial relationships with the surrounding local community.

3.3.1.2 Driver Awareness Program

Hanson BHQ has developed a driver awareness program to educate young drivers in the local community. In August 2015 Hanson's transport branch along with BHQ attended Hunter River High School to educate more than 100 year 11 students about the operations of heavy vehicles and safe driving practices near trucks. The program was developed in 2012 and continues to be implemented at the time of writing. Initiatives of this nature are close to the hearts of Hanson staff as truck drivers are often local residents, whose children attend local schools and drive on local roads. These courses ensure that Hanson trucks and local commuters are employing safe driving practices. The safety of the community is of paramount importance to Hanson, and hance the company has developed these interactive programs to promote driver safety.

3.3.1.3 Responsive Community Engagement

Brandy Hill Quarry has an established presence in the local Brandy Hill/Seaham community since the quarry's establishment in 1983. During this time, the quarry has aimed to establish the business with a positive presence in the local community. During times where the community has faced adversity, Hanson has endeavoured to assist the community where possible. During April 2015 the area was hit with high rainfall and consequently experience extensive flooding in the area surrounding BHQ causing significant property and infrastructure damage. Hanson offered to donate aggregate to repair driveways washed out in the floods. Hanson provided a total of approximately 5000 tonnes of aggregate and labour towards reconstruction efforts. To meet the community demands, Hanson put on extra staff and drivers and worked in conjunction with local businesses to ensure that road materials were transported to locations where help was needed. The efforts were published in the industry body Quarry Magazine.

3.3.1.4 Complaints Handling

Community engagement is conducted through the Hanson complaints management system. The Quarry takes complaints from the community seriously and has hence established a comprehensive complaints handling process whereby the complaint is:

1. Recorded on site.
2. Directed to the appropriate Hanson staff.
3. Investigated.
4. Outcome reported back to the complainant where applicable.

This progress is a responsive approach triggered upon receipt of a community complaint, however enables the Quarry to identify area of improvement to reduce any potential impacts on the local community and develop improved environmental safeguards.

3.3.2 Initial Project Community Meeting

The first community meeting was held on the 18th of July 2013 at Seaham School. This public meeting was attended by a member from the Department of Planning, EPA and PSSC. The development process was described by the member from the DP&E officer as

well as the EPA's role in the process. Hanson management spoke on the development and BHQ operations and the member from PSSC described their role in the development process.

3.3.3 Informal Community Consultative Committee

The community expressed an interest in being informed of the progress of the proposed Project. To enable active dialogue between Hanson and the local community, an informal Community Consultation Committee (CCC) was established with the primary goal of informing the local community of the EIS process and progress.

This committee is primarily composed of Hanson representatives and community members, however the committee includes an independent chairperson from the fourth (4th) meeting onwards and a representative of Port Stephens Shire Council also attended the 4th meeting and 8th meeting. Meeting details are shown in **Table 3.3:1** and further detailed in **Appendix 4.**

Table 3.3:1: CCC Meeting Details

CCC Meeting Number	Date of CCC Meeting	Supporting Documentation
1	Wednesday 18th December 2013	Agenda: **Appendix 4** Minutes: **Appendix 4**
2	Thursday 20th March 2014	Agenda: **Appendix 4** Minutes: **Appendix 4**
3	Thursday 19th June 2014	Agenda: **Appendix 4** Minutes: **Appendix 4**
4	Thursday 18th September 2014	Agenda: **Appendix 4** Minutes: **Appendix 4**
5	Thursday 27th November 2014	Agenda: **Appendix 4** Minutes: **Appendix 4**
6	Thursday 5th February 2015	Agenda: **Appendix 4** Minutes: **Appendix 4**
7	Thursday 7th May 2015	Agenda: **Appendix 4** Minutes: **Appendix 4**
8	Thursday 24th September 2015	Agenda: **Appendix 4** Minutes: **Appendix**
9	Thursday 25th February 2016	Agenda: **Appendix 4** Minutes: **Appendix 4**

3.3.4 Community Concerns

Primary concerns have been identified in a community run survey by the Brandy Hill and Seaham Action Committee. The findings of this survey were presented to Hanson in the CCC meetings. The primary concerns raised were:

- Increased traffic levels
- 24 hour production and sales
- Road surface deterioration
- Safety (pedestrian/cycle path along Brandy Hill Drive)

- Noise associated with increase in truck movements

Table 3.3:2: Concerns Addressed in the EIS

Concern	Where Addressed in EIS
Increased traffic levels	Traffic and transport Impact Assessment**: Appendix 8/Section 5.6** Socioeconomic Impact Assessment: **Appendix 17/Section 5.3**
24 hour production	Socioeconomic Impact Assessment: **Appendix 17/Section 5.3**
Road surface deterioration	Traffic and transport Impact Assessment**: Appendix 8/Section 5.6**
Safety (pedestrian/cycle path along Brandy Hill Drive)	Community Consultation **Appendix 4/Section 3.3.3**
Noise associated with increase in truck movements	Noise Impact Assessment: **Appendix 9/ Section 5.7**

During the CCC meetings, the Brandy Hill local community highlighted safety concerns of Brandy Hill Drive. The community identified the desire to have a pedestrian footpath/cycleway constructed on Brandy Hill Drive. This was discussed with Port Stephens Shire Council at CCC meeting four in which Council advised that Council is directing focus on larger population areas due to fund restrictions. Hanson made contact with council to facilitate a discussion with the intention of providing material to aid in the construction of a footpath. Details of this discussion to date have been included in **Appendix 4**. Port Stephens Council officers attended meeting number 8 where further discussions of the footpath took place. Further details included in **Appendix 4**.

3.4 Consultation with Aboriginal Stakeholders

The aboriginal people, as one of the oldest continuous living cultures in human history, need to have their cultural heritage recognised and valued. This cultural heritage lives through memories, stories and associations with their traditional land as well as important evidence present throughout the landscape. Due to this a comprehensive consultation process is employed to protect this invaluable link between past and present by seeking to identify and protect this cultural heritage.

Biosis undertook the Aboriginal Heritage consultation on behalf of Hanson using the Department of Climate Change and Water (DECCW) guideline *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* as required under the National Parks and Wildlife Act 1974. Hanson recognises that Aboriginal people are the primary determinants of the cultural significance of their heritage.

The Heritage Impact Assessment involved notifying relevant Aboriginal stakeholders of the Project proposal. Such stakeholders include;

- NSW Office of Environment and Heritage (OEH)
- Mindaribba Local Aboriginal Land Council (MLALC)
- Worimi Local Aboriginal Land Council (WLALC)
- Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW)
- National Native Title Tribunal
- NSW Native Title Services Corporation Limited (NTSCORP Limited)

- Port Stephens City Council (PSCC)
- Hunter Local Land Services

The consultation process included placing a public notification in the *Newcastle Herald* on Friday 18 July 2014 calling for registration of interest in the project by Aboriginal groups (see **Appendix 12**). An invitation was then sent to all interested groups to register. The following Aboriginal parties registered for consultation;

- Worimi LALC
- Gomeroi Namoi
- Lower Hunter Aboriginal Incorporated
- Maaiangal Aboriginal Heritage
- Mur-roo-ma Inc
- Nur-Run-Gee Pty Ltd

The following Aboriginal parties provided comment on the methodology by the closing date, and were sent invitations to participate in the field survey conducted 9 October 2014. The three (3) interested parties who attended the field surveys were;

- Worimi LALC
- Nur-Run-Gee Pty Ltd
- Mur-roo-ma Inc

The Aboriginal Cultural Heritage Assessment report was sent to each registered aboriginal party and comments received are included in the Aboriginal Cultural Heritage Assessment Report **Appendix 12**. A summary of the findings and a more in depth overview of the consultation process is included in the *Aboriginal and Heritage Impact Assessment* – **Section 5.10** and **Appendix 12**.

3.5 Other Consultation

3.5.1 Daracon's Martin's Creek Quarry

Hanson has been actively engaged in consultation with Daracon, whom also have a state significant application in for the expansion on an existing quarry, namely Martins Creek Quarry. Consultation has included the exchange of weighbridge data, teleconference to discuss traffic/transport data exchange (**Appendix 4**), and email correspondence. Further details are included in **Appendix 4**.

Planning Context

Section 4

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

4 Planning Context

The SEARs dictate that the EIS must include;

Consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments – **Section 4.**

4.1 Approval Process

Hanson is proposing to extend the approved extraction boundary of Brandy Hill Quarry. The proposed development (the Project) will extract an excess of 5 million (M) tonnes of reserves, as well as extracting more than 500, 000 tonnes per annum (tpa). In doing so, the development meets the criteria listed within schedule 1, clause 7 (1) (a) and (b) of the State and Environmental Planning Policy (State and Regional Development) 2011 for assessment as a 'state significant development' under section 89C (2) of the *Environmental Planning and Assessment Act 1979* (the EP&A Act). The consent authority will be the determining authority for this development application

4.1.1 Approval Process Prior to Submission

The approval process prior to the submission of the EIS under Section 89C of the EP&A Act is outlined below;

1. Hanson has submitted a Development Application (**Appendix 3**) and Preliminary Environmental Assessment (PEA) (**Appendix 2**) to the Department of Planning and Environment (previously the Department of Planning and Infrastructure) under Part 4 of the *Environmental Planning & Assessment (EP&A) Act 1979.* The PEA and Development Application requested an extension to the currently approved quarry footprint and depth along with an increase in annual sales/production volume with an estimated capital value of approximately $22.5 M. The PEA included a preliminary project proposal and identified potential environmental issues during the life of the Project.
2. Director General's Environmental Assessment Requirements (now SEARs) were subsequently issued under an application number SSD 5899 under Section 78A (8A) of the EP&A Act 1979 on the 26 April 2013.
3. Hanson subsequently received revised DGRs/SEARs on the 11th November 2014 and 9th July 2015 under the aforementioned application number. The revised DGRs/SEARs have been annexed as **Appendix 1** to this document.
4. Hanson has prepared an Environmental Impact Statement to meet the requirement of Section 78A, Clause (8A) of the EP&A Act, and the accompanying DGRs/SEARs. Assuming the Project is approved, Hanson will endeavour to meet all Project Approval Conditions during the life of the Project wherever feasible and reasonable.

4.1.1 Approval Process Post Submission

The approval process post submission of the EIS under Section 89C of the EP&A Act is outlined below;

1. The EIS is placed online for public review for a minimum period of 30 days. The public and Secretary consultants/government agencies are invited to provide

comment, which are reviewed and considered by the DP&E and relevant government agencies.

2. The DP&E will provide Hanson with recommendations; identify further issues and community issues raised. This will be responded to by Hanson and may include modifying the proposal or statement of commitments and responding to any issues raised by the community in a Submissions Report.
3. If changes to the proposal are necessary due to the recommendations a Preferred Project Report will be prepared. This would be publicly displayed for 30 days.
4. The DP&E will then release the Secretary's Environmental Assessment Report which would be publicly available.
5. The minister for planning or makes a determination on the project.

4.2 Relevant Legislation

The Brandy Hill Project is accountable under Commonwealth, State, and regional and local legislative controls. These are outlined in **Table 4.2:1** below and elaborated upon subsequently.

Table 4.2:1: Legislative Controls Relevant to the Project

Government Tier	Legislation
Federal	*Environment Protection and Biodiversity Conservation Act 1999 (*EPBC) Act
	Native Title Act 1993
State	*Environmental Planning and Assessment Act 1979*
	State Environmental Planning Policies State Environmental Planning Policy No.33 – Hazardous and Offensive Development State Environmental Planning Policy No. 44 – Koala Habitat Protection State Environmental Planning Policy No. 55 – Remediation of Land State Environmental Planning Policy (State and Regional Development) 2011 State Environment Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007. State Environmental Planning Policy (Infrastructure) 2007
	Fisheries Management Act 1994
	Heritage Act 1977
	National Parks and Wildlife Act 1974
	Native Vegetation Act 2003
	Protection of the Environment and Operations Act 1997
	Roads Act 1993
	Threatened Species Conservation Act 1995 (TSC) Act)
	Water Act 1912
	Noxious Weeds Act 1993
	Threatened Species Conservation Act 1995 (TSC Act)
Local and Regional	Port Stephens Local Environment Plan 2013

Planning Instruments	Lower Hunter Regional Strategy
	Hunter Regional Plan 2036
	Port Stephens Futures Strategy 2009
	Port Stephens Planning Strategy 2011
	Port Stephens Development Control Plan 2013
	Water Sharing Plan for the Hunter Unregulated & Alluvial Water Sources 2009
	Aquifer Interference Policy

4.2 Commonwealth Legislation

4.2.1 Environment Protection and Biodiversity Conservation Act 1999

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

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Matters of National Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DoE 2013), was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required.

This assessment determined that two flora species and three fauna had a moderate likelihood of occurrence in the study area, with one additional fauna species (being the koala) having a high likelihood of occurrence in the study area. Koala presence was confirmed during the spring/summer sampling effort 12th – 14th November 2014, conducted by Biosis Pty Ltd. To enable an accurate and detailed assessment of koala presence in the Project area a supplementary targeted field assessment was conducted by Biosis Pty Ltd 9th – 11th December 2014. A copy of this supplementary report as well as the referral has been included as **Appendix 7.**

The presence of federally listed threatened species meant the Project was referred to the Department of the Environment for further assessment under the EPBC Act. Hanson commissioned Biosis Pty Ltd to complete additional koala field surveys to ensure accurate quantification of koala populations. The referral assessment (dated 3 June 2015, **Appendix 7**) considers that the proposed action is likely to have a significant impact on listed threatened species and communities (sections 18 & 18A). The Project will be assessed as a bilateral agreement with the NSW Department of Planning and Environment. Further details are provided in **Appendix 7.**

4.2.2 Native Title Act 1993

The commonwealth *Native Title Act 1993* is applied in Australia to provide determinations of native title, which are investigated by the National Native Title Tribunal and determined by the Federal Court of Australia. The Act aims to;

> *"Provide for the recognition and protection of native title; and*
> *To establish ways in which future dealings affecting native title may proceed and to set standards for those dealings; and*

To establish a mechanism for determining claims to native title; and

To provide for, or permit, the validation of past act, and intermediate period acts, invalidated because of the existence of native title" (Native Title Act 1993).

Table 4.2:1 identifies property ownership of the Project area. All lots, except one, are freehold land. Native Title does not apply under the *Native Title Act 1993* for these free hold land lots. The remaining lot is zoned as Crown Land.

Additionally, Hanson possesses an Enclosure Permit 512131 for the Crown land parcel shown in **Figure 4.1**. The enclosure permit has been annexed as **Appendix 19** to this EIS. A search using the National Native Title Register managed under the National Native Title Tribunal was conducted using the online National Native Title Register search function for the Port Stephens Area to determine if there have been any claims on this parcel of land. The search results are annexed to this document as **Appendix 20**. Search results revealed six (6) Native Title Claims on land in the Port Stephens Local Government region have been lodged. The applicable land parcels to which the claims were made have documented in **Table 4.2:2.** None of these parcels are included in the proposed Project area. Therefore, at the time of submission of this EIS, *Native Title Act 1993* does not apply to any of the land lots on site.

Table 4.2:1: Land Ownership and Lot Identification

Land Parcel ID	Ownership
1 DP 737844	Hanson
2 DP 737844	Hanson
19 DP 752487	Hanson
20 DP 752487	Hanson
21 DP 752487	Hanson
36 DP 752487	Hanson
56 DP 752487	Hanson
57 DP 752487	Hanson
58 DP 752487	Hanson
59 DP 752487	Hanson
236 DP 752487	Hanson
36 DP 752467	Hanson
100 DP 712886	Hanson
101 DP 712886	Hanson
1 DP 264033	Hanson
2 DP 264033	Hanson
12 DP 264033	Hanson
1 DP 47313	Hanson
1 DP 823760	Hanson
1 DP 1006516	Hanson
2 DP 1006516	Hanson
3 DP 1006516	Hanson
512131	Enclosure permit on Crown owned land.

Figure 4.1: Property Ownership

Table 4.2:2: Native Title Claims

Case	Land Parcel	Determination
NND2005/002 – Worimi Local Aboriginal Land Council #1	Folio identifier 220 of Deposited Plan 1049608	Native title does not exist.
NND2005/003 - Worimi Local Aboriginal Land Council #2	Folio identifiers 216 and 218 of Deposited Plan 1044608	Native title does not exist.
NND2005/002 – Worimi Local Aboriginal Land Council #3	Folio identifier 473 of Deposited Plan 728126	Native title does not exist.
NND2008/002 – Worimi Local Aboriginal Land Council #4	Folio identifier 576 in Deposited Plan 48823	Native title does not exist.
NND2012/001 – Worimi Local Aboriginal Land Council #5	Lot 2 in Deposited Plan 1145824 being the land contained in Folio Identifier 1/114582	Native title does not exist.
NND2012/002- Worimi Local Aboriginal Land Council #6	Lot 491 in Deposited Plan 727810 being the land contained in Folio Identifier 491/727810	Native title does not exist.

4.3 State Legislation

4.3.1 Environmental Planning and Assessment Act 1979

As outlined in aforementioned sections, the Project will be assessed under the EP&A Act. Under Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011, the Project will require approval under Section 89C of the EP&A Act due to the annual and total Project extraction quantities.

Additionally consideration will be given to the *Environment Planning and Assessment Regulation 2*000 which is made under the EP&A Act.

4.3.2 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPPs) may be triggered by the proposed development and are considered below.

4.3.2.1 State Environmental Planning Policy No.33 – Hazardous and Offensive Development

SEPP 33 – Hazardous and Offensive Development (SEPP 33) assesses the potential hazard associated with a proposed development by providing definitions for 'hazardous industry', 'hazardous storage establishment', 'offensive industry' and 'offensive storage establishment'. A full hazard assessment in association with SEPP 33 is presented in **Section 5.15** and **Appendix 16**.

4.3.2.2 State Environmental Planning Policy No. 44 – Koala Habitat Protection

SEPP 44 - Koala Habitat Protection (SEPP 44) aims to conserve and manage areas of natural vegetation that provide habitat for koala to promote a permanent free-living population of koalas over their present range, and also reverse the current trend of koala population decline. This process requires the preparation of a management plan/s prior to development consent in areas of core koala habitat, the identification of core koala habitat and the protection of said habitat in environment protection zones.

SEPP 44 provides details on whether vegetation is classified as "potential" or "core". Potential Koala habitat is described as "*areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component*". Core Koala habitat is defined as ""*land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population*". *A d*etailed flora and fauna investigations were undertaken as part of this EA and are presented in **Section 5.5** and **Appendix 7** of this report.

SEPP 44 does not apply to Major Projects that are being assessed as State Significant Development, however, SEPP 44 Koala habitat definitions have been used in the Biodiversity Assessment Report to determine potential and core Koala habitat areas for the study area.

4.3.2.3 State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 (remediation of Land) was gazetted in 1998 and aimed to provide part of the framework for the remediation of contaminated lands across NSW. The SEPP has been accompanied by a number of guidelines and notes, including the 'Managing Land

Contamination: Planning Guidelines SEPP 55 Remediation of Land,'1998 prepared by the (then) Department of Urban Affairs & Planning.

Clause 7 of the SEPP provides that the consent authority for any application must consider, firstly, whether land is potentially contaminated and, secondly, whether the land is suitable for the intended purposes (either with or without remediation activities).

The SEPP goes on (at Clauses 9 and 14) to set out remediation work in (generally) two categories:

- Category 1 Remediation work: work requiring consent; and
- Category 2 Remediation work: work not requiring consent.

Martens and Associates have undertaken a Stage 1 Environmental Site Assessment (ESA) of the Project Site which is addressed at Section 6.2.5. Martens and Associates recommends that based on the findings of the Stage 1 assessment, a Stage 2 ESA is not recommended and no further testing is proposed provided the site continues to maintain the current and proposed use. Should site use change, further testing would be required with a site investigation plan developed in accordance with NSW EPA (1995) and a risk based assessment.

4.3.2.4 State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) came into effect upon the repeal of Part 3A of the EP&A Act and identifies development to which the SSD assessment and determination process under Division 4.1 in Part 4 of the EP&A Act applies. The BHQ Project is classified as SSD pursuant to Section 89C of the EP&A Act and declared to be such by the SEPP (State and Regional Development) 2011 (SRD SEPP). Schedule 1 of the SRD SEPP identifies development for the purpose of extractive industry as SSD where more than 500ktpa are extracted.

4.3.2.5 State Environmental Planning Policy (Infrastructure) 2007

Part 3, Division 5, Subdivision 2, 44 of SEPP (Infrastructure) 2007 applies provisions pertaining to a development likely to affect an electricity transmission or distribution network in particular the penetration of ground to a depth of at least 3m below existing ground level that is within 10m of electricity corridors. As per these requirements the proposed Project will not interfere with the transmission electrical supply.

Part 3, Division 6, 44 of SEPP (infrastructure) 2007 relates to bushfire reduction work. The site has addressed fire breaks and adequate buffer distances in **Section 5.15** of this EIS based on Port Stephens Bushfire risk mapping. Refer to **Section 5.15** and **Appendix 16** for a complete *Hazard Impact Assessment.*

Part 3, Division 9, Subdivision 2, 55 relates to development in gas pipeline corridors. The closet pipeline to the proposed Project site at the time of writing is the Wilton to Wollongong pipeline which runs more than 20 kilometres outside of the proposed Project boundary, and therefore does not need further consideration.

4.3.2.6 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

Mining, Petroleum Production and Extractive Industries SEPP provides guidance on the consent requirements for various activities. This SEPP defines developments as prohibited, exempt or complying based on their proposed works. Under Clause 7(3)(a) of this SEPP, the proposed Project is permissible with consent as it is zoned RU2, rural landscape.

Matters for consideration

Clause 12

Clause 12 requires an assessment of compatibility of the proposed development with other land uses. Specifically the Proponent is required to consider existing and approved land uses, potential impact of these land uses and identify whether the proposed project is consistent or inconsistent with preferred land uses.

The existing project site is currently used for extractive purposes. Brandy Hill Quarry has been in operation since 1983, within the Port Stephens Local Government Area. As shown in **Figure 4.3**, the project is directly surrounded by Environmental Conservation, Primary Production, and Rural Landscape zoned land. The main land uses permissible and utilised in the vicinity of the side include residential properties to the east, south and west of the project and environmental management zoned land to the direct north and west of the project site.

This EIS has been prepared to quantify the impact (if any) on surrounding land uses. Specialist studies indicate that with appropriate mitigation and environmental management measures, the project will not impose a significant impact on the surrounding land uses. Hanson commissioned Martens and Associates to undertake a Stage 1 Environmental Site Assessment (ESA) using available site history, aerial photograph interpretation and site walkovers. Although there have been identified localised soil contamination, the majority is considered minor in nature and will be removed as the quarrying progresses.

Martens also conducted a Land Resources Assessment finding the proposed Project disturbance area has low agricultural capacity and is suitable for quarrying purposes proposed for the Project (as confirmed by the *Department of Primary Industries – Agriculture,* see **Appendix 6**). Therefore the project is not anticipated to have a significant impact on surrounding land uses as the likely preferred land use in terms of compatibility as an extractive industry.

The project is zoned RU2 – *Rural Landscape* which is consistent with the surrounding land uses. The project will involve transit of trucks through local haulage routes, including through residential areas until reaching regionally and state significant arterial roads. The company imposes stringent mitigation measures to minimise impact of the surrounding community. This EIS documents, a noise impact assessment, traffic noise limitations, air quality compliance criteria, socio-economic considerations, visual impact considerations, a water impact assessment, a heritage impact assessment, hazard impact assessment, waste impact assessment and a biodiversity impact assessment to quantify any impacts on the local and regional community. The EIS also proposes mitigation measures where applicable to manage any potential detrimental impacts. Moreover Hanson notes that Daracon's Martins Creek Quarry is situated in the local area which operates in a similar capacity to Hanson's Brandy Hill Quarry.

Clause 12 required the Proponent to evaluate and compare the respective public benefits of the development. The public benefits of the project are explored in detail in **Appendix 17** – *Socio-Economic Impact Statement* however the major public benefits are;

1. increasing the security in supply of construction materials; and
2. enabling the provision of direct and carry on employment opportunities.

Clause 12 requires the Proponent to evaluate and measures proposed by the applicant to avoid or minimise any incompatibility. Mitigation measures presented in the traffic, noise, air and visual impact assessments suggest that the project can be adequately managed without imposing a detrimental significant impact on the public.

Measures imposed to combat incompatibility are referred to as mitigation measures during this report and should be assessed in respect to each specialist study. Mitigation measures, should they be applicable, will be found in each respective appendix.

Table 4.3:1: Summary of Mitigation Measures

Environmental Impact Assessment Applicable to Potential Offsite Impacts	Summary of Mitigation Measures (full details can be found in the relevant section).
Traffic	To minimise road traffic impacts on the environment, Hanson will limit truck movements outside of standard operations where reasonable and feasible. Hanson has discussed the prospect of constructing a footpath along Brandy Hill Drive with Port Stephens Council and is committed to supporting the construction of a footpath in some capacity. Develop and implement a Driver Code of Conduct.
Noise	- Prepare a Noise Compliance Management Strategy to monitor operations phase noise emissions from Brandy Hill Quarry in accordance with current and applicable NSW EPA requirements - Contingency response plan unless otherwise approved by the Secretary of the DP&E - Annual noise monitoring - Construction of an 18m high earth bund.
Blast	- Propagation of ground vibration and air overpressure is adequately controlled, primarily resultant of the separation distance between the quarry pit and the closest receptor. - Blasting will be monitored using best practices and monitoring pads where reasonable and feasible - prepare and utilise a Blast Management Plan - Blasts will be regularly reviewed based on vibration and overpressure data and used to guide blast designs. - Construction of an 18m high earth bund
Air	Construction of an 18m high earth bund Air quality management plan Watering of stockpiles to minimise dust emissions from wind erosion where applicable; Direction to minimise dust emissions from the construction of the bund by either watering, screening or revegetating; Watering unpaved haul roads and exposed ground as required, particularly in dry weather conditions; Direction to revegetate the bund; Variable stacking height; Implementing modern design features for the plant upgrade including; Housing and screening of the processing plant once relocated; Enclosure of conveyors.
Visual	Construction of an 18m high earth bund Maintenance of the sites existing vegetative buffer (outside of the disturbance area) and replace/replant dead plants where possible.
Socio-Economic	Encourage employment from the local district. Provide training and certification to ensure suitable applicants can improve or

	acquire necessary skills. Manage heavy vehicle traffic. Maintain use of existing transit paths to reduce “spread” of traffic impacts. Maintain Continuous Community Involvement. Promote driver awareness where relevant. Introduce a ‘Driver Code of Conduct’ to the site’s Traffic Management Plan.
Land Use	To mitigate and manage the predicted >2m drawdown Martens have recommended that further works are undertaken to determine measures required to ensure long-term bore viability will not be adversely affected if “make-good” provisions are applied. Recommended that groundwater level monitoring be undertaken at this bore prior to quarry progression below existing approved quarry floor level to provide a benchmark for impact assessment.
Water	To mitigate and manage the predicted >2m drawdown Martens have recommended that further works are undertaken to determine measures required to ensure long-term bore viability will not be adversely affected if “make-good” provisions are applied. Recommended that groundwater level monitoring be undertaken at this bore prior to quarry progression below existing approved quarry floor level to provide a benchmark for impact assessment. Water management systems and erosion control systems as well as water testing to maintain compliance with EPL surface water criterion for water discharged from site via the licenced discharge point.

Clause 12A requires the Proponent to consideration of voluntary land acquisition and mitigation policy. However, the project does not involve the acquisition of any land and therefore no further assessment under 12 A is required.

Clause 13

Clause 13 of Mining, Petroleum Production and Extractive Industries SEPP requires an assessment of compatibility of with extractive industry. However this is not applicable as Hanson is proposing to extend project life thereby maintaining compatibility with the current extractive industry operation.

Clause 14

Clause 14 requires the proponent to consider natural resource management and environmental management. The project is required to be undertaken in an environmentally responsible manner, with specific consideration given to water resources, biodiversity, and greenhouse gas emissions.

The Water Impact Assessment (**Appendix 13**) includes an assessment of groundwater and surface water as well as a peer review of the *Groundwater Impact Assessment* by Dr. Noel Merrick of HydroAlgorithmics Pty Ltd. Numerical modelling including combined sensitivity/uncertainty analysis indicates that the proposed development can proceed with an acceptable level of impact to stakeholders (environment and licensed bore users).

The Biodiversity Assessment Report (**Appendix 7**) includes assessment of threatened species and proposed mitigation measures to ensure minimal impact considerations.

The Greenhouse Gas Assessment (GHG) is provided in **Appendix 11.** Best practices outlined in the air quality impact assessment ensure GHG emissions are minimised where practical. Applicable State or national policies, programs or guidelines concerning

greenhouse gas emissions have been included in the *Air and Greenhouse Gas Assessment* (**Appendix 11).**

Clause 15

Clause 15 requires the proponent to consider resource recovery, in particular efficiency of resource recovery and recycling or re-use of material and minimisation of waste.

The existing site includes (but is not limited to) an established quarry pit, established processing plant, established mobile machinery, established pug mil and pre coat plant, ancillary structures and established weighbridge which utilise the existing resource recovery facilities. Waste resource recovery utilises the established waste hierarchy described in the Waste Impact Assessment (**Appendix 14**). The Waste Impact Assessment (outlined in **Section 5.12**) also describes the manner in which waste will be managed throughout Project life.

Clause 16

Clause 16 requires the Proponent to consider transportation routes, and whether these occur in residential areas, as well as implementation of a driver code of conduct relating to the transport of materials on public roads.

Hanson has commissioned the preparation of the Traffic Impact Assessment. This specialist study describes the transport environment of the Project in detail. *The Traffic Impact Assessment* will be reviewed by the consent authority to address the aforementioned points in accordance with SEPP *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, matters for consideration (**Appendix 8**).

Additional requirements of Clause 16 requires the consent authority to provide the application to each roads authority for the road and the Roads Traffic Authority within 7 days if the application is applicable to transport of materials on public roads. The consent authority must also consider submissions that it receives in response from any roads authority with 21 days after they were provided with a copy of the application and must also provide them with a copy of the determination. This is to be actioned by the consent authority at the relevant time based on the information provided in this EIS, its appendices, and any subsequent information provided at request of the consent authority.

Clause 17

Clause 17 requires consideration of rehabilitation proposal applicable to the land that will be affected by the development. Additionally Clause 17 considers requirement to prepare a rehabilitation plan, assessment of waste generated by the project, potential soil contamination in conjunction with maintaining public safety.

This project has included relevant assessment in the following sections;

Closure and Rehabilitation Plan **(Appendix 18**) / **Section 5.16**

Waste Management Plan (**Appendix 14**)/**Section 5.12**

Land Resources (**Appendix 6**)/**Section 5.4**

Hazard Assessment (**Appendix 16**)/**Section 5.15**

4.3.3 Other State Legislation Applicable to the Project

Additional State legislation applicable to the Project has been outlined below in **Table 4.3:2.**

Table 4.3:2: State Legislation Applicable to the Project

Legislation	Legislation Objectives	Application to the Proposal	Assessment
Fisheries Management Act 1994	This Act aims to conserve threatened species, populations and ecological communities of fish and marine vegetation, and to promote biological diversity through ecologically sustainable development.	Assessment of key aquatic habitats to determine potential impacts and presence of *Fisheries Management Act 1994* (FM Act) listed species within the study area and immediately downstream should be included in the biodiversity assessment if applicable to the Project.	No threatened aquatic fauna was identified in Deadman's Creek which runs immediately outside of the Expansion Footprint, and therefore further consideration under this Act is not required.
Heritage Act 1977	This Act aims to develop an understanding of and encourage conservation of State heritage by enabling the identification and registration of items of State heritage significance.	An Aboriginal and European Heritage Impact Assessment revealed there were no areas of cultural significance or cultural artefacts.	In the event that a cultural object(s) is discovered during development, works will cease until an archaeologist has examined the find. The archaeologist will provide guidance on further activities in accordance with relevant legislation.
National Parks and Wildlife Act 1974	This Act promotes the conservation of the State's natural environments, objects, places or features, whilst fostering public appreciation, understanding and enjoyment of nature. The Act also aims to conserve areas which hold cultural significance to Aboriginal people, places of historic, architectural or scientific significance.	No areas included in the Project are declared under this Act.	In the event that a cultural object(s) is discovered during development, works will cease until an archaeologist has examined the find. The archaeologist will provide guidance on further activities in accordance with relevant legislation.
Native Vegetation	This Act aims to protect native vegetation	No approval is required under this legislation	No approval is required under this

Act 2003	possessing high conservation value, to improve the condition of existing native vegetation, and to encourage the revegetation of land with appropriate native vegetation. In certain circumstances, approval is required under this Act from appropriate Catchment Authority to clear native vegetation.	for projects assessed as a State Significant Development under the EP&A Act.	legislation for projects assessed as a State Significant Development under the EP&A Act.
Noxious Weeds Act 1993	The Act purposes to reduce the negative impact of weeds on the economy, community and environment of NSW. Plants declared as noxious weeds are currently listed under Weed Control Order No. 28 Declaring Certain Plants to be Noxious Weeds published in the New South Wales Government Gazette No. 97 (Department of Premier and Cabinet 2011). As the Project lies within the Port Stephens LGA, Hanson must take reasonable steps to eradicate regionally prohibited weeds, suppress and destroy regionally controlled weeds, and prevent the growth and spread of locally controlled weeds.	Noxious weeds present within the Project Area are identified in the Biodiversity Assessment Report (**Appendix 7**). As a land owner, Hanson has an obligation to control all noxious weeds under this Act. Hanson has outlined weed management initiatives in the *Statement of Commitments* (**Section 7**).	Hanson has outlined weed management initiatives in the *Statement of Commitments* (**Section 7**).
Protection of the Environment Operations Act 1997	This Act aims to protect, restore and enhance the quality of the environment in NSW through ecological sustainable development. Under this Act Environment Protection Licences are required to be administered from the EPA for 'scheduled	The Project will be classified as 'scheduled activity' as it involves the extraction, processing or storage of more than 30,000 tonnes per year of extractive materials.	Any 'scheduled development work' during the life of the Project will obtain all required licenses under Part 3.2 (47) of this Act. The Project will apply for a variation to the current EPA licence

	activities' and 'scheduled development work'.		(EPL number: 1879), as the proposed extraction limit (1.5Mtpa) will exceed the current EPL limit of 700 000 tpa.
Roads Act 1993	Under this Act approval is required from NSW Roads and Maritime Services (RMS) or local Council for any Development that affects a public road.	There is no anticipated impact on any State road infrastructure pertinent to the proposed project. A *Traffic Impact Assessment* identified Project compliance with all State road regulations and specifications under this Act **(Appendix 8)**	A *Traffic Impact Assessment* identified Project compliance with all State road regulations and specifications under this Act **(Appendix 8)**
Threatened Species Conservation Act 1995 (TSC Act)	This Act aims to conserve biological diversity, promote species recovery, manage threats and reduce impacts on threatened species. Under this Act, approval is required to: • Harm any animal that is of, or is part of, a threatened species, population or ecological community; • Pick any plant that is of, or is part of a threatened species, population or ecological community; • Damage critical habitat; or • Damage habitat of a threatened species, population or	A Biodiversity Assessment Report (**Appendix 7**) documents identified threatened species and endangered ecological communities.	Key findings; • Two threatened ecological communities • Koala *Phascolarctos cinereus* (Vulnerable, Threatened Species Conservation Act 1995 [TSC Act]) A Biodiversity Offset Strategy has been prepared to offset impacts to threatened species. Appropriate clearance protocols amongst other mitigation measures have been proposed.

	ecological community.		
Water Act 1912	This Act is being progressively phased out and replaced with the *Water Management Act 2000*, but provisions are still in force over the project site. Where water sharing plans have no commenced this Act still governs water licence allocations, trade and issue of new water licences.	The project is located within the North Coast Fractured and Porous Rock Groundwater Sources Water Sharing Plan (WSP). At the time of writing this report this plan is still in development and has not been gazetted. Therefore site groundwater licencing is covered by the Water Act (1912). It is anticipated that water licencing with sufficient share component for the taking of water shall be required, which is governed by the rules within the Water Act 1912	It is anticipated that water licencing with sufficient share component for the taking of water shall be required, which is governed by the rules within the Water Act 1912

4.3.4 Project Water Licence Requirements

The site's surface water is governed by the *Water Management Act, 2000* and the site's groundwater is managed by the *Water Act 1912*. These are independently addressed in **Section 5.11.2** and **Section 5.11.3** below.

4.3.4.1 Surface Water

Runoff is captured and treated in sedimentation basins within the quarry floor. Treated water is recirculated for application in quarry operations. Surface runoff from stockpile and processing areas shall be directed to the plant sedimentation basin and be similarly recirculated. Neither basin captures clean water from runoff or pumping. Site sedimentation basins are excluded from the harvestable rights dams capacity calculation and exempt from Water Management Act (2000) licencing in accordance with NSW Government Gazette 40 dated 31 March 2006 (pages 1628 to 1631), which has been confirmed by NOW (see Surface Water Impact Assessment).

4.3.4.2 Harvestable Rights Orders

The maximum harvestable right dam capacity has been calculated using the NSW Office of Water (NOW), under Department of Primary Industries' online calculator based on property size of 555ha. This calculation yielded a maximum Harvestable right dam capacity of 49.9 ML (megalitres). Exemption status has been confirmed by NOW. The calculation output is included as **Appendix 13** to this EIS.

The Project's West Dam has an estimated capacity of 26.79 ML based on the Farm Dams Assessment Guide (1999) (See **Section 5.11 and Appendix 13)**. Storage dam in stages 3-5 is proposed to be constructed with 8.9ML capacity. As these dams fall below the maximum harvestable capacity for the property, the Project does not need to apply for water licences. The site's sedimentation basins are exempt from classification as harvestable rights dams and therefore require no licence and are not included in the maximum harvestable rights capacity calculations.

Capture of surface water within the quarry void is an authorised supply and is considered reliable. The proposed development is consistent with the Water Sharing Plan for the Hunter Unregulated Alluvial Water Sources (2009) as there is no licenced surface water take proposed.

4.3.4.3 Groundwater

It is anticipated that water licencing for the taking of water will be required with the sufficient share component for the taking of water.

There is no net groundwater outflow from the quarry void when at equilibrium conditions. Therefore no permanent groundwater licencing is required. It is predicted that reaching equilibrium shall take of the order of 165 years after quarrying is completed, and therefore maintenance of groundwater extraction licences is required for the quarry in the long term. The Minister is required to administer the Water Act by approving the sale or transfer of licences from the site. Hanson will relinquish licences at the appropriate time, and will be subject to approval from the Minister.

Annual groundwater licencing requirements will be continuously reviewed over the life of the project and during long term rehabilitation of the site. The groundwater model will be

updated, and will be informed by ongoing data collection including continued groundwater monitoring and dewatering rates monitoring.

Preliminary estimates of licensable take at each stage's completion and through the rehabilitation period have been calculated by Martens and Associates is provided in **Table 4.3:3** below.

Table 4.3:3 Licensable groundwater take at each stage of proposed development

Stage	Calendar End Year	Licensable Groundwater Take (ML/yr) [2]
Proposed Expansion Stage 1	2022	172
Proposed Expansion Stage 2	2028	315
Proposed Expansion Stage 3	2034	424
Proposed Expansion Stage 4	2040	516
Proposed Expansion Stage 5	2046	642
10 Years of Rehabilitation	2056	452
20 Years of Rehabilitation	2066	356
30 Years of Rehabilitation	2076	277
40 Years of Rehabilitation	2086	197
50 Years of Rehabilitation	2096	142
60 Years of Rehabilitation	2106	111
70 Years of Rehabilitation	2116	86
80 Years of Rehabilitation	2126	66
90 Years of Rehabilitation	2136	50
100 Years of Rehabilitation	2146	37
163 Years of Rehabilitation [1]	2209	0 [1]

[1.] Based on rehabilitation water balance at equilibrium (Section 6.3.5 of the Hydrological Assessment)

[2.] Dewatering rates are based on uniform annual rainfall as discussed at Section 6.2.3 and Section 6.3.4 in the Hydrological Assessment.

4.3.4.4 Water Act 1912 and North Coast Fractured and Porous Rock Groundwater Sources

The project is located within the North Coast Fractured and Porous Rock Groundwater Sources Water Sharing Plan (WSP). At the time of writing this report this plan is still in development and has not been gazetted. Therefore site groundwater licencing is covered by the *Water Act 1912.*

Under the *Water Act 1912* a licence or authority is required to;

1. Take water from a stream or river via a pump or other work for all purposes other than for basic landholder rights
2. Capture surface water
    a. From rainfall runoff in a farm dam with a storage capacity greater than the calculated Maximum Harvestable Right Dam Capacity for the property; and
    b. From river flow in a dam (any size) located on a river or stream.

3. Extract groundwater via any type of bore, well, spear point or groundwater interception scheme for all purposes except to take water from an aquifer under a basic landholder rights.

Overall the *Water Act 1912* governs;

- The right to take a specific volume of water
- Works to be constructed

New water licences may still be granted in some water sources covered by the *Water Act 1912*, whereas in other area there is an embargo in place. Additionally the *Water Act 1912* governs the purchase and transfer of a licences entitlement from an existing licence holder.

As a consequence of Part 4 Division 4.1 Section 89 J(1)(g) of the EP&A Act, the following do not require approval should a SSD Approval be granted*;*

- Section 89 – Water Use Approval
- Section 90 – Water Management Work Approval
- Section 91 – Controlled Works Approval

The Project's *Hydrogeological Assessment* (**Appendix 13**) models a predicted drawdown of >2m at licenced bore GW51309 which has the potential to impact the bore's productivity. Further works are required to ensure long-term bore viability will not be affected or to assess necessary 'make good' provisions.

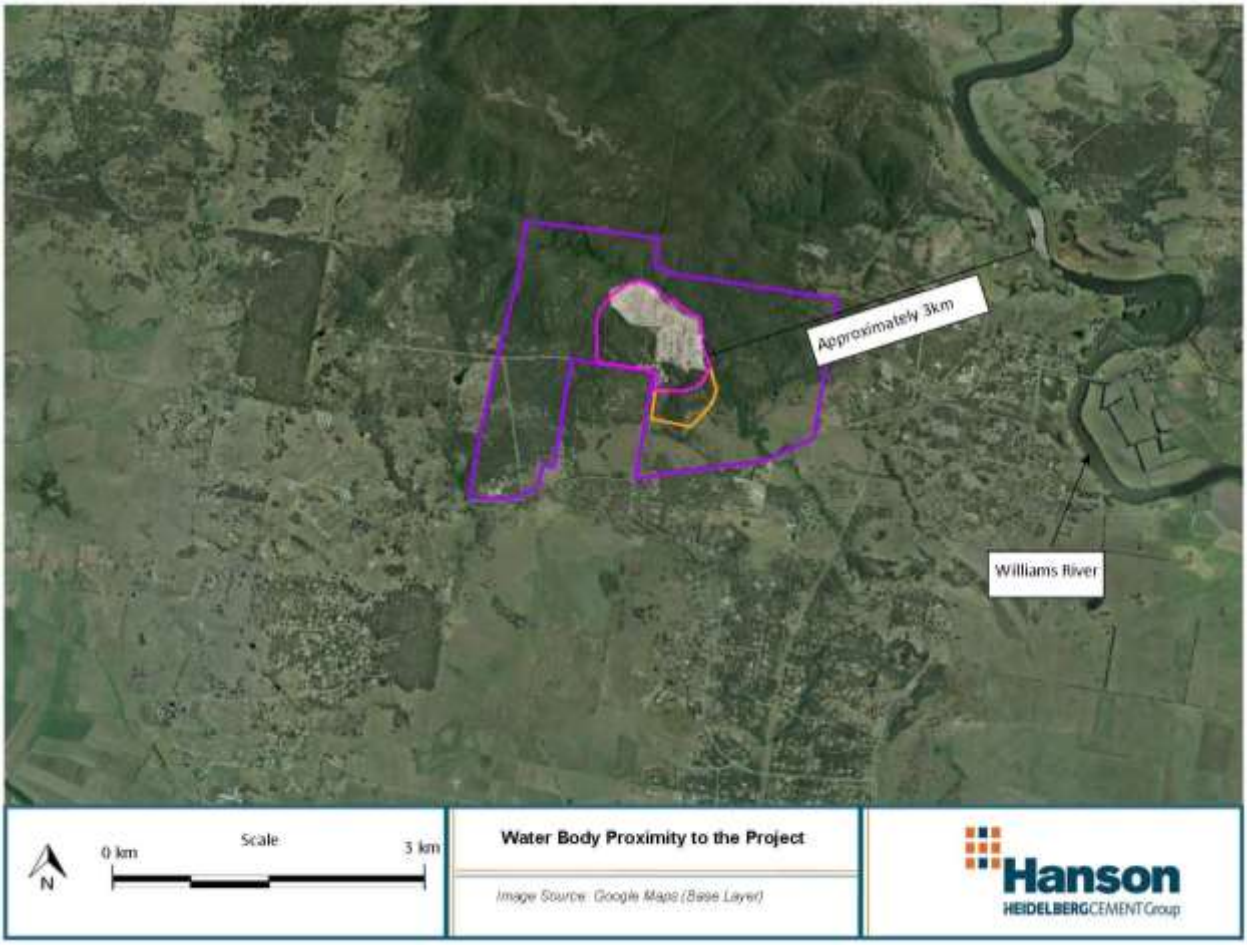

Figure 4.2: Site Proximity to Water Bodies

Aquifer Interference Policy

The Aquifer Interference Policy (the Policy/AIP) explains the role and requirements of the Minister administering the *Water Management Act 2000* in the water licensing and assessing processes for aquifer interference activities under the *Water Management Act 2000* and other legislative frameworks including the *Water Act 1912.*

Under the Aquifer Interference Policy (AIP) an aquifer is defined as;

> *"a groundwater system that is sufficiently permeable to allow water to move within in and which can yield productive volumes of groundwater".*

This Policy applies to all activities which penetrate, interfere, obstruct, take or dispose with/of water in an aquifer. Under this Policy aquifer has the same meaning as groundwater system and hence Brandy Hill Quarry Expansion Project must consider the potential project interference with its related ground water system under the Policy.

The site is located in an area where water sharing plans do not yet apply for groundwater systems. As such an aquifer interference activity that is taking groundwater is required to hold a water licence under Part 5 of the *Water Act 1912.* The requirements for proponents as detailed in sections 2.1 and 2.2 of the Policy apply to proponents/applicants of a *Water Act 1912* licence, and will be assessed in the same manner as an application made under the *Water Management Act 2000.*

Assessment of Minimal Impact Considerations

Under the Aquifer Interference Policy (AIP), licences have been divided into “highly productive” and “less productive”.

Highly productive groundwater sources are declared based on the following;

- Has total dissolved solids of less than 1,500 mg/L, and
- Contains water supply works that can yield water at a rate greater than 5L/sec.

Groundwater Quality

The site’s groundwater averages 1,560 mg/L of total dissolved solids (TDS) which is higher than the highly productive threshold. The nearest licenced bore (GW078135) records 3,600 mg/L of TDS.

Water Yield Rate

Licenced bores within the study area are below the groundwater supply threshold with an average yield of 0.53 L/s and a maximum yield of 2.53 L/s. This is reflective of the low hydraulic conductivity of the rock mass (**Appendix 13**).

Productivity

Both the site and the study area groundwater systems do not meet the criteria for groundwater quality or supply and are therefore considered low productivity.

Drawdown

GW078135 is affected by >2 m drawdown. As drawdown of the proposed development exceeded 2 m at a licenced bore, in accordance with the NSW Aquifer Interference Policy (2012) further studies are required to demonstrate to the Minister’s satisfaction that long-term bore viability will not be affected unless make good provisions apply.

Salinity

Surface Water

The NSW Aquifer Interference Policy (2012) requires that changes caused by a development to the salinity of a nearby reliable river are <1% of average river salinity. This was calculated for the Hunter River as it will receive the majority of groundwater flow passing through the rehabilitated void lake.

Results show that due to the large existing salt mass in the Hunter River there is no significant change in average salinity caused by additional salt from the rehabilitated quarry lake. Impacts of increased development salt is modelled at 0.06% and are therefore acceptable for receiving rivers in accordance with the NSW Aquifer Interference Policy (2012).

Groundwater

The NSW Aquifer Interference Policy (2012) requires assessment of any change in beneficial groundwater use caused by a development. This assessment was undertaken for the offsite licenced bore GW078135 which will receive the majority of groundwater flows passing through the rehabilitated void lake.

Results show that at equilibrium conditions groundwater salinity at bore GW078135 will increase 12.6%. There is no change in beneficial groundwater use as the groundwater is still

classified as brackish and is unsuitable for potable and most agricultural purposes. Impacts of increased development salt are therefore acceptable for receiving rivers in accordance with the NSW Aquifer Interference Policy (2012).

4.4 Local and Regional Plans/Policies/Strategies

Key Plans, Strategies and documents have been elaborated upon in the subsequent section. Additional Plans, Strategies and important documents have been identified in **Table 4.4:1** and **Table 4.4:2,** in specific regard to their relevance to the Project.

4.4.1 Lower Hunter Regional Strategy (2006)

The Lower Hunter Regional Strategy (LHRS) was released by the State Government in 2006 to guide the future of the Lower Hunter Region. It applies to all land within the Lower Hunter and that includes the Port Stephens Council LGA. The strategy's primary purpose is to ensure adequate land is available and appropriately located to accommodate the projected housing and employment needs of the Region's population over the next 25 years.

The LHRS also identifies the region's natural resources and states that 'Maintaining access and sustainable use of these resources is crucial to achieving the Strategy's objectives'. Furthermore the resource that is proposed to be extracted as part of the BHQ Project is identified in the Strategy (refer to **Figure 2.21**). In this respect toe BHQ is identified by the strategy as containing 'Non Coal Extractive Resources'. The BHQ Project proposal is consistent with the objectives and intent of the LHRS.

4.2.1 Hunter Regional Plan 2036

The subject land is clearly identified within the adopted Hunter Regional Plan 2036 (HRP) which identifies the area as important for extractive resources refer to Figure 2.22). The HRP identifies the importance of protecting resource lands for their appropriate purposes. Specifically the Strategy identifies the importance of not sterilising land suitable for extractive purposes by enabling inappropriate land use. According to the Strategy there should be careful consideration when planning land use to maintaining access and sustainable use of the resources. Additionally urban and rural housing encroachment into identified extractive resource areas should be limited. Housing development in accordance with the Strategy should not impact on strategic or important extractive resource viability.

4.2.2 Port Stephens Futures Strategy 2009

Port Stephens Futures Strategy 2009 provides a statement of the strategic directions of the region in accordance with the Port Stephens Local Environmental Plan. Specifically the plan addresses;

- Regional Context
- Future Trends and Issues
- Community Engagement
- Over-arching Strategic Directions
- Social Futures
- Cultural Futures
- Economic Futures
- Environmental Futures
- Primary Industries
- Achieving Sustainable Development and Infrastructure

- Governance

The plan provides regional guidance, facilitating compliance with overarching parental framework including local, state and federal legislation.

4.2.3 Port Stephens Planning Strategy 2011

The *Port Stephens Planning Strategy 2011* provides a comprehensive planning strategy for the Port Stephens LGA building upon the *2007 Community Settlement and Infrastructure Strategy.* This plan addresses the regional objectives outlined in the State Governments Lower Hunter Regional Conservation Plan and Lower Hunter Regional Strategy at a local scale.

The Plan also provides a review of the Port Stephens Development Control Plan, rationale for the land use planning policies and also incorporates;

- Port Stephens Commercial and Industrial Land Study; and
- Rural Lands Study.

The Project supports the outcomes contained within this plan through the provision of construction materials required to facilitate planned local and regional development as well as the provision of direct and subsequent employment opportunities required to extract, transport and process the construction materials for infrastructure development.

4.2.4 Port Stephens Local Environment Plan 2013

The relevant local environmental planning instrument is the *Port Stephens Local Environment Plan (LEP) 2013* (PSLEP 2013).

4.2.4.1 *Applicable land use definition*

The BHQ Project Proposal is defined as follows:

The **hard rock quarry** is defined as an extractive industry:

- ***extractive industry*** *means the winning or removal of extractive materials (otherwise than from a mine) by methods such as excavating, dredging, tunnelling or quarrying, including the storing, stockpiling or processing of extractive materials by methods such as recycling, washing, crushing, sawing or separating, but does not include turf farming.*

The **concrete batching plant** is defined as general industry:

- ***general industry*** *means a building or place (other than a heavy industry or light industry) that is used to carry out an industrial activity.*

The existing **Pre Coat Plant**, that is proposed to be relocated as part of this application, is also defined as general industry.

The **concrete recycling facility** is defined as a resource recovery facility as follows:

- ***resource recovery facility*** *means a building or place used for the recovery of resources from waste, including works or activities such as separating and sorting, processing or treating the waste, composting, temporary storage,*

transfer or sale of recovered resources, energy generation from gases and water treatment, but not including re-manufacture or disposal of the material by landfill or incineration.

Consequently there are three land use definitions that apply to the Project Proposal:

- *extractive industry;*
- *general industry; and*
- *resource recovery facility*

4.2.4.2 *Site Zoning*

In accordance with the PSLEP 2013 the Project Site is zoned RU2 – Rural Landscape (Refer to **Figure 4.3**). Land within the BHQ holdings is also zoned E3 – Environmental Management however the Project Proposal components nor the Project Site is within land under this zone. This land is only relevant insofar as it relates to the Biodiversity Offset Strategy outlined in **Section 5.5**.

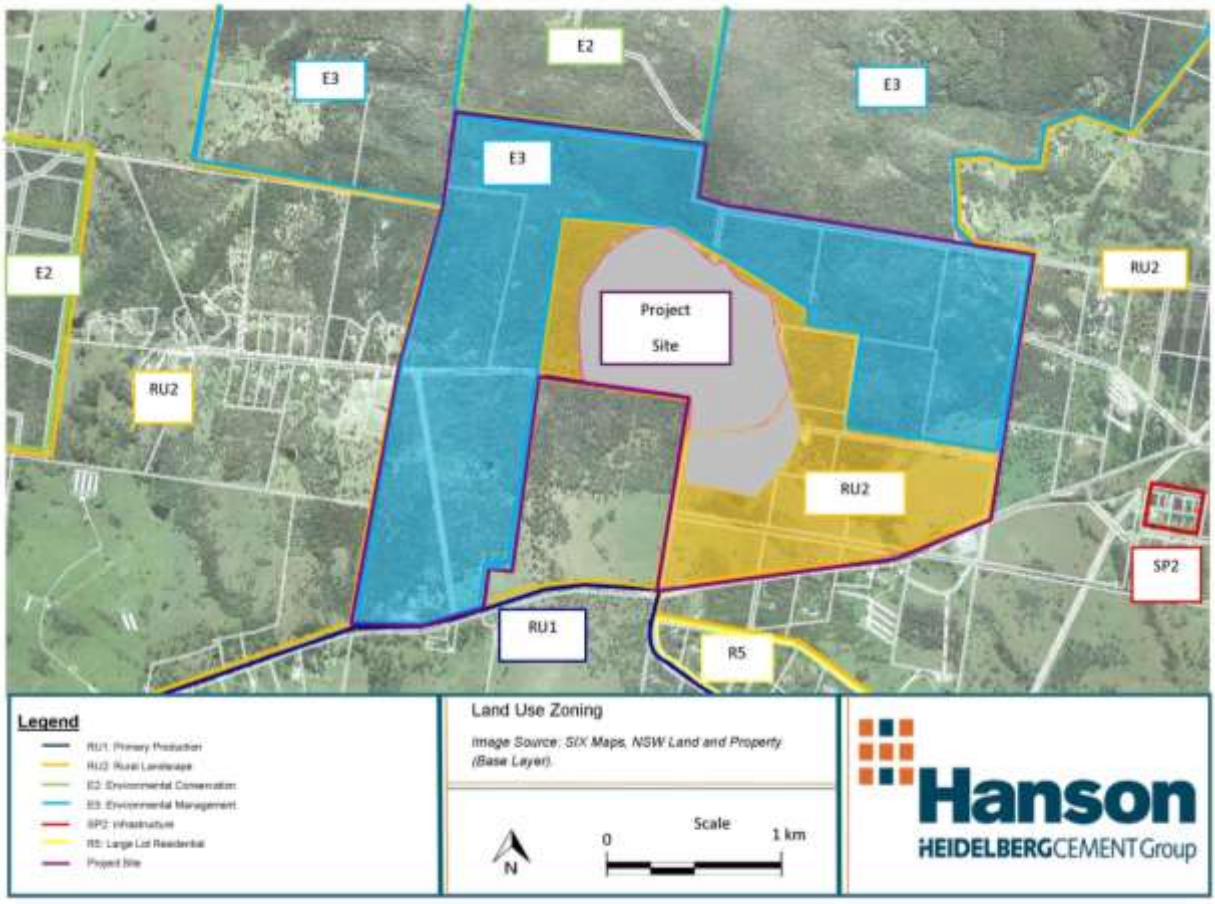

Figure 4.3: Project and Surrounding Land Use Zoning

4.2.4.3 *Project Permissibility*

The land use table for the RU2 Rural Landscape zone within the PSLEP 2013 is as follows:

> ***2 Permitted without consent***
> *Extensive agriculture; Home occupations; Intensive plant agriculture*
>
> ***3 Permitted with consent***
> *Agriculture; Airstrips; Animal boarding or training establishments; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Dual occupancies; Dwelling houses; Eco-tourist facilities; Environmental facilities; Environmental protection works;* ***Extractive industries****; Farm buildings; Flood mitigation works; Forestry; Group homes; Helipads; Home-based child care; Home businesses; Home industries; Information and education facilities; Jetties; Landscaping material supplies; Plant nurseries; Recreation areas; Roads; Roadside stalls; Rural industries; Tourist and visitor accommodation; Turf farming; Veterinary hospitals; Water recreation structures; Water supply systems*
>
> ***4 Prohibited***
> *Backpackers' accommodation; Hotel or motel accommodation; Serviced apartments;* ***Any other development not specified in item 2 or 3***

Extractive industries are a permitted use with consent in RU2 Rural Landscape zone. Additionally, under the Mining, Petroleum Production and Extractive Industries SEPP 2007 (refer to **Section 4.3)** in accordance with Clause 7, extractive industries are a permissible use in any zone where agricultural or industry is a permitted land use.

However, general industry; and resource recovery facilities are prohibited land uses within the RU2 zone. Neither land use nor their parent definitions appear in the permitted with consent column of the RU2 Rural Landscape land use table, and therefore by the virtue of the words "Any other development not specified in item 2 or 3" means that these land uses are prohibited in this zone.

Ancillary use – Concrete Batching Plant and Concrete Recycling Facility

The predominant uses of the BHQ is as extractive industry – the quarry itself is clearly the dominant land use. This proposal to incorporate a concrete batching plant and a concrete recycling facility to the Project Proposal is clearly ancillary to that predominant use and not a separate use. It has been clearly established that a use that is otherwise a prohibited use can be approved if it is not the dominant use or a separate use of the land.

In this case the proposal includes as relatively minor components to the Project Proposal the establishment of these two facilities on the site in conjunction with the quarry operations. This is because they will co-exist with the quarry which will be the major source of the resource for the concrete batching plant. Similarly the concrete waste recycling facility will also supply a recycled resource to the concrete batching plant.

The part use of the site as a concrete batching plant and a concrete recycling facility is clearly ancillary to the dominant use of the site and is not a separate use. On that basis the proposal can also be approved as an ancillary use.

Existing Use Rights – Pre Coat Plant

An existing use (defined in section 106 of the Environmental Planning and Assessment Act 1979) is a use that is lawfully commenced but subsequently becomes a prohibited use under a new local environmental plan (LEP) or other environmental planning instrument (EPI). The

EP&A Act (1979) and the EP &A Regulation 2000 (clause 39 – 46) makes provision for the continuance of existing uses.

It is understood that the Pre Coat Plant was previously lawfully approved. The fact that it is now prohibited under the PSLEP 2013 means that it enjoys existing use rights.

The Pre Coat Plant can also be considered ancillary development to the quarry operations.

4.2.4.4 *Consistency with PSLEP 2013 Objectives*

The proposed Project is consistent with the objectives of the Port Stephens LEP, specifically;

- The Project will provide construction materials to facilitate regional development consistent with *Port Stephens Futures Strategy 2009* and *Port Stephens Planning Strategy 2011*;
- The Project will facilitate economic growth through the provision of direct and flow on employment opportunities;
- The Project has assessed any cultural or heritage values on site though an *Aboriginal and European Heritage Assessment* with no identified sites/items that hold significant value;
- Clearing of vegetation will be isolated to the expansion area, with mitigation measures in place to minimise ecological impact. These are outlined in the Biodiversity Assessment Report (**Appendix 7**) and the Project's *Statement of Commitments* (**Section 7).** Offset requirements will be outlined in a separate Biodiversity Offset Strategy.
- The expansion will minimise potential visual impact through the construction of an earth bund, and natural vegetation screening.
- The Project will not place additional demand on existing local amenities/services or create demand for the extension of these amenities/services. Any increased traffic generation is within the current road capacity of the local road network.

The project is consistent with the Port Stephens LEP in the following ways;

- The project has included an assessment of Port Stephens Futures Strategy 2009 and Port Stephens Planning Strategy 2011;
- Maintain the mix of land use diversity compatible mix of land uses
- The project's offset strategy and rehabilitation plan protects and enhances the natural environmental assets of Port Stephens;
- Continues economic growth that contributes to long-term and self-sufficient employment locally through the provision of direct and carry on employment opportunities.
- The cultural and heritage assessment conserves and respect the heritage and cultural values of the natural and built environments;
- assist in the provision of infrastructure
- to continue to implement the legislative framework that supports openness, transparency and accountability of assessment and decision making; and

- Includes an assessment of intergenerational equity and assesses environmental, social and economic goals.

4.2.4.5 *Additional local provision applicable to the Project*

Table 4.4:1 addresses the additional local provisions that apply to the project:

Table 4.4:1: Additional local provision applicable to the Project

Additional local provision applicable to the Project	Assessment area and key findings
Clause 4.3 Height of Buildings	No minimum height applies to the site – structures proposed unaffected by this provision.
Clause 5.9 Preservation of trees or vegetation	**Appendix 7** This issue is dealt with at **Section 5.5** of this report.
Clause 5.10 Heritage Conservation	**Appendix 12** The proposal does not impact on any items of Environmental Heritage.
Clause 5.11 Bushfire	**Appendix 16** The subject site is bushfire prone land.
Clause 7.1 Acid sulphate soils	**Appendix 6** The site is mapped on the Department of Land and Water Conservation (DLWC) Acid Sulphate Soil Risk Map 1:125 000 Sheet 64 (1997) as '*no known occurrence of acid sulphate soil materials*'.
Clause 7.9 Wetlands	**Appendix 7** The study area does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links.
Clause 7.3 Flood planning	**Appendix 13** Flood flows up to and including the Probable Maximum Flood will not increase flows from the project in comparison to existing flows
Clause 7.10 Williams River catchment	**Appendix 13** Overall the reduction in the catchment area of drainage line 2 represents approximately 2% of the entire Deadmans Creek catchment to Williams River and henceforth changes to the Williams River will be negligible.

4.2.5 Port Stephens Development Control Plan 2013

The Port Stephens Development Control Plan provides guidelines for local development which enhances natural and cultural heritage values consistent with the local amenity. This Plan applies to all land zones under the Port Stephens Local Environmental Plan 2013. It is applied in conjunction with the Environmental Planning and Assessment (EPA) Act, 1979 and other State Planning Policies which may apply to the land to which the DCP applies. Issues that are relevant to the project include;

- Environmental and Construction Management;
- Parking, Traffic and Transport; and
- Industrial Development.

4.2.6 Port Stephens Council Comprehensive Koala Plan of Management

The Port Stephens Comprehensive Koala Plan of Management (CKPoM) was released in 2002 to ensure long term survival of the koala by;

- Evaluating and ranking koala habitat throughout the Port Stephens LGA;
- Identifying threats impacting on koalas and koala habitat;
- Provide effective public awareness and education programs;
- Facilitate targeted koala conservation and management-oriented research projects within the Port Stephens LGA; and
- Ensure that adequate detail is provided with development applications in order to assess minimise and ameliorate likely impacts on koala habitat.

The Biodiversity Assessment Report composed by Biosis Pty Ltd (Biosis) notes the applicability of the CKPoM to the Project. Further details regarding koala assessment is provided in the *Biodiversity Assessment Report* and koala referral (**Appendix 7**) which is also outlined in **Section 5.5.5** of this report. This section outlines the applicability of the Port Stephens CKPoM in respect to the Brandy Hill Quarry Expansion Project.

Table 4.4:2: Regional/Local Plans, Strategies, and Documents.

Plan/Strategy/Document	Description	Relevance to the Project
Lower Hunter Regional Conservation Plan, 2009.	This Plan develops the framework to guide conservation efforts in the Lower Hunter in relation to conservation planning efforts in areas of anticipated growth.	The Project has revised the impact area to decrease the clearing size and to promote the maintenance of biodiversity on site. This Plan provides guidelines for environmental impact assessment of biodiversity in areas identified for development.
Port Stephens Economic Development Strategy, 2007	Details the development strategy for the Port Stephens LGA. The plan is sustainability focused, accounting for economic, social and environmental factors in the development of services and provisions required to support population growth.	The Project will provide integral road and construction resources to enable this Strategy to meet its objectives and the objectives of interrelated plans on which it relies in inputs into.
Australia to 2050: Future Challenges - the 2010 Intergenerational Report, 2010	This report documents Australia's demographic composition and also the factors influences demographic changes on a national scale and the challenges associated with providing services to meet these challenges.	The Project will facilitate the provision of road and construction materials required to develop infrastructure to meet some of the planning challenges outlined in this report.

Environmental Assessment

Section 5

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

5 Environmental Assessment

The SEARs dictate that the EIS must include;

A risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment – **Section 5.1**
The likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site (such as the Martins Creek Quarry) – **Section 5.2**

5.1 Environmental Risk Assessment

5.1.1 Overview

A qualitative risk analysis was undertaken to assist in determining whether detailed assessment of key issues was required, formulating assessment methodologies, prioritising environmental issues for assessment, and identifying proposed actions for each identified environmental issue.

A qualitative risk assessment was undertaken which involved;

through preliminary environmental investigations.

consultation with major agency stakeholders.

community consultation, particularly through the CCC and community groups.

Specifically, a Preliminary Environmental Assessment (PEA) was submitted to the NSW DP&I (now DP&E) with the Project Application to assist in the preparation of DGRs (now SEARs) for the proposed Project. These documents are annexed as **Appendix 1, Appendix 2** and **Appendix 3.** Environmental Issues related to the Project have been identified below;

- Land resources
- Biodiversity
- Traffic and Transport
- Noise
- Blasting
- Air Quality
- Heritage
- Water Resources
- Waste
- Greenhouse Gases
- Visual
- Hazards
- Social & Economic
- Rehabilitation

After the DGRs (now SEARs) were issued, the Proponent commenced consultation as per **Section 3.3.** Community Consultation, in particular through the Brandy Hill and Seaham Action Committee via the CCC identified key community environmental issues that require particular focus in the EIS process.

Such community raised concerns have been cross referenced with the DPE SEARs to ensure that all major environmental issues have been adequately addressed.

The primary concerns raised were:

- Increased traffic levels
- 24 hour production and sales
- Road surface deterioration
- Safety (pedestrian/cycle path along Brandy Hill Drive)
- Noise associated with increase in truck movements

Community Concern	Correlation with DPE SEARs
Increased traffic levels	Traffic and transport Impact Assessment
24 hour production	Socioeconomic Impact Assessment
Road surface deterioration	Traffic and transport Impact Assessment
Safety (pedestrian/cycle path along Brandy Hill Drive)	Community Consultation and noted in the Traffic and Transport Impact Assessment.
Noise associated with increase in truck movements	Noise Impact Assessment

A detailed Environmental Risk Assessment for the above mentioned environmental issues has been undertaken and is summarised in **Table 5.1:1.** Issues requiring additional analysis have been identified and are further elaborated upon in the following *Key Environmental Issues* section. Proposed mitigation measures to minimise detrimental Project impacts on the surrounding amenity are also presented in the following Key Environmental Issues (**Section7.4**) section of this EIS.

Table 5.1:1: Environmental Risk Analysis

Environmental Issue	Development Action	Additional Analysis Required?	Proposed Action
Socio-Economic	Increase in truck movements, noise and air emissions and visual exposure.	Yes. Driver awareness, bund construction to minimise air and noise dispersion and to reduce views to the quarry.	Assessment of local and regional social amenity, detailed mitigation measures, and a costs and benefits analysis of the Project.
Land Resources	Land form alteration and potential development on contaminated land.	Yes. Assessment of potential contamination, soil characteristics, and agriculture capability of the site is required.	Assessment of soils in respect to the agricultural and existing contamination. If the soils are deemed non-contaminated and non-productive then the Project should proceed in this regard.
Biodiversity	Vegetation clearance & habitat removal.	Yes. Potential impacts on flora and fauna with particular consideration given to threatened species and endangered ecological communities.	Preparation of a detailed Flora and Fauna Assessment to identify clearance estimates, impacts of regionally significant remnant vegetation or vegetation corridors, impacts on terrestrial or aquatic threatened species, populations and their habitats, EECs and GDEs, and a measures to avoid, reduce or mitigate impacts on biodiversity. An offset strategy has been prepared.
Aboriginal and European Heritage	Landform alteration & vegetation clearance	Yes. Assessment required to determine the presence of culturally significant sites.	An Aboriginal cultural heritage assessment including investigation of cultural and archaeological significance. Specifically consultation with Aboriginal communities, regarding the proposed mitigation and management measures, and identification of any culturally significant sites/ State or locally significant historic heritage items.
Traffic and Transport	Increase in truck movements.	Yes. Noise increase and safety concerns. Potential impact on socio-economic amenity.	A traffic and transport impact assessment to enable accurate prediction of road traffic generated by the Project, including road transport routes likely to be used and a description of vehicles. Inclusion of noise and safety concerns in the socio-economic impact assessment report.
Noise	Extended operating time, increase in annual production & increase in truck movement.	Yes. Potential site and road impacts. Potential impact on socio-economic amenity.	A detailed noise impact assessment to quantify construction, operational and off-site transport noise impacts, as well as proposed mitigation measures.
Blast	Increase in blast frequency.	Yes. Blast impact analysis required to assess the impact on the closest receptors.	A blast impact assessment to address proposed hours, frequency, methods and impacts.
Air quality	Increased operating time and increase in annual production. Operations extending closer to residential properties	Yes. Potential increase in dust and GHG emissions.	An air quality impact assessment to quantify construction and operations impacts of dust (PM2.5 and PM10), dust generation from blasting and processing, diesel emissions, mitigation measures including monitoring and management.
Water Resources	Increase in operational water demands. Disturbance of the water table. Alteration of existing	Yes. Potential for groundwater and surface water impacts including groundwater drawdown, alteration to both groundwater and	A comprehensive assessment of ground and surface water detailing; resource impact of site water balance, water discharge, proposed water management system and water monitoring program to mitigate surface and ground water

	surface water systems.	surface water quality, yield etc.	impacts, and conformance to any relevant Water Sharing Plan.
Rehabilitation	Vegetation removal and increase in surface area exposure. Alteration in land geomorphology.	Yes. Geotechnical stabilisation and return to pre-project ecological conditions where possible.	The preparation of a proposed rehabilitation strategy detailing proposed conceptual final landform and associated rehabilitation works to enable closure and successful rehabilitation.
Greenhouse Gas (GHG)	Extended operating time of the plant both mobile and fixed. Increase in annual production.	Yes. Emissions estimation required.	A GHG quantitative assessment of potential scope 1, 2, and 3 greenhouse gas emissions, qualitative assessment of the potential impacts of these emissions on the environment and an assessment of reasonable and feasible measures to minimise GHG emissions and promote energy efficiency.
Waste	Increase of general and production waste.	Yes. Quantification and management of Project waste.	An accurate assessment of quantity and nature of potential waste, waste disposal strategy, material importation details, and waste minimisation strategies.
Hazards	Hazardous substance use and new extraction limits conforming to bushfire setback requirements.	Yes. Vegetation setback distance and safe hazardous chemical use.	Preparation of hazard analysis assessment addressing hazardous chemicals and bushfire with respect to public safety.
Visual	Increase quarry footprint & introduction of a concrete batching plant. Relocation of the processing plant.	Yes. Bund construction and implementation of mitigation measures.	Preparation of a detailed assessment of the changed landforms, potential visual impacts of receptors and proposed mitigation measures.

5.1.2 Other Issues

The *Port Stephens Development Control Plan 2013* contains provisions for Environmental and Construction Management, Parking, Traffic and Transport, and Industrial Development which have relevance to the Project. Council building regulations, wastewater, and waste management requirements as outlined in the *Environmental and Construction Management DCP 2013* or the most recently updated document will be adhered to at applicable Project stages unless otherwise approved by the Secretary as part of this EIS. Wastewater and waste requirements are addressed in full in **Section 5.11(Appendix 13)** and **Section 5.12 (Appendix 14)** respectively**.**

5.2 Interactions with existing approved and proposed extractive industry development.

Interactions between the Project and other extractive industry development differ based on the scale of the development, the nature of the development and the proximity of the development to Hanson's Brandy Hill Quarry site. However in general, interactions for the purposes of this EIS are defined as the kind of interactions that occur or have the potential to occur between the proposed Project and another extractive industry site/s. The way in which the degree of interaction is determined is by assessing assessment components. The following environmental components have been investigated for inclusion in this EIS as directed by the SEARs and are detailed below;

- Socio-economic
- Biodiversity
- Traffic/Transport
- Noise
- Air quality
- Hazards
- Visual
- Rehabilitation
- Waste
- Water (surface and groundwater)

Each environmental issue has the potential to impact the wider environment (including social environment) at varying scales. **Table 5.2:1** below attributes an interaction weighting for each extractive industry with respect to Hanson's proposed Brandy Hill Quarry Expansion Project. The description is based on findings from specialist studies to this EIS (See **Appendix 6 – 18)** which should be reviewed in full for complete understanding of the interaction rating with between Brandy Hill Quarry and each identified quarry.

The interaction assessment outlined in the tables below demonstrate that Brandy Hill Quarry has little or no interaction with other quarries operating in the region.

Table 5.2:1: Interaction Assessment Table

Assessment Criteria	Description	Score
Proximity	0km – 5 km	2
	5.1km – 15km	1
	15km +	0
Scale of Development	750, 001 tonnes per annum +	3
	250, 001 – 750, 000 tonnes per annum	2
	0 – 250, 000 tonnes per annum	1
Nature of development	Socio-economic	No (0) Yes (1)
	Biodiversity	No (0) Yes (1)
	Traffic/Transport	No (0) Yes (1)
	Noise	No (0) Yes (1)
	Air quality	No (0) Yes (1)
	Hazards	No (0) Yes (1)
	Visual	No (0) Yes (1)
	Rehabilitation	No (0) Yes (1)
	Waste	No (0) Yes (1)
	Water (surface and groundwater)	No (0) Yes (1)

TOTAL IMPACT	0 – 4: No Interaction	0 – 4
	5-10: Low interaction	5 – 10
	11-15: Moderate Interaction	11– 15
	16 + High	16 +

5.2.1 Methodology

A search was conducted using the Department of Planning and Environment's online search tool with the search input *"Port Stephens Local Government Area".* The search results identified;

- SEARs issued for;
    - Bobs Farm Quarry
    - Brandy Hill Quarry (this application)
- Revoked;
    - Johnstons Quarry Project
- Determined;
    - Salt Ash Quarry
    - Mackas Sand Project
    - Tanilba North Quarry
    - Fullerton Cove Sand Quarry
    - Boral Windblown Sand Extraction
- EIS Exhibition;
    - Cabbage Tree Road Sand Quarry
    - Eagleton Quarry

Additional Projects

Hanson notes that Martins Creek Quarry is located in the Dugong Shire Council will potentially interact with the Brandy Hill Quarry Expansion Project as well.

Boral Seaham Quarry is not approved as a state significant project, however it has been assessed in respect to potential interaction as it is situated 16km by road (10km as the crow flies) from the Brandy Hill site.

5.2.1.1 *Description of Projects*

Bobs Farm Quarry

Bobs Farm sand project involves the establishment of a quarry to extract and process sand at a rate of approximately 750,000 tonnes per annum from a total resource of 10 million tonnes, establishment of extractive materials processing and transport infrastructure, transportation of extractive materials off-site via roads, and rehabilitating the site. The site is

located approximately 15km southwest of Nelson Bay and approximately 30km (as the crow flies) from the proposed Project.

The Bobs Farm project has not been approved and therefore environmental impacts are unable to be accurately quantified. In regards to traffic it is noted that Bob's Farm Quarry Project does not utilise the same regional road network (except when supplying jobs local to the Brandy Hill area). Other environmental issues are not deemed cumulative in nature. Environmental issues include (not limited to) noise, air quality, rehabilitation, water, socio-economic, visual, ecology, hazards, and waste. Environmental Impacts from Bobs Farm project do not exceed determined criteria. They are effectively managed on site resulting in negligible cumulative impacts considering the 30km buffer distance between this Project and Bob's Farm Quarry. The interaction assessment outlined in **Table 5.2:2** below scores the interaction between Bob's Farm Quarry and Brandy Hill Quarry as 2 – No Interaction.

Table 5.2:2: Bobs Farm Quarry Interaction Assessment Score

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	250, 001 – 750, 000 tonnes per annum	2
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with proposed Bobs Farm quarry operations and therefore there is no predicted socio-economic interaction between BHQ and Bobs Farm Quarry.	No (0)
	Biodiversity: Unlikely to have cumulative impacts it would be unreasonable to attribute a score until a review of the Biodiversity Assessment Report (BAR) could be undertaken.	No (0)
	Traffic/Transport: Uses different regional haulage routes, unless accessing local jobs in the Brandy Hill Quarry area.	No (0)
	Noise: Noise impacts will remain complaint with the relevant criteria and therefore there will be no noise interaction with Bobs Farm Quarry.	No (0)
	Air quality: Air quality generally complies with applicable levels. The distance between quarries is too great to consider an air quality interaction between Bobs Farm quarry and BHQ.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Any hazard generated by Bobs Farm will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Bobs farm quarry, as the quarries are 30km apart (as the crow flies). There is therefore no visual interaction between quarries.	No (0)
	Rehabilitation: BHQ is the subject of a project specific rehabilitation plan which will have no impact on the rehabilitation objectives of Bob's Farm.	

	Waste: Waste generated by BHQ will be effectively managed in accordance with the site's waste management assessment (Appendix 14). Should Bob's Farm quarry be approved, the site would be subject to their own waste management procedures. Data is currently unavailable.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater (**Appendix 13**). Therefore no water interaction will occur between BHQ and Bobs Farm.	No (0)
TOTAL IMPACT	No interaction	Value 2

Eagleton Quarry

The Eagleton Quarry Project has submitted a request for SEARs in October 2015. This project proposes to extract 600,000 tonnes of rock per annum to be transported by truck to customers. Approval is sort for a 30 year project life. The EIS was on public exhibition at the time of writing. The interaction assessment outlined in **Table 5.2:3** below scores the interaction between Eagleton Quarry and Brandy Hill Quarry as 2 – No Interaction.

Table 5.2:3 Eagleton Quarry Interaction Assessment Score

Assessment Criteria	Description	Score
Proximity (straight line distance).	5.1km – 15km	1
Scale of Development	250, 001 – 750, 000 tonnes per annum	2
Nature of development	Socio-economic: Due to the proximity of these quarries, there may be a small degree of socio – economic interaction between them, associated with traffic when assessing local jobs. Positive interaction between quarries is associated with generating competition in local markets.	Yes (1)
	Biodiversity: Biodiversity: Values will be determined by Martin's Creek Biodiversity Assessment.	No (0)
	Traffic/Transport: Minor levels of transport interaction occur when vehicles access local jobs. However Eagleton Quarry is located near the Pacific Highway, which is expected to be the quarry's major haul route in both northerly and southerly directions.	Yes (1)
	Noise: BHQ noise levels are compliant with applicable criteria. Traffic noise for the project complies with the applicable criteria. Therefore noise interaction will be negligible between BHQ and Eagleton Quarry.	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries acts as a buffer to avoid potential accumulation of air pollutant dispersion between quarries. Brandy Hill Quarry's Air Quality Impact Assessment (AQIA) includes predictive dispersion modelling which indicates that air pollutants will not travel the necessary distance to create a cumulative interaction impact with emissions from the Eagleton Quarry.	No (0)
	Hazards: All hazards are effectively managed on site. No off site	

	hazard impacts are generated by the project. Therefore any hazard impact generated by Eagleton Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Eagleton Quarry. Therefore there will be no visual interaction between these two quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ is subjected to the project's individual rehabilitation plan which will have no impact on the rehabilitation objectives of Eagleton Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and procedures independently to Boral Seaham Quarry. Therefore there is no interaction in respect to waste management between BHQ and Eagleton Quarry.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Eagleton Quarry.	No (0)
TOTAL IMPACT	No impact	Value 4

Johnstons Quarry Project

This project has been revoked and is therefore not subject to further consideration.

Salt Ash Quarry

The Salt Ash Quarry Project involves the extraction of up to 200, 000 tonnes of sand per annum which will be transported by road during a project life of 18 years. The quarry is situated on Nelson Bay Road, Salt Ash, over 25km from BHQ. Salt Ash received conditional approval in 2010. The interaction assessment outlined in **Table 5.2:4** below scores the interaction between Salt Ash Quarry and Brandy Hill Quarry as 1 – No Interaction.

Table 5.2:4: Salt Ash Quarry Interaction Assessment Score

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	0 – 250, 000 tonnes per annum	1
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Salt Ash Quarry operations and therefore there is no predicted socio-economic interaction between BHQ and Salt Ash Quarry.	No (0)
	Biodiversity: There will be insignificant biotic interaction between sites due to the distance.	No (0)
	Traffic/Transport: The Salt Ash Quarry Project uses different regional haulage routes, unless accessing local jobs in the Brandy Hill.	No (0)

	Noise: Noise impacts will remain compliant with relevant criteria. There will be no noise interaction with Salt Ash Quarry.	No (0)
	Air quality: Air quality generally complies with applicable criteria. The distance between the two quarries is too great to consider an air quality interaction between Salt Ash Quarry and BHQ.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Salt Ash Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Salt Ash Quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point	No (0)
	Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Salt Ash Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed. Salt Ash Quarry are accountable for managing their own waste in accordance with relevant guidelines.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. No water interaction will occur between BHQ and Salt Ash Quarry.	No (0)
TOTAL IMPACT	No interaction	Value 1

Mackas Sand Project

Mackas Sand Project involves the transportation of up to 2 million tonnes of sand a year by truck to local and regional markets. The site is located at Salt Ash, approximately 25 km from Brandy Hill Quarry. The project was approved September 2009. The interaction assessment outlined in **Table 5.2:5** below scores the interaction between Mackas Sand and Brandy Hill Quarry as 3 – No Interaction.

Table 5.2:5: Mackas Sand Project Interaction Assessment

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	750, 000 +	3
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Mackas Sand Quarry operations and therefore there is no predicted socio-economic interaction between BHQ and Mackas Sand Quarry	No (0)

	Biodiversity: There will be negligible biotic interaction between sites due to the distance between quarries.	No (0)
	Traffic/Transport: Uses different regional haulage routes, unless accessing local jobs in Brandy Hill Quarry.	No (0)
	Noise: Noise impacts will remain complaint with the relevant criteria. There will be no noise interaction with Mackas Sand Quarry.	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries is too great to consider an air quality interaction between Mackas Sand Quarry and BHQ.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Mackas Sand Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Mackas Sand Quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point	No (0)
	Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Mackas Sand Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in accordance with relevant waste policy and procedures. Mackas Sand Quarry will manage their waste independently to BHQ.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Mackas Sand Quarry	No (0)
TOTAL IMPACT	No interaction	Value 3

Tanilba North Quarry

Tanilba Northern Dune Sand Extraction Project involves vegetation clearance, topsoil stripping and stockpiling, extraction of 300, 000 tonnes of sand over three years, transportation of silica, transportation of processed materials to Sydney and Newcastle via road and progressive rehabilitation of the site. The project was approved 8 March 2013. The extraction facility is located at Salt Ash approximately 25km (as the crow flies) from BHQ. The interaction assessment outlined in **Table 5.2:6** below scores the interaction between Tanilba North Quarry and Brandy Hill Quarry as 1 – No Interaction.

Table 5.2:6: Tanilba North Quarry Interaction Assessment

Assessment Criteria	Description	Score

Proximity	15km +	0
Scale of Development	0 – 250, 000 tonnes per annum	1
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Tanilba North Quarry operations and therefore there is no predicted socio-economic interaction between BHQ and Tanilba North Quarry Biodiversity: There will be negligible biotic interaction between sites due to the distance. Traffic/Transport: Uses different regional haulage routes, unless accessing local jobs in the Brandy Hill area. Noise: Noise impacts will remain complaint with the relevant criteria and therefore there will be no noise interaction with Tanilba North Quarry. Air quality: Air quality generally complies with criteria levels. The distance between quarries is too great to consider an air quality interaction between Tanilba North Quarry and BHQ. Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Any hazard impact generated by Tanilba North Quarry will not interact with BHQ. Visual: There are no views from BHQ to Tanilba North Quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point. Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Tanilba North Quarry. Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and procedures. Tanilba North Quarry will manage their waste independently to BHQ. Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. No water interaction will occur between BHQ and Tanilba North Quarry.	No (0) No (0) No (0) No (0) No (0) No (0) No (0) No (0) No (0)
TOTAL IMPACT	No interaction	Value 1

Fullerton Cove Sand Quarry

Fullerton Cove Sand Extraction Project involves the extraction of approximately 1,056,500 tonnes of sand from the site, constructing visual and acoustic barriers across the site, and progressively grading the landform post-extraction. The project was approved July 2009 and

is situated approximately 25km (as the crow flies) from BHQ. The interaction assessment outlined in **Table 5.2:7** below scores the interaction between Fullerton Cove and Brandy Hill Quarry as 3 – No Interaction.

Table 5.2:7: Fullerton Cove Sand Quarry

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	750, 000 tonnes per annum +	3
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Fullerton Cove operations. No socio-economic interaction between BHQ and Fullerton Cove is predicted.	No (0)
	Biodiversity: There will be negligible biotic interaction between sites due to the distance.	No (0)
	Traffic/Transport: Uses different regional haulage routes, unless accessing local jobs in the Brandy Hill area.	No (0)
	Noise: Noise impacts will remain compliant with relevant criteria. There will be no noise interaction with Fullerton Cove Sand Quarry	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries is too great to consider an air quality interaction between Fullerton Cove and BHQ.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Fullerton Cove will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Fullerton Cove. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Fullerton Cove.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and procedures. Fullerton Cove will manage their own wastes independently to BHQ.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Fullerton Cove	No (0)
TOTAL IMPACT	No interaction	Value 3

Boral Windblown Sand Extraction

The project involves the extraction of windblown sand from the Boral Stockton quarry located approximately 25 km from Brandy Hill Quarry. The consent limits transportation of product from the site to 500,000 tonnes per annum. The interaction assessment outlined in **Table 5.2:8** below scores the interaction between Boral Windblown Sand Extraction and Brandy Hill Quarry as 2 – No Interaction.

Table 5.2:8: Boral Windblown Sand Extraction

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	250, 001 – 750, 000 tonnes per annum	2
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Stockton quarry operations. Socio-economic interaction between BHQ and the Stockton quarry is not predicted.	No (0)
	Biodiversity: There will be negligible biotic interaction between sites due to the distance.	No (0)
	Traffic/Transport: Uses different regional haulage routes.	No (0)
	Noise: Noise impacts will remain complaint with the relevant criteria and therefore there will be no noise interaction with Boral Windblown Sand Extraction quarry.	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries is too great to consider an air quality interaction between Stockton quarry and BHQ.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Stockton quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Stockton quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Stockton quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in accordance with relevant waste policy and procedures. Stockton quarry will manage their waste independently to BHQ.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Stockton	No (0)

	quarry	
TOTAL IMPACT	No interaction	Value 2

Cabbage Tree Road Sand Quarry

The proposed Cabbage Tree Road Sand Quarry project includes establishment of a quarry to extract and process at a maximum rate exceeding 500,000 tonnes per annum of sand, from a total resource of 4.6 million tonnes, construction of site infrastructure, amenities & environmental controls, transportation of material off-site via public roads, and progressive rehabilitation of the site. The EIS was on public exhibition at the time of writing. The interaction assessment outlined in **Table 5.2:9** below scores the interaction between Cabbage Tree Sand Extraction and Brandy Hill Quarry as 2 – No Interaction.

Table 5.2:9: Cabbage Tree Road Sand Quarry

Assessment Criteria	Description	Score
Proximity	15km +	0
Scale of Development	250, 001 – 750, 000 tonnes per annum	2
Nature of development	Socio-economic: Due to the distance, the Brandy Hill community will have negligible interaction with Cabbage Tree Road Sand Quarry operations. No socio-economic interaction between BHQ and the Cabbage Tree Rd Sand Quarry is predicted.	No (0)
	Biodiversity: Uses different regional haulage routes, unless accessing local jobs in the Brandy Hill Area.	No (0)
	Traffic/Transport: Uses different regional haulage routes, unless accessing local jobs in Brandy Hill Quarry.	No (0)
	Noise: Noise impacts will remain complaint with the relevant criteria and therefore there will be no noise interaction with Cabbage Tree Road Sand Quarry.	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries is too great to consider an air quality interaction between Cabbage Tree Road Sand Quarry and BHQ. Neither are they visible together from any reasonably distant vantage point	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Cabbage Tree Road Sand Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Cabbage Tree Road Sand Quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ has prepared project specific rehabilitation assessment which will have no impact on the rehabilitation objectives of Cabbage Tree Road Sand Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in accordance with relevant waste policy and procedures. Cabbage Tree Road Sand Quarry will manage their waste independently to BHQ.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Cabbage Tree Road Sand Quarry.	No (0)
TOTAL IMPACT	No interaction	Value 2

Martin's Creek Quarry

Additionally Hanson is aware of the Martin's Creek Quarry situated approximately 20km via road from Brandy Hill Quarry. Martins Creek Quarry, has submitted a *Preliminary Environmental Assessment* for a quarry expansion proposing:

- extracting up to 1.5 million tonnes of hard rock material per annum;
- expanding into new extraction areas and clearing approximately 36.8 hectares of vegetation;
- increasing the hours of operation for quarrying to 6am – 6pm (Monday to Saturday), processing to 6am - 10pm (Monday to Saturday), mixing and binding to 4:30am - 10pm (Monday to Friday) and 4:30am - 6pm (Saturdays), stockpiling, loading and dispatch of road transport to 5:30am - 7pm (Monday to Saturday) and train loading to 24 hours per day, 7 days per week;
- consolidating existing operations and approvals; and
- rehabilitating the site.

Table 5.2:10: Martin's Creek Quarry

Assessment Criteria	Description	Score
Proximity (straight line distance).	5.1km – 15km	1
Scale of Development	750, 000 +	3
Nature of development	Socio-economic: Socio- economic assessment considers visual, traffic, noise and air quality impacts, to gauge the overall level of impact. There will be some degree of interaction in regards to traffic which has the potential to cause some socio-economic impact.	Yes (1)
	Biodiversity: Values will be determined by Martin's Creek Biodiversity Assessment.	No (0)
	Traffic/Transport: Martins Creek Quarry uses some of the same local haulage routes as Brandy Hill Quarry. Because of this, Hanson has consulted with Martin's creek quarry management to obtain traffic counts and accurately attribute an interaction assessment value. The Brandy Hill Traffic Impact Assessment (TIA) revealed that the local road network is capable of accommodating current and proposed increases of both quarries. Refer to the traffic impact assessment for complete details. Nonetheless, both quarries use Brandy Hill Drive as a haul road and therefore a level of interaction is recorded (whilst not deemed significant).	Yes (1)
	Noise: Noise levels are compliant with applicable criteria. Traffic noise for the project complies with the applicable criteria. Traffic data for Martins Creek Quarry was made available to Hanson and has been included in the Brandy Hill Traffic Impact Assessment.	No (0)
	Air quality: Each site is subject to their own criteria levels as determined by the Environment Protection Authority (EPA).	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Martins Creek Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Martins Creek Quarry. There is therefore no visual interaction between quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ is the subject of a specific rehabilitation plan which will have no impact on the rehabilitation of Martins Creek Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and	

	procedures. Martins Creek Quarry will manage their waste independently to BHQ. Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Martins Creek Quarry.	No (0)
TOTAL IMPACT	Low interaction	Value 6

Hanson has engaged with the operators of the Martins Creek Quarry, with the aim of establishing and maintaining constructive and transparent dialogue, to assist in quantifying potential interactions and subsequent cumulative impacts associated with the expansion of both proposed quarries.

The Brandy Hill Quarry Expansion Project has engaged expert consultants to quantify and model the potential cumulative impacts (interaction between the projects). In doing so, the resultant modelling has generally indicated no significant cumulative impact as a result of interaction between the two projects. Interactions are mostly associated with traffic movements and consequent socio-economic concerns with the main issues being road noise and road safety. Refer to **Section 5.3**/**Appendix 17** and **Section 5.6/Appendix 8**.

Boral Seaham Quarry

Boral Seaham Quarry is not approved as a state significant project. It has been assessed in respect to potential interaction with Brandy Hill, as it is located 16km from the BHQ Project Site by road (10km in a direct line). The quarry is managed through Port Stephens Council and therefore little is publicly available about this quarry, however the EPA licence stipulates an upper limit of 200, 000 tonnes extracted processes or stored.

Additionally, both Brandy Hill and Seaham quarries currently co-exist with one another. With no further information available, a more detailed assessment regarding any interaction between both quarries is not possible.

No further information available regarding the conditions of Development Consent applied to Boral Seaham Quarry. Hanson is therefore unable to make a more detailed assessment regarding any interaction between both quarries.

A minor level of socio-economic interaction is anticipated, due to the moderate proximity of the Boral Seaham Quarry and the Brandy Hill Quarry. There may also be insignificant transport interaction, when vehicles are taking materials to local job-sites. However Boral Seaham Quarry is located just 1.5 km from the Pacific highway, which is expected to be the quarry's major haul route in both northerly and southerly directions.

Anecdotal evidence indicates trucks from Boral Seaham Quarry use Clarencetown Road and Brandy Hill Drive, albeit at negligible frequencies. Without understanding the Boral Seaham quarry haulage routes, it would be difficult to assess any cumulative impact any further. No other environmental issues are expected to have any level of interaction between these two quarries due to the distance, relatively low annual production of Boral Seaham quarry, and

the environmental safeguards and best practice operations conducted by BHQ to ensure best practice in compliance, environmental management and safety.

Table 5.2:11: Boral Seaham Quarry

Assessment Criteria	Description	Score
Proximity (straight line distance).	5.1km – 15km	1
Scale of Development	0 – 250, 000	1
Nature of development	Socio-economic: Due to the proximity of these quarries, there may be a small degree of socio – economic interaction between them, associated with traffic when assessing local jobs. Positive interaction between quarries is associated with generating competition in local markets.	Yes (1)
	Biodiversity: Without either viewing a biodiversity impact assessment or conducting a biodiversity impact assessment, it is not possible to quantify the level of biotic interaction between sites. Interaction would require either the presence of a biodiversity corridor (not present) and/or migratory or mobile species using both sites. It is unlikely that threatened species located at BHQ would also be using the habitat resources at Boral Seaham Quarry. Furthermore, suitable regional habitat resources occur elsewhere therefore interaction is deemed minimal.	No (0)
	Traffic/Transport: Minor levels of transport interaction occur when vehicles access local jobs. However Boral Seaham Quarry is located just 1.5 km from the Pacific Highway, which is expected to be the quarry's major haul route in both northerly and southerly directions. Anecdotal evidence suggests that Boral Seaham Quarry uses Clarencetown Road and Brandy Hill Drive highly infrequently. However due to their proximity, a conservative low interaction has been allocated for traffic/transport interaction between these two quarries.	Yes (1)
	Noise: BHQ noise levels are compliant with applicable criteria. Traffic noise for the project complies with the applicable criteria. Therefore noise interaction will be negligible between BHQ and Boral Seaham Quarry.	No (0)
	Air quality: Air quality generally complies with criteria levels. The distance between quarries acts as a buffer to avoid potential accumulation of air pollutant dispersion between quarries. Brandy Hill Quarry's Air Quality Impact Assessment (AQIA) includes predictive dispersion modelling which indicates that air pollutants will not travel the necessary distance to create a cumulative interaction impact with emissions from the Boral Seaham Quarry.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Boral Seaham Quarry will not interact with BHQ.	No (0)
	Visual: There are no views from BHQ to Boral Seaham Quarry. Therefore there will be no visual interaction between these two quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ is subjected to the project's individual rehabilitation plan which will have no impact on the rehabilitation	No (0)

	objectives of Boral Seaham Quarry. Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and procedures independently to Boral Seaham Quarry. Therefore there is no interaction in respect to waste management between BHQ and Boral Seaham Quarry. Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Boral Seaham Quarry.	No (0) No (0)
TOTAL IMPACT	No impact	Value 4

Karuah Quarry

For the purposes of this EIS Karuah Quarry includes both the existing Karuah Quarry and the approved Karuah East Quarry. Karuah Quarry and Karuah East Quarry are located adjacent to each other, and are situated approximately 30km (straight line distance) from Brandy Hill Quarry.

Karuah Quarry is operated by Karuah East Quarry Pty Ltd and currently has approval to extract 500 000 tonnes per annum of andesite basalt.

Karuah East Quarry Pty Ltd also operates Karuah East Quarry and has approval to extract up to 1.5 million tonnes of andesite per annum from a total resource of 29 million tonnes over a 20 year extraction period. The Project was conditionally approved in 2014.

The interaction assessment outlined in **Table 5.2:12** below scores the interaction between Karuah East Quarry and Brandy Hill Quarry as 4 – No Interaction.

Table 5.2:12: Karuah East Quarry

Assessment Criteria	Description	Score
Proximity (straight line distance).	15km +	0
Scale of Development	750, 001 tonnes per annum +	3
Nature of development	Socio-economic: Karuah/Karuah East Quarry EIS states that the proposal is essential to the delivery of major infrastructure projects and will create positive social and economic outcomes. Numerous letters of support were received for the Karuah/Karuah East. From this assessment, it appears that Karuah/Karuah East is effectively managing socio-economic impacts. Little or no interaction between the socio-economic outcomes of this quarry with BHQ is likely. Biodiversity: The Karuah/Karuah East Quarry Project includes a 129 ha conservation offset of existing vegetation, to mitigate the impacts of the project on native flora and fauna. Due to the distance between sites, biodiversity interaction between them is not expected to affect any mobile species. Traffic/Transport: The Karuah East Project found that the traffic it will generate will not have an adverse impact on the public road	Yes (0) No (0) Yes (1)

	network. Additionally traffic volumes generated by the proposal will not adversely impact provision of safe vehicular access. As Karuah/Karuah East Quarry produces a hard road product (competitive resource with BHQ), both quarries may experience a small level of interaction when accessing local jobs. However regional and state road networks (namely the Pacific Highway), will enable the long distance transportation of construction resources with marginal levels of interaction.	
	Noise: Predicted noise levels have demonstrated that cumulative noise and vibration levels are well under acceptable standards. Assessment of traffic noise demonstrates that sound levels are within acceptable limits. Blast emissions are compliant with relevant criteria.	No (0)
	Air quality: As the Brandy Hill Quarry is situated 30km from Karuah/Karuah East there will be no significant interaction in respect to air quality between the two quarries.	No (0)
	Hazards: All hazards are effectively managed on site. No off site hazard impacts are generated by the project. Therefore any hazard impact generated by Karuah/Karuah East will not interact with BHQ. Additionally Karuah/Karuah East is committed to effectively managing wastes on site.	No (0)
	Visual: There are no views from BHQ to Karuah/Karuah East or vice versa. Therefor there will be no visual interaction between these two quarries. Neither are they visible together from any reasonably distant vantage point.	No (0)
	Rehabilitation: BHQ is the subject of a project-specific rehabilitation plan which will have no impact on the rehabilitation objectives of Karuah/Karuah East Quarry.	No (0)
	Waste: Waste generated by BHQ will be effectively managed in conjunction with relevant waste policy and procedures. Karuah/ Karuah East Quarry will manage their own wastes independently to BHQ.	No (0)
	Water (surface and groundwater): BHQ will not have any significant impact on surface or groundwater. Therefore no water interaction will occur between BHQ and Karuah / Karuah East Quarry.	No (0)
TOTAL IMPACT	No impact	Value 4

The above section demonstrates that for the majority of extractive industries in the locality surrounding Brandy Hill Quarry do not and will not interact with the Project. Martin's creek is predicted to interact with Brandy Hill to a low level.

Key Environmental Issues

The SEARs dictate that the EIS must include:

Detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment, which include:

- A description of the existing environment, using sufficient baseline data
- An assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes
- A description of the measures that would be implemented, to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to address any significant risks to the environment

5.3 Socio-Economic

5.3.1 Background

The SEARs stipulate that the EIS must include:

SEAR Requirements

- an assessment of potential impacts on local and regional communities, including impacts on social amenity;
- a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the development, including any infrastructure improvements, or contributions and/or voluntary planning agreement or similar mechanism; and
- a detailed 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

Supporting Resources

Draft Economic Evaluation in Environmental Impact Assessment (DoP)

Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)

The extraction and utilisation of natural resources has heterogeneous and specific impacts on the social and economic infrastructure of local communities in which such practices occur (Hajkowicz et. al., 2011). To quantify the dynamic nature of change and the unique way it affects local amenity requires a specialised Socio-Economic Impact Assessment. This assessment was conducted by Hanson and can be found in full in **Appendix 17** of this report. **Section 5.3** (this section) of the EIS provides a detailed summary of the findings presented in **Appendix 17.**

5.3.2 Existing Environment

Hanson Construction Materials Pty Ltd has been operating Brandy Hill Quarry since 1983 and has developed relationships with the local community during this time. Brandy Hill Drive was historically built as a purpose-built road to service the quarry. Over time residential lots off Brandy Hill Drive were released for sale and now form the suburb of Brandy Hill. During this period Hanson has endeavoured to work with local residents and the community to both develop and maintain a positive relationship and to minimise any potential impacts from the quarry.

5.3.3 Community Involvement

Hanson has been a long-term active presence in the local community and will continue to support community groups and residents into the future. Specifically, Hanson Brandy Hill has sponsored community sporting teams and events, donated building materials following flood events and community projects. Hanson has also provided project-related information through an informal Community Consultation Committee (**Section 3.3.3** – *Consultation*). Of paramount concern to the local community is the projected increase of heavy vehicles along

predetermined local haulage routes. The community has expressed other concerns which are fully detailed in **Appendix 17**.

5.3.4 Methodology

This socio-economic impact assessment initially identifies economic and social characteristics at national, regional and local levels. Secondly the assessment presents the anticipated socio-economic benefits and concerns related to the Project. Following this, the report provides an assessment and related findings of the predicted socio-economic impacts of the Project.

5.3.5 Impact Assessment

5.3.5.1 *Economic*

The construction industry is of vital economic significance at a national level, enabling the development of state and national infrastructure, and subsequent planned, local urban development. The construction industry has a major influence on planned urban and rural development, enabling the progressive development of vital infrastructure such as roads, residential dwellings and various engineering projects. The construction industry contributed 9.1% to the Australian national workforce, and accounted for 6.8% of national GDP in 2008 – 2009.

Hanson and its subsidiaries operate over 70 quarries nationwide. The major economic benefit for the proposed Brandy Hill Quarry Expansion Project is to provide security in the supply of construction materials to primarily meet the demand from the Central Coast, Hunter and Newcastle regional markets, and secondly allow Hanson's other metropolitan quarries (Kulnura and Bass Point) to meet the demands from the Sydney Metropolitan markets. The estimated cost for the quarry expansion is approximately $22.5m over a 30 year period and will inject economic benefits into the local economy as well as providing up to 31 employment positions (including existing employment) upon completion of stage 5, the final stage of the project.

5.3.5.2 *Social*

The Project will be situated in a predominantly rural zoned area. The site is currently operating under approval for the operation of a hard rock quarry and processing plant. The addition of a concrete batching plant on-site will not alter the nature of the predominant land use being the quarry.

Environmental issues associated with the Project that may generate potential impacts on local social and health amenity are visual, traffic, noise and vibration and air quality. *The Socio-Economic Impact Assessment* (**Appendix 17**) details the following findings;

Although traffic from the quarry is a concern of the local community, the Traffic Impact Assessment (refer **Appendix 8**) undertaken by Intersect has shown that the projected traffic increases will be within the local and regional road network capacity;

Traffic noise is also an expressed concern from the local community, in particular noise from trucks. However the Noise Impact Assessment (refer **Appendix 9**) has concluded that noise from truck movements will comply with traffic noise criteria levels

provided the number of truck movements on Brandy Hill Drive is kept within the acceptable limit of 584 truck movements during the day and 78 truck movements at night;

Air impacts, as set out in the Air Quality Impact Assessment (refer **Appendix 11**) is set to remain low, within pre-determined criteria (except 24 hour PM_{10} and annual $PM_{2.5}$ which exceed applicable criteria due to high background concentrations); and

Visual impacts have also been assessed to be low or moderate from all viewing platforms (refer **Appendix 15**). Due to the quarries position in the landscape it and screening vegetation, it is not readily visible from local and more-distant vantage points.

A social assessment of the surrounding region has identified sites of high social value including local and regional natural conservation areas, such as the Stockton Sand Dunes and Hunter Estuary Wetlands. The *Socio-Economic Impact Assessment* reveals that the Project is not anticipated to have detrimental impacts on these community assets.

A summary of potential impacts is presented in **Table 5.3:1** below and is elaborated upon in **Appendix 17.**

Table 5.3:1: Summary of Socio-Economic Impacts

Area of Assessment	Impact Rating
Visual	Low Impact
Noise	Low Impact
Traffic	Low – Moderate Impact
Air	Low Impact

5.3.6 Mitigation

To mitigate potentially detrimental social consequences of the Project, Hanson will engage in the following where reasonable and feasible:

- Encourage employment from the local district.
  Provide training and certification to ensure suitable applicants can improve or acquire necessary skills.
- Manage heavy vehicle traffic.
- Maintain use of existing transit paths to reduce “spread” of traffic impacts.
- Maintain continuous community involvement via a Community Consultative Committee platform.
- Promote driver awareness where relevant.
- Introduce a ‘Driver Code of Conduct’ to the site’s Traffic Management Plan.

Further commitments can be found **Section 7** – Statement of Commitments.

5.3.7 Conclusion

The proposed Brandy Hill Quarry Expansion Project is expected to have considerable economic and social benefits related to securing the supply of construction materials to local and regional markets transcending into local expenditure and employment opportunities. The main potential impact on local social amenity is from increased heavy vehicle movements along pre-determined local haulage routes. Overall, the Project is expected to have net positive socio-economic benefits on local, regional and national socio-economic conditions.

5.4 Land Resources

5.4.1 Background

SEAR Requirements

The SEARs require a detailed assessment of the potential impacts on:

Soils and land capability – **Section 5.4.2/Appendix 6**

Landforms and topography, including rock formation, steep slopes, land slippage, etc. – **Section 5.4.4/Appendix 6**

Land use, including agricultural use – **Section 5.4.3/Appendix 6**

Extractive material resources, including assessment of the size and quality of the resource and description of the methods used to assess the resource and its suitability for the intended applications - **Section 2.3/Appendix 5.**

Supporting Resources

Agricultural Impact Assessment Guidelines 2012 (DP&I)

Agfact AC25: Agricultural Land Classification (NSW Agriculture)

Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)

Agricultural Issues for Extractive Industries (NSW Department of Trade and Investment, Regional Infrastructure and Services)

Soil and Landscape Issues in Environmental Impact Assessment (DLWC)

The land resource assessment for the project is broken into four main components, these being;

1. Site Soil Assessment
2. Land Use and Agricultural Land Capacity Assessment
3. Site Topography Assessment
4. Contamination Assessment

5.4.2 Site Soils

Marten's and Associates conducted an assessment of the existing site. The findings of this assessment are summarised below.

5.4.2.1 *Existing Environment*

The existing soil environment in the proposed expansion area is classified as Seaham and Hungry Hill on Carboniferous volcanics and sediments (Soil and Conservation Service of NSW, 1995). Soils are considered to be shallow to moderately deep rapidly-drained *soloths*. The site also contains some moderately deep imperfectly or well-drained chocolate soils on colluvial benches and moderately deep poorly-drained structured loams on small alluvial flats. Lastly the site contains shallow to moderately deep well-drained lithosols.

5.4.2.2 *Methodology*

A field investigation was undertaken on 29th January 2015 and comprised;

- Walkover inspection, assessing site conditions, local topography, geology, soil characteristics, hydrology and vegetation.
- Excavation of three boreholes (see **Appendix 6** for complete details).
- Collection of representative soil samples from boreholes for future reference.

Consultation

- Consultation with the NSW Department of Agriculture was undertaken.

5.4.2.3 *Assessment and Findings*

Assessment of the site's soils indicates that the sandy loam soils are not dispersive; soils do have significant erosion potential. This is due to the proposed development changing the land use of existing vegetated areas to quarry. This will increase annual sediment loads, running from quarry faces. To address increases in annual sediment loads, sediment erosion and control plans have been developed in order to address the risk of increased sediment loads (See Martens Surface Water Impact Assessment, **Appendix13**).

The soil profile constructed for the site is summarised in **Table 5.4:1** below and a summary of site soil characteristics is provided in **Table 5.4:2.** Borehole logs are shown in the *Land Resource Assessment* - **Appendix 6.**

Table 5.4:1: Summary of typical soil layers for the site

Layer	Depth (m)1	Agricultural Classification
Loamy sand	0.0-0.2	LS
Sandy clay	0.2 – 0.7	SC

1Depth varies – indicative only

Table 5.4:2: Summary of site soil characteristics

Feature	Details	Description	Impact on Erosion
Soil permeability category	2a and 4a	Soils are moderately permeable	Low
Coarse fragments (%)	0 – 20%	Soils have a low coarse fragment content	Low
pH (1:5)1	4.5	Soils are acidic	Moderate
ECe (dS/m)1	<4	Soils are not saline	Low
P-sorption (mg/kg)[1]	552	Soils have a high phosphorous sorption capacity	NA2

1Chemical Properties estimated based on local experience and soil landscape book.

2Not Applicable

The findings from this Land Resource Assessment are consistent with the Hunter Valley Mining Corporation (1983) Brandy Hill Quarry EIS. These being;

1. The majority of the site consists of sandy loams (<50cm) overlying weathering bedrock, with some gravels and kaolinite clays, as well as areas of rock outcrop.
2. The soil layer thickens towards the base of the existing quarry due to colluvial deposits from upslope, and alluvial deposits are present in local drainage lines.
3. Soils are acidic with pH values ranging from 4.5 – 5.5.

Acid Sulphate Soil Assessment

Acid sulphate soils are soils that contain metal sulphides. The Department of the Environment states that when disturbed or exposed to oxygen, acid sulphate soils undergo a chemical reaction known as oxidation. Oxidation produces sulfuric acid which results in the naming of these soils as acid sulphate soils. The proposed Brandy Hill Quarry development proposes to disturb surface soils, so an investigation into the potential presence of acid sulphate soils is required. Marten's and Associates conducted this investigation.

The site is mapped on the Department of Land and Water Conservation (DLWC) Acid Sulphate Soil Risk Map 1:125 000 Sheet 64 (1997) as '*no known occurrence of acid sulphate soil materials*'.

Likewise the Port Stephens Council Local Environmental Plan (LEP) 2014 Acid Sulphate Soils Map Sheet ASS_004 classifies the site as Class 5, which does not typically consist of acid sulphate soils. Therefore the site is not impacted by acid sulphate soils, hence adverse impacts on the ecosystem due to acidified soil and surface waters are not expected.

5.4.2.4 *Mitigation and Conclusion*

The Project Area is not impacted by acid sulphate soils.

The Project has incorporated mitigation measures within the quarry's design to manage site sediment and erosion. Such measures include sediment basins and water capture, recycling and reuse systems. These are further examined in **Appendix 13** – *Water Impact Assessment*. Marten's specialist assessments consider that these measures are adequate to appropriately mitigate risks.

5.4.3 Site Land Use and Agricultural Land Capability

5.4.3.1 *Existing Environment*

The site is surrounded by undeveloped bushland and agricultural land, with the town of Seaham approximately 3.0 km east. The quarry is situated in a predominately rural, residential, and environmental zoned land use area. The site and surrounding land use zones include:

- RU1 – Primary Production,
- RU2 – Rural Landscape,
- E2 – Environmental Conservation,
- E3 – Environmental Management,
- SP2 – Infrastructure (Cemetery), and
- R5 – Large Lot Residential.

Agriculture is the most significant use of land in the surrounding area based on the land use zoning map. Land use has been assessed in more detail by the *Land Resource Assessment.* Other potential impacts on surrounding land uses have been assessed in other expert reports, which is detailed later in this section of the EIS. Potential impacts and the reports in which they have been addressed include;

- Land resources impacts – addressed in **Section 5.4** (this section) of the EIS and **Appendix 6**.
- Biodiversity impacts – refer to **Section 5.5** and **Appendix 7**
- Traffic and transport impacts – refer **Appendix 8** of the EIS/**Section 5.6**
- Noise impacts – refer **Appendix 9** of the EIS/**Section 5.7**
- Blasting impacts – refer **Appendix 10** of the EIS/ **Section 5.8**
- Air quality impacts – refer **Appendix 11** of the EIS/**Section 5.9**
- Heritage impacts – refer **Appendix 12** of the EIS/**Section 5.10**
- Water impacts – refer **Appendix 13** of the EIS/**Section 5.11**
- Waste impacts – refer **Appendix 14** of the EIS/**Section 5.12**
- Visual impacts – refer **Appendix 15** of the EIS/**Section 5.14**
- Hazard impacts – refer **Appendix 16** of the EIS/**Section 5.15**
- Socio-economic impacts – refer **Appendix 17** of the EIS/ **Section 5.3**

Potential impacts to sensitive receivers within each surrounding land use have been considered in these reports, as well as the acceptability of impacts and recommended

mitigation measures. Duplication of these findings will not be presented in this section of the EIS.

5.4.3.2 *Methodology*

Agricultural land use is assessed based on constraints to agricultural production. NSW Agriculture Agfact AC. 25 (2002) was applied to determine the agricultural classification that would apply to the site.

Hanson commissioned Martens and Associates (Martens) to review available land and soil data for the Brandy Hill Quarry; and to assess the agricultural land capacity of the proposed expansion area (**Appendix 6**). The agricultural assessment considers various biophysical constraints, which are further discussed in the *Land Resources Assessment* **(Appendix 6**), summarised below:

- Shallow soils and areas of rocky outcrops.
- Rapidly drained (sandy side sloped) and poorly drained (swampy valley floors) soils.
- Steeps slopes.
- Acidic soils of low fertility.

The NSW Department of Agriculture was consulted to confirm the findings and an assessment of potential impacts was conducted. Land use considerations for further assessment were identified:

- reduction to site agriculture use potential, and
- bore drawdown at nearby poultry farms.

Both of the aforementioned areas were assessed in respect to the quantification of impact (if any) caused by the Brandy Hill Expansion Project.

5.4.3.3 *Assessment and Findings*

Based on these constraints and NSW Agriculture classifications, the site has a low agricultural capability and is likely Class 4 or 5, which are defined as follows (NSW Agriculture Agfact AC. 25, 2002);

- *Class 4: Land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.*
- *Class 5: Land unsuitable for agriculture, or at best suited only to light grazing. Agricultural production is very low or zero as a result of severe constraints, including economic factors which prevent land improvement.*

Marten's agricultural impact assessment reveals that the site's agricultural land use potential is marginal, as agreed by the NSW Department of Agriculture. Consequently loss of agricultural land use potential of the site due to the proposed quarry expansion is negligible.

Despite the Class 4 or Class 5 classification, the NSW Department of Agriculture has requested that nearby poultry farm bores be assessed for potential drawdown (see Attachment D of *Land Resource Assessment* - **Appendix 6** of the EIS). Drawdown at all licenced bores in the study area has been assessed in detail in the Hydrological Assessment (**Attachment 13,** refer to **Sections 5.11.3.4** and **5.11.3.5** for model results discussion, **Section 7.4.6** for impact management discussion, and Attachment C Figure 47 for predicted

offsite bore drawdown plot). Full details of this assessment are presented in the Hydrological Assessment report, noting the assessment concluded that one nearby licenced bore is modelled to be subjected to >2m of drawdown due to the proposed development.

A summary of potential offsite impacts has been identified in **Table 5.4:3** below, noting land use impacts should be reviewed in full in their respective sections. This section of the EIS should be assessed in respect to land uses not otherwise analysed as part of the EIS i.e. Agricultural Land Use.

Table 5.4:3: Potential Offsite Land Use Impacts

Environmental Impact Assessment Applicable to Potential Offsite Impacts	Assessment of Impact Applicable to Offsite Land Use Impacts
Traffic	Dust: the access road and off-site haulage route are sealed. Dust generated from haulage traffic will be insignificant provided all loads are covered as required by law in NSW. Noise: the operation of road trucks can generate noise particularly when returning to the quarry empty. See Traffic Noise Assessment findings below.
Noise	Offsite Impacts on Vacant Land: According to Vipac, there are no third party sensitive receivers on vacant land (see **Appendix 9/Section 5.7**). Operational Noise: All operational noise impact associated with the proposed expansion on noise sensitive receivers ranged between 1 and 41dB(A), which is within the applicable Project Specific Noise Level criteria during the daytime, evening and night period. Traffic Noise: The predicted traffic noise will comply with daytime and night-time noise criteria provided the total number of truck movements is kept within the acceptable limit of 584 truck movements during the daytime and 78 truck movements during the night-time periods respectively.
Blast	Generation of ground vibration and overpressure is adequately controlled due to the separation distance between the quarry pit and the closest receptor.
Air	Offsite Impacts on Vacant Land: According to Vipac, there are no third party sensitive receivers on vacant land (see **Section 5.9/Appendix 11**). Air Quality Prediction Modelling: The results of the modelling have shown that the Project's air quality emissions contribution fall within applicable criteria. However when modelled with background concentrations, 24 hour PM_{10} and annual $PM_{2.5}$ exceed applicable criteria in some stages due to high levels of background concentrations in 2013.
Visual	All views to the Project area were categorised as very low, low, or moderate. No views to the Project were classified as high.
Socio-Economic	Provided applicable criteria are met and mitigation measures implemented, social impacts will be effectively managed throughout the life of the Project.
Land Use	The proposed expansion site has low agricultural capacity (likely Class 5) and is suitable for the proposed purpose of the Project as confirmed by the NSW Department of Agriculture. The Project Area has been used as a quarry since 1983 and an environmental site assessment identified localised soil contamination. However the majority of this is considered insignificant and will be removed as the quarrying progresses and therefore a Stage 2 ESA is not recommended and nor is any further testing proposed.
Water	Licenced bore GQ51309 is modelled to be subjected to >2m drawdown as a result of the Project. Reduction in the catchment area of drainage line 2 represents approximately 2% of the entire Deadman's Creek catchment to Williams River and henceforth changes to the Williams River will be negligible There will be a reduction in the catchment size of drainage lines 2 and 3 which drain into grassed depressions and will have no environmental consequence.

5.4.3.4 *Mitigation*

The project site has been assessed as having low capability for agriculture to be unsuitable. Further the project site is not currently used for agriculture and consequently the project would not have any direct impacts on agricultural land resources.

There is potential for offsite impacts with a predicted 2m draw down on the water table. To mitigate and manage the predicted >2m drawdown Martens have recommended that further investigations are required to determine measures to ensure long-term bore viability will not be adversely affected, by applying "make-good" provisions. Additionally, it is recommended that groundwater level monitoring be undertaken at this bore prior to quarry progression below existing approved quarry floor level to provide a benchmark for impact assessment.

Potential impacts to surrounding land uses have been assessed in a number of expert reports which consider the proposal's degree of impact (See **Table 5.4:3** above) and recommend mitigation measures. These are detailed in respective sections of this EIS and summarised in the Project's Statement of Commitments, **Section 7.**

5.4.4 Site Formations and Topography

5.4.4.1 *Existing Environment*

Brandy Hill Quarry is underlain by the Carboniferous Paterson Formation which consists of acid lava flows, crystal tuff, interbedded conglomerate and ignimbrite (Newcastle 1:100,000 Geological Sheet 9232 - *Geological Survey of NSW, Department of Mines, 1975)*.

The northern side of the Hunter River supports a carboniferous rock which is separated from the younger Coal Measure geology to the south by a fault system, known as the Hunter Thrust. The area is highly faulted which has cut off the area's geological unity abruptly.

Site Slopes

The existing quarry is situated on the eastern slopes of Brandy Hill at elevations approximately between 35m AHD and 100m AHD, and adjacent to Deadman's Creek's incised valley, approximately between 25m AHD and 55m AHD.

Pre-quarrying slopes are approximately 10% – 30%, with current slopes to the south of the site generally consistent with pre-quarrying slopes. Slopes to the north of the site (opposite side of Deadman's Creek) gradually increase to grades exceeding50%.

Batter slopes of the current quarry benches range from approximately 60° to beyond 90°, with the average batter slope being approximately 80°. The average pit slope of the quarry is approximately 25°.

Topography and Quarry Landform

The existing quarry pit is approximately 900m long, 380m wide and 70m deep. The quarry has 6 benches and 2 rehabilitated former benches on the uppermost slopes which are no longer quarried. Benches are typically east to south east facing and are stepped down on the mid to lower north-west slopes of Brandy Hill. Benches increase in length from upper to lower levels with the second last bench wrapping around the quarry to form an amphitheatre shape, with an opening to the east. The final drop, cut to the currently approved extraction limit of 30m AHD was made on 28 March 2014 and is currently being excavated.

The pit has elevations ranging from approximately 95m AHD at the uppermost bench to 31m AHD within the currently active base bench.

The crushing plant and stockpiling area is approximately 420m long and 410m wide. The plant is located on a mostly flat surface south of the quarry and haul road at approximately 33m AHD to 37m AHD. Aggregate stockpiles are located on three benches with elevations ranging from 32m AHD to 45m AHD. The plant area is separated from the quarry floor by a haul road up to 13m above the current quarry floor.

Natural ground levels at the site range from approximately 111m AHD north-west of the quarry to approximately 32m AHD south of the processing area.

Stormwater over the disturbed area is currently collected in the existing pit, the top of which is at the highest point of the catchment. Stormwater is directed via bunds upslope of the pit;

- north east to Deadman's Creek;
- west to an unnamed drainage path running to Barties Creek; and
- south east to the site's western dam and through the site processing area.

5.4.4.2 *Methodology*

Hanson has conducted geological investigations at Brandy Hill Quarry around the expansion area through borehole drilling investigations with 10 boreholes drilled up to approximately 110m below ground level (BGL). Borehole logs were assessed by Hanson's geologist, Peter Browne, and data applied to calculate the available resource.

5.4.4.3 *Impact Assessment*

Site Investigations

Site-drilled boreholes compromised of sandy loams and clays overlying weathered ignimbrite, sandstone or conglomerate confirmed the presence of Seaham Glacial Beds compromising sandstone, mudstone and conglomerate overlying Patterson Volcanics compromising predominately fine-grained mudstone and sandstone (Hanson, 2014 – **Appendix 5**).

At boreholes within the quarry void, ignimbrite is present at the surface due to soil overburden removal. Where rock overburden is present, the sandstone, conglomerate and mudstone layers range from 10m to 58m deep. Isolated thin lenses of conglomerate, sandstone and granite are present within the ignimbrite rock mass. At the ignimbrite base, mudstone or sandstone belonging to the Mount Johnson Formation were intercepted.

Land Slippage

Martens conducted a Geotechnical Assessment which identified land slippage hazards onsite related to stability of pit slopes, benches and haul roads within the quarry, due to discontinuities within the rock mass. The risk of slope failure due to groundwater and seepage inflows is considered to be low. Additional potential hazards identified were generally confined to individual benches and included rock toppling, rock fall, rock slide and wedge failure. Martens have not observed complete bench failure which is not expected to be a likely failure mechanism **(Appendix 5).**

The site has no history of major land slippage. Assessment of site slopes indicates that both pit slope failure risk and bench slope failure risk are generally low. The risks identified in the

site geotechnical assessment have been addressed and are managed through quarry operations and appropriate mitigation measures. These mitigation measures will continue during quarry expansion.

Furthermore, land slippage hazards are localised within the quarry footprint. Any land slippage failure would be internalised, and there is no increased risk of land slippage outside of the quarry footprint.

5.4.4.4 *Findings*

Martens assess the slope stability risks as minimal. They can be effectively managed through the implementation of the proposed geotechnical stability control measures.

5.4.4.5 *Mitigation Measures and Conclusion*

Brandy Hill Quarry does not have a history of major land slippage, and assessment of site slope failure potential indicates that internal slope stability risks are minimal with the implementation of the proposed geotechnical stability controls:

- **Trimming of batter slopes:** Trimming the batter slopes to remove hazardous blocks of rock and to reduce the batter slope angle.
- **Bunds:** Instillation of bunds at the base of the batter to control falling rocks and prevent them from damaging site equipment and causing injury or death.
- **Positions of future bunds and material stockpiles**: Located away from the edge of benches to prevent rock fall and unnecessary loading which may lead to instability.
- **Cut-off drains:** Suitable drains are excavated into the rock or formed by mound construction, and are used to intercept surface water run-off and reduce flows down the batter face. Sheet flow across slope surfaces is thus avoided during quarry expansion.
- **Drains**: Properly designed and constructed stormwater and sub-soil drainage to prevent scour, ponding and limit inflow to a slope.

These measures are further detailed in the Brandy Hill Quarry Geotechnical Assessment (**Appendix 5**).

Internal quarry slope failure and land slippage are risks inherent to the operation of a quarry, however these risks are comprehensively addressed through quarry operation practices and management including regular inspection and maintenance. Therefore these localised internal risks are considered acceptable. Quarry management recommendations shall continue to be incorporated and practiced throughout the proposed development. When implemented in conjunction with regular inspection and on-going maintenance, the above measures are considered adequate to control internal quarry land slippage risk.

Any potential land slippage failure would be internalised, and there is no risk of slope slippage in the external environment.

5.4.5 Contamination

5.4.5.1 *Existing Environment*

The existing environment of the site is detailed in **Table 5.4:4** below;

Table 5.4:4: Site background information

Source: Martens Stage 1 Environmental Site Assessment (Appendix 6)

Site Characteristic	Information
Investigation Address	979 Clarence Town Road, Seaham, NSW
Site Lot and DP (Title Information)	Investigation area includes 7 lots: Lot 101, DP 712886 Lot 1, DP 47313 Lots 19, 36, 56 and 236, DP 752487 Lot 2, DP 823760
Site area	230 ha
Investigation area	53.6 ha
Local Government Area (LGA)	Port Stephens Council
Zoning	Part E3 – Environmental Management and part RU2 – Rural Landscape
Site description	The site includes the Brandy Hill Quarry and significant surrounding lands owned by Hanson Construction Materials Pty Ltd. Current quarry operations are primarily located on Lot 101 DP 712886, Lot 1 DP 47313 and Lot 56 DP 752487 with the majority of site's remainder undeveloped bushland. The site is surrounded by undeveloped bushland and agricultural land, with the town of Seaham approximately 3.0 km to the east. Site elevation varies between approximately 170 m AHD in the north west (near Brandy Hill), to approximately 40m AHD in the south east.
Current and proposed land use	Quarrying, no change of use
Surrounding land uses	Undeveloped bushland and rural land
Geology and soil landscapes	The Newcastle 1:100,000 Geological Sheet 9232 (Geological Survey of NSW, Department of Mines, 1975) identifies the site as being underlain by the Dalwood Group, comprising sandstone, mudstone, siltstone, shale, tuff, Basalt flows and erratics. The Soil Landscapes of the Newcastle 1:100,000 Sheet identifies the site as having soils of the Hunter, Glenurie Hill, and Seaham soil landscapes, generally comprising deep, moderately well to imperfectly drained prairie soils and brown clays, moderately deep to moderately well-drained yellow soloths, and shallow to moderately deep, well to imperfectly drained yellow and brown soloths.
Environmental receptors	The south west portion of the site drains generally toward an unnamed tributary of Barties Creek located in the south western portion of the site, while the remainder of the site drains toward Deadman's Creek and it's unnamed tributaries (on the north eastern, eastern and south eastern portions of the site) to the south east.
Human receptors	Existing and future site workers / builders.

Historic Photograph Observations

Aerial photographs were taken of the site during 1952, 1967, 1974, 1984, 1996, 2007 and current (2014), which were reviewed to identify historical site land use (**Table 5.4:5 -** duplicated from Martens *Stage 1 Environmental Site Assessment*).

Table 5.4:5: Historic Photograph Observations

Source: Martens Stage 1 Environmental Site Assessment (**Appendix 6**)

Year	Investigation Area Description	Surrounding Areas
1952	Extensive site clearing with some remaining undeveloped bushland	Undeveloped bushland to north and rural land to south west, south, east and south east.
1967	Regrowth of some vegetation in the central and southern areas of the site,	Clarence Town Road visible to south east. Regrowth of vegetation to north east, south

	and along watercourse corridors.	west and south.
1974	Continued regrowth in previously cleared area, otherwise little change from 1967 photo.	Little change from 1967 photo.
1984	Regrowth of vegetation across site. Dam constructed in south central area of site.	Regrowth of vegetation to east, south west and west.
1996	Quarry constructed in central area of site, including site offices in south western portion of developed area and dams constructed for quarry operations.	Rural residential property developed to east, and sheds for poultry farm to south east. Clearing for rural land use to south.
2007	Little change from 1996 photo	Minor rural residential development to east and west, otherwise little change from 1996 photo.
Nearmap (2014)	Sedimentation ponds constructed in southern area of site, otherwise little change from 2007 photo.	Revegetation of land to south. Minor rural residential development to south west.

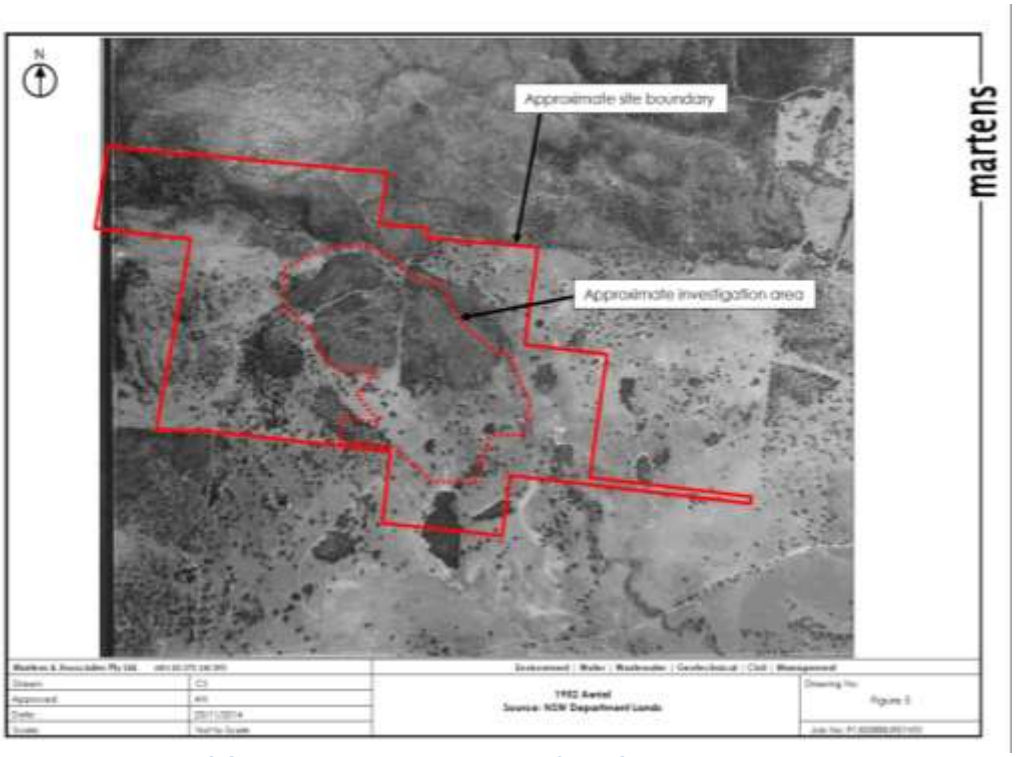

Figure 6.1: 1952 Aerial, Source NSW Department of Lands

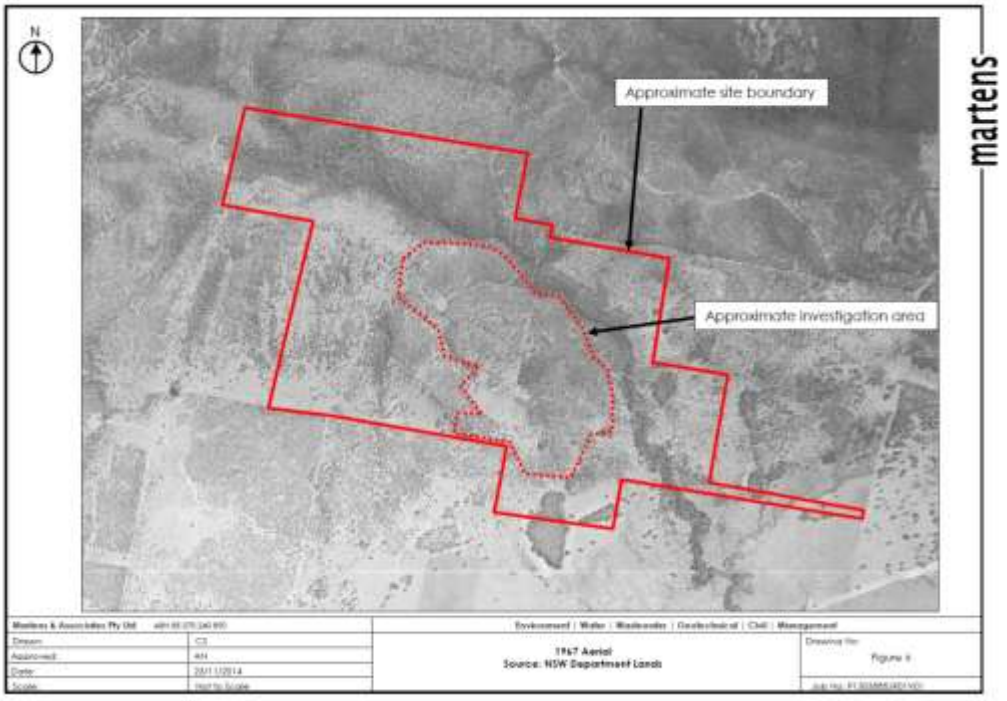

Figure 6.2: 1967 Aerial, Source NSW Department of Lands

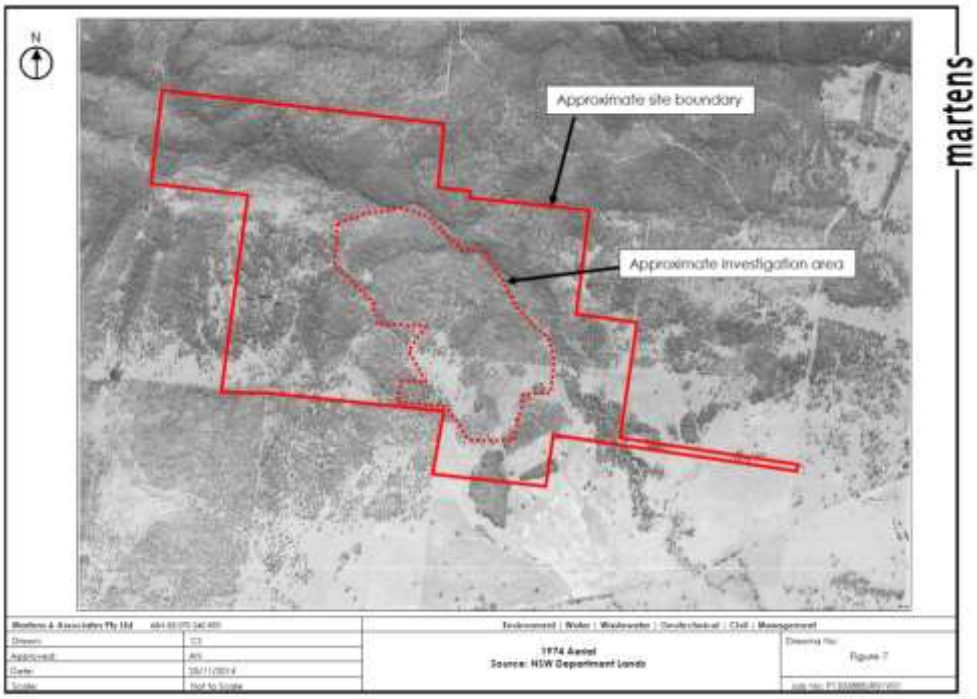

Figure 6.3: 1974 Aerial NSW Department Lands

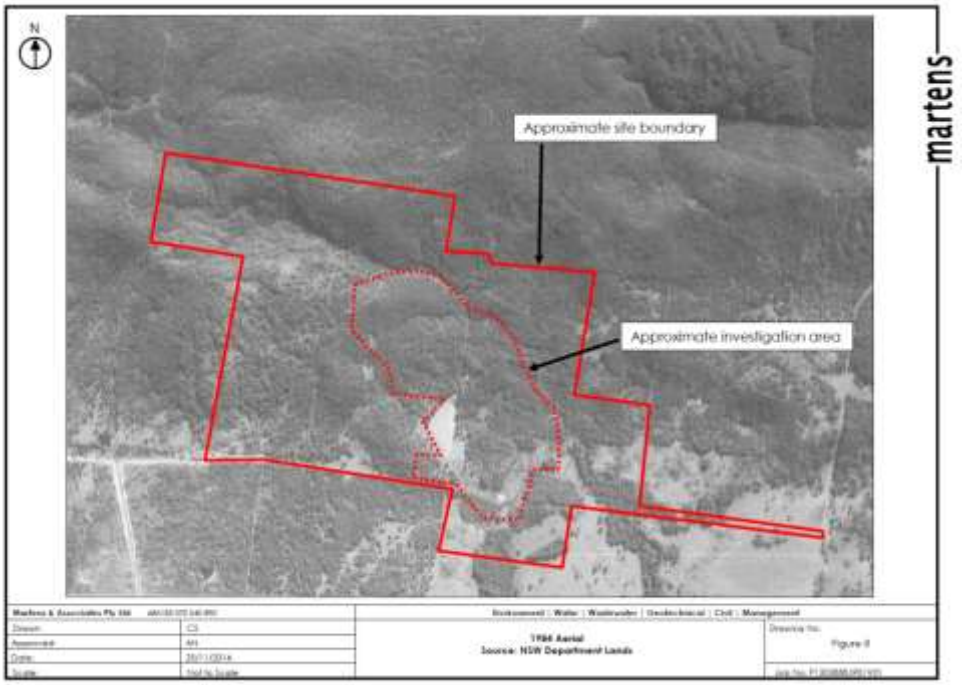

Figure 6.4: 1984, Source NSE Department Lands

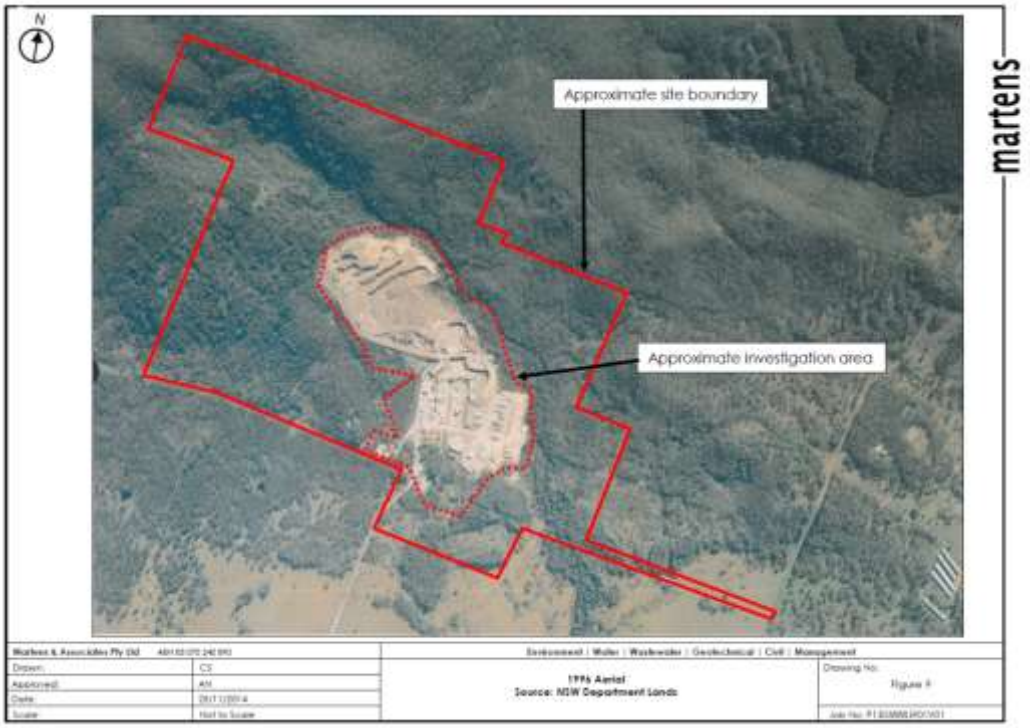

Figure 6.5: 1996 Aerial, Source NSW Department Lands

Figure 6.6: 2007 Aerial, Source NSW Department Lands

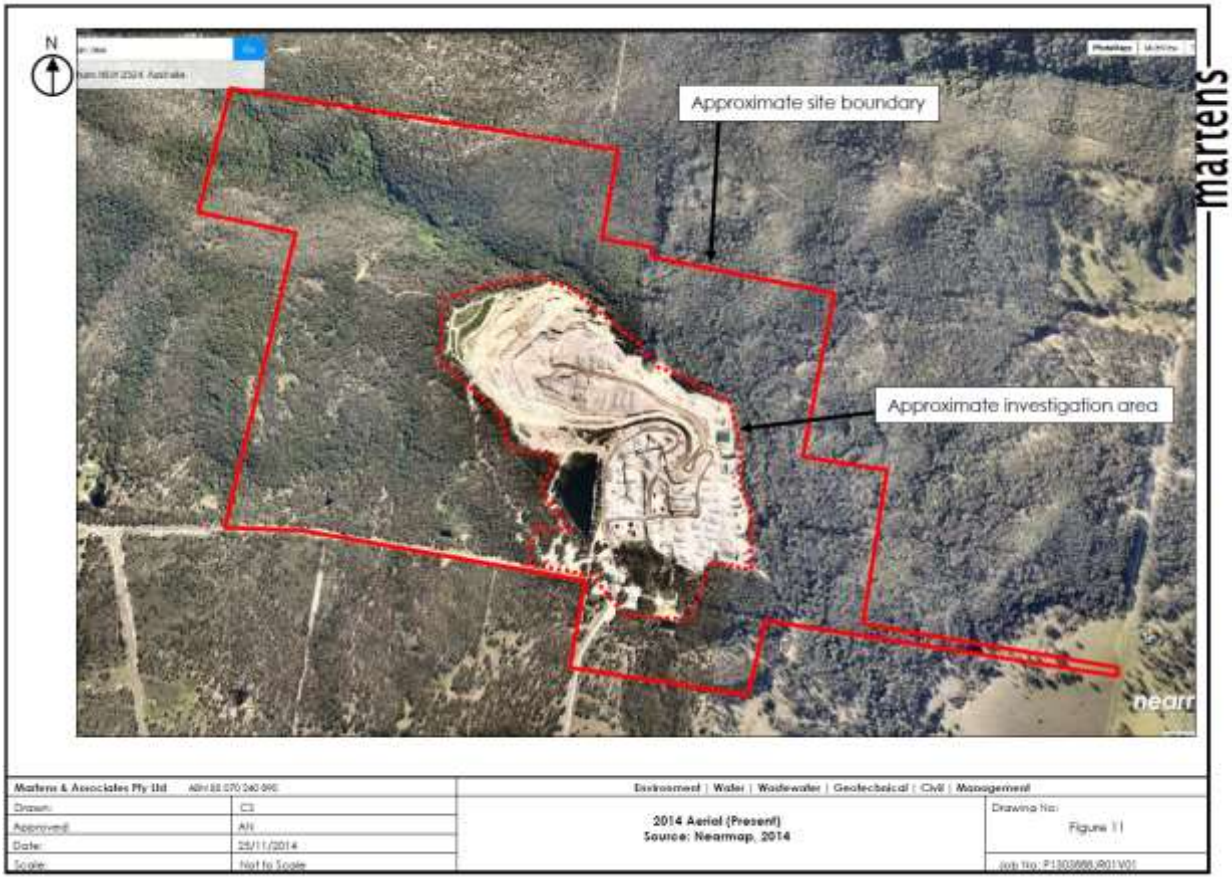

Figure 6.7: 2014 Aerial, Source NSW Department Lands

5.4.5.2 *Methodology*

Martens and Associates' Stage 1 Environmental Site Assessment (ESA) used available site history, aerial photograph interpretation and site walkovers. A site assessment was undertaken on 24 September 2014 to investigate areas of environmental concern and contaminants of primary concern. A detailed assessment is provided in **Appendix 6A**.

Methodology

Scope of works included:

- Walkover inspection to review current land use, potential contaminating activities and neighbouring land uses.
- Review available Port Stephens Council (PSC) site development consents.
- Review of 7 historic aerial photographs to assess past site and surrounding land use patterns.
- Review NSW OEH (formerly NSW EPA) notices under the Contaminated Land Management Act (1997).
- Preparation of an ESA report in general accordance with the relevant guidelines of NSW OEH (2011) and DEC (2006).

5.4.5.3 *Impact Assessment*

Site Walkover Summary

Summary of the site walkover conducted on the 24th September 2014 is summarised from Martens *Stage 1 Environmental Site Assessment* and is summarised in **Table 5.4:6** below.

Table 5.4:6: Site Walkover Summary - *Source: Martens Stage 1 Environmental Site Assessment (Appendix 6)*

Location	Walkover Summary
Maintenance sheds and surrounds, south western area of site.	Metal maintenance shed with metal roof near southern site boundary. Concrete floor in good condition, some staining. Used for maintenance and storage of vehicles and quarry equipment. Storage of containers of lubricants, oil and fuel, with most above ground storage tanks (AST) and containers of hydrocarbons (oils, fuels) within bunds. Drain on floor to oil/water separator system (located to west of maintenance sheds). Bunded storage area for waste oils and fuels adjacent to oil/water separator system (located along external western wall of maintenance shed). Two storage sheds north of maintenance shed with 1200 litre (L) bunds (locked, no access available), understood to store oils and lubricants. Several shipping containers with miscellaneous content, including containers labelled "Megapoxy" (grout for crushing and mining equipment). Empty intermediate bulk containers (IBC) labelled Meropa 150 (gear lubricant) adjacent to shipping containers. Open storage areas to west and north of maintenance shed with aggregate surface. Storage of quarry operations equipment, metal, timber, and stockpiles of gravel, rocks, aggregate, soil and crushed rock. Vehicle with diesel tank and lubricants used for mobile refuelling and lubrication of site plant.
Quarry operations area.	Quarry equipment, including crusher in south western portion of quarry operations. Benched quarry void in operating quarry.

	Dams to north and west of quarry operations area.
Sales yard	Stockpiles of pre-coated aggregate (used for asphalt) south and south east of crusher. Two aggregate pre-coat tanks (bitumen emulsions) in tarpaulin-covered bunds to south and east of crusher. Former diesel AST (57kL), white, raised, with some exterior staining but no evidence of ground staining, at southern edge of sales yard. AST (old bitumen tank) rusting and in poor condition, with possible asbestos containing material (PACM) (exposed fibrous insulation) in south eastern corner of sales yard. Sedimentation ponds south of sales yard. Petrol/diesel pump west of sedimentation ponds, well maintained with no staining.
Office and administration area	AST used for diesel, double-skinned (not bunded) and in good condition, no evidence of ground staining. Located north west of sedimentation ponds. AST used as water reservoir with some external rust staining, north west of sedimentation ponds. Various office buildings and drivers' room. Car parking areas and associated infrastructure such as septic systems and rainwater tanks.
Remainder of site.	Undeveloped bushland on the majority of the site's remainder.

Areas of Environmental Concern/Contaminants of Primary concern

Martens and Associates have identified the following areas of environmental concern (AEC) and contaminants of primary concern (COPC). Refer to **Table 5.4:7.**

Table 5.4:7: Areas of environmental concern and contaminants of primary concern

Source: Martens Stage 1 Environmental Site Assessment (**Appendix 6**)

Site Section	AEC[1]	Potential for Contamination	COPC	Contamination Likelihood
Maintenance area, along south western boundary of site.	A – Beneath and within maintenance and storage sheds.	Use of OCP/OPP and HM (pest control). Potentially contaminating chemicals from storage of oil/fuel or other chemicals.	HM, TRH, BTEX, PAH and OCP/OPP	Medium
	B – Drums, containers and IBC of unknown content within and around sheds.[2]	Potentially contaminating fuels, oils or lubricants.	HM, TRH, BTEX and PAH	Low – medium
	C – Vehicle used for mobile refuelling and plant lubrication.	Potentially contaminating fuels or oils.	HM, TRH, BTEX and PAH	Medium
	D – Stored oils and fuel at separator system and within	Potentially contaminating chemicals.	HM, TRH, BTEX and PAH	Low – medium

	maintenance shed.			
Sales yard	E - Beneath crusher	Lubricants.	TRH, BTEX and PAH	Low
	F – Stockpiles of precoated aggregate.	Potentially contaminating chemicals (bitumen emulsion).	TRH, BTEX and PAH	High
	G –AST, bunded, covered, containing pre-coating for aggregate (bitumen emulsion).	Potential bitumen emulsion leaks.	TRH, BTEX and PAH	Low
	H – AST, former diesel tank, unknown content.	Potential diesel leaks into the soil	TRH	Very low
	I – Former bitumen tank with possible asbestos insulation.	Potential bitumen leaks into the soil. Likely fibrous asbestos insulation exposed.	TRH, BTEX and PAH Asbestos	Very low Very high
	J – Under petrol/diesel pump west of sedimentation ponds.	Potentially contaminating fuels or oils.	HM, TRH, BTEX and PAH.	Very low
Office and administration area.	K – AST, diesel tank, double-skinned.	Potential leakage.	TRH, BTEX and PAH.	Very low
Quarry operations area, central area of site.	L – Entire quarry operations area.	Potential fuel and lubricant leakage from plant and during refuelling/maintenance operations.	TRH, BTEX and PAH.	Low

[1]Locations identified on AEC maps in Attachment C.

[2] Drums and containers of unknown content were visible in several locations. The label on one of the intermediate bulk containers (IBC) indicated 'Meropa 150', a non-hazardous extreme pressure gear lubricant with the main ingredients being distillates (petroleum) and solvent dewaxed parafinnic (Caltex Australia Petroleum Pty Ltd, 2010). The label on one of the containers indicated 'Megapoxy', Parts A & B, environmentally hazardous substances which include the ingredients Bisphenol A (30-60%), epoxy resin, ether and propanol (Vivacity Engineering Pty Ltd, 2011).

Asbestos Risk Assessment

An asbestos risk assessment was conducted by WorkPlace Environment Consultants. Two tanks were assessed for the presence of bonded or friable asbestos, the extent of any contamination, and the need for special remediation procedures. No asbestos was detected.

5.4.5.4 *Mitigation Measures and Conclusion*

Martens and Associates recommends that based on the findings of the Stage 1 assessment, a Stage 2 ESA is not recommended and no further testing is proposed provided the site continues to maintain the current and proposed use. Should site use change, further testing would be required with a site investigation plan developed in accordance with NSW EPA (1995) and a risk based assessment.

The Project Area has been used as a quarry since about 1983 while the remainder of the property has been undeveloped bushland. Martens has documented the following key findings from the site assessment;

- Maintenance, storage shed and office construction and upkeep have the potential to have introduced contaminants to the site. Prime contaminants of this nature are asbestos (as a construction material), pesticides (termite control) and heavy metals (paints and pest control).
- The site contains drums, containers and IBC, both bunded and unbunded. These may have leaked and introduced contaminants to the site.

- The site contains several ASTs ranging from poor to good condition of known and unknown content. These may have introduced contaminants to the soil.
- Martens observed potential asbestos containing material (PACM) on exposed fibrous insulation on one disused AST. Results of an asbestos inspection and risk assessment indicated no asbestos in the steel tank, or the shell insulation, gasket or turret sealant of the rail tanker (Workplace Environment Consultants, 2014).
- Martens' contamination assessment considered there is a high risk that stockpiles of pre-coated aggregate may have introduced localised contamination of hydrocarbons (bitumen emulsion) to the site. Additionally, fuels and oils used in the mobile refuelling and maintenance of plant and beneath the crusher may have introduced contaminants to the soil.

Although localised soil contamination has been identified, Martens concluded that associated risks are insignificant. The contaminants will be removed as quarrying progresses, eliminating any risks. Environmental (surface water) monitoring ensures no off site impacts from hydrocarbons.

5.5 Biodiversity

5.5.1 Background

Requirements from the SEARs

- accurate estimates of proposed vegetation clearing and impacts on regionally significant remnant vegetation, or vegetation corridors;
- a detailed assessment of potential impacts of the development on any terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities listed under State or Commonwealth legislation;
- a detailed assessment of potential impacts of the development on any groundwater dependent ecosystems; and
- a detailed description of the measures that would be implemented to avoid, reduce or mitigate impacts on biodiversity, including an appropriate biodiversity offset strategy;

Supplementary Information

- Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW 2009)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DECC 2004)
- Guidelines for Threatened Species Assessment (DoP 2005)
- BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW 2011)
- The Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)
- NSW State Groundwater Dependent Ecosystem Policy (DLWC)
- Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)
- State Environmental Planning Policy No. 44 – Koala Habitat Protection Principles for the Use of Biodiversity Offsets in NSW (OEH)
- Significant impact guidelines 1.1 – Matters of National Environmental Significance (Commonwealth Department of Environment 2013)

The Biodiversity Assessment includes five main components being;

1. Site Assessment of Biodiversity Values **(Section 5.5.2)**
2. Assessment under the EPBC Act **(Section 5.5.3)**

3. Assessment under the Port Stephens Council Koala Plan of Management (**Section 5.5.5.1**)
4. Assessment under the Avoid, Minimise and Offset Hierarchy (OEH principles for the use of biodiversity offsets in NSW).
5. Biodiversity Offset Strategy

These sections are addressed below.

5.5.2 Assessment of Site Biodiversity Values

5.5.2.1 *Existing Environment*

Brandy Hill is an elevated rural locality in the Port Stephens Local Government Area (LGA) and primarily consists of large, rural-residential blocks overlooking the lower Hunter River floodplain. The Quarry is situated on a low ridge on the eastern flank of Brandy Hill, approximately 3.5 kilometres west of Seaham and 175 kilometres north of Sydney. The surrounding landscape consists of farmland, primarily used for cattle and poultry broiler sheds, which lie on a large floodplain.

Vegetation within the study area forms part of a large expanse of relatively intact, regrowth native bushland that extends approximately 14 kilometres north to the town of Martin's Creek.

Bioregions and landscape regions

The entire Brandy Hill Quarry expansion area is located within the Upper Hunter subregion of the North Coast Interim Biogeographic Regionalisation for Australia (IBRA) bioregion in NSW. The Hunter IBRA subregion and Sydney Basin IBRA region are located to the south of the study area, and within the inner assessment circle (**Figure 6.8**).

The majority of the study area is located within the Newcastle Coastal Ramp Mitchell Landscape and it is the Mitchell Landscape identified in the assessment. The northern portion of the study area is located within the Scone-Gloucester Foothills Mitchell Landscape, while the Lower Hunter Channels and Floodplains Mitchell Landscapes are located to the south of the study area within the outer assessment circle (**Figure 6.8**)

Waterways and wetlands

The study area is located within the Hunter River catchment. The Hunter is the largest coastal catchment in NSW, with an area of about 21,500 square kilometres. Elevations across the catchment vary from over 1,500 metres in the high mountain ranges north of the catchment, to less than 50 metres on the floodplains of the lower valley.

The expansion area is located within the catchments of two local waterways;

- Deadman's Creek: Deadman's Creek is a third order (Strahler 1957) ephemeral stream that flows from north to south outside of and to the east of the expansion area.
- Barties Creek: The headwaters of this waterway are located within and to the west of the study area **(Figure 6.8**), with a first order (Strahler 1957) section of the waterway located within the western section of the study area (**Figure 6.8**).

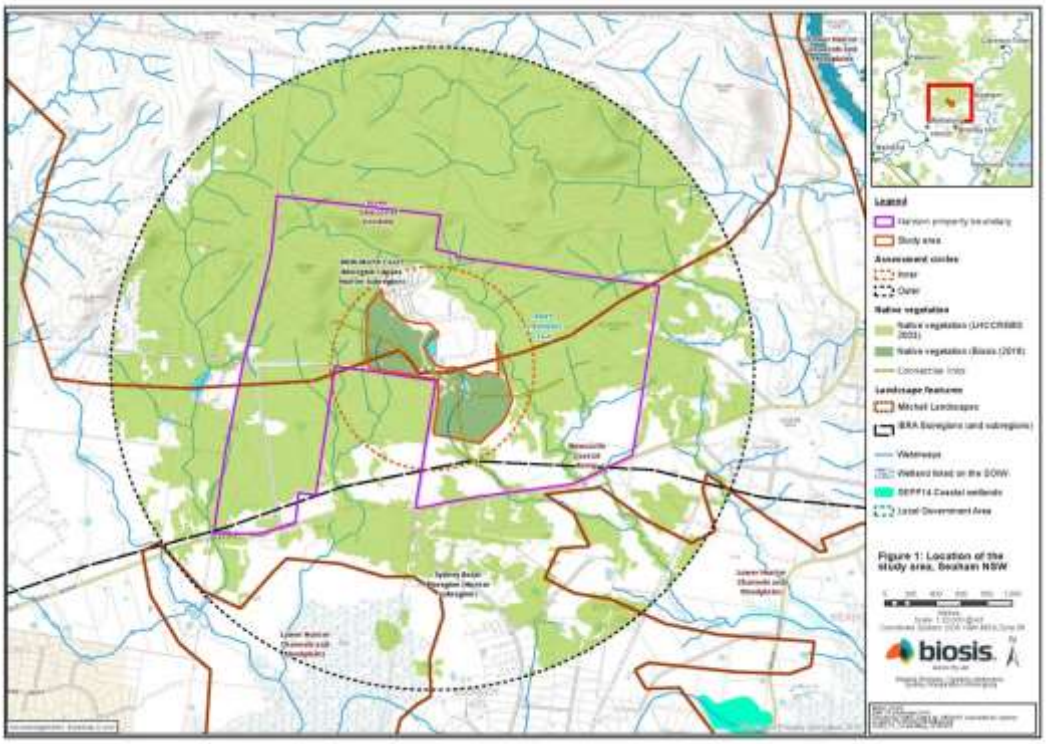

Figure 6.8: Location of the Study Area, Seaham NSW

Native vegetation extent

The outer assessment circle (**Figure 6.8)** contains a large portion of vegetated land with areas to the south of Clarence Town Road cleared. The inner circle contains areas of cleared land as part of previous development approvals for Brandy Hill Quarry.

5.5.2.2 *Methodology*

A Biodiversity Impact Assessment of potential ecological impacts has been undertaken for the Project by Biosis Pty Ltd (**Appendix 7**). The assessment was prepared in accordance with applicable legislative requirements. This section provides a summary of the findings of the Biodiversity Assessment Report (BAR).

Biobanking Assessment Methodology (OEH 2014a) has been used to calculate landscape value for the project. The Lower Hunter and Central Coast Regional Environmental Management Strategy (LHCCREMS; 2003) was referenced to determine vegetation extent outside the study area. Detailed mapping was undertaken inside the study area.

Vegetation Information System (VIS) classification was used for the Project. Vegetation communities were separated into Plant Community Types (PCTs) based on a variety of biological and geographical characteristics such as soils, landform, floristic composition and geographic location. Detailed mapping of vegetation in the study area was undertaken using Keith (2004).

Site Investigation

In order to provide a context for the study area, information about flora and fauna from within 10 kilometres (the 'locality') was obtained from relevant public databases. Aquatic fauna

records were searched from the Hunter/Central Rivers Catchment Management Authority (CMA) management area.

Complete details of the Biodiversity Assessment methodology have been provided in the BAR (**Appendix 7**). Key aspects of field assessment have been summarised below. The Project will involve removal of 48.65 ha of undisturbed vegetation. This area has been assessed in respect to its ecological values.

Flora

An initial flora assessment of the study area was undertaken in winter from 11 to 15 August 2014 by two ecologists. An additional flora assessment was undertaken in spring on 13 and 14 November 2014 by two ecologists. PCT were delineated and stratified by walking boundaries of communities, then using plot and transect survey data in accordance with biodiversity assessment methodology (BBAM) requirements (OEH 2014a). Surveys included;

- A 20m x 50m quadrat and 50m transect for assessment of site attributes.
- A 20m x 20m quadrat, nested within the quadrat outlined above, for full floristic survey to determine native plant species richness.

A total of 19 plots/transects were completed within the study area. Additional spot locations for incidental observations and random meanders (Cropper 1993) were used to determine the vegetation types present within the study area.

Noxious weed infestation, management works, grazing impacts and regeneration capacity were noted.

Patch Size: Assessed using a Geographic Information System (GIS) and all condition not defined as low condition was mapped sequentially using ArcGIS software.

Species

Initial flora and fauna assessments of the study area were undertaken in winter from 11 to 15 August 2014 and in spring from 13 to 14 November 2014.

Flora

Flora surveys included 20m X20m quadrats, bio banking plots/transect surveys, spot locations and random meanders (14 person days across the entire study area).

Fauna

Habitat-based fauna assessment of the study area was undertaken to determine its values for fauna based on the type and qualities if habitat present. Active searching included direct observation, searching under rocks and logs, examination of tracks and scats and identifying calls. Particular attention was given to searching for threatened species and their habitats.

Targeted surveys for fauna were undertaken in both August and November 2014, and included a wide variety of survey techniques consistent with the BBAM and the draft NSW *Threatened Biodiversity Survey and Assessment Guidelines* (DECC 2004). Given a known koala population occurs in the locality and individuals and scats were located during the

winter and spring survey periods, a targeted koala habitat assessment and survey was undertaken in accordance with the *EPBC Act Referral Guidelines for the vulnerable koala* (DoE 2014) using the Spot Assessment technique (SAT [Phillips and Callaghan 2011]).

Ecosystem credit species

The BBAM (OEH 2014a) calculator was applied to generate a list of ecosystem credit species predicted to occur within the study area. The potential for these species to occur within the study area was assessed in accordance with Section 6.3 of the BBAM (OEH 2014a).

TS offset multipliers relate to the ability of species to respond to improvements in site or habitat values. TS values for the study area range from 1.3 to 3, with 3 being attributed to forest owls.

Species Credit Profiles

Flora: A number of flora species were identified as candidate species for further assessment, in accordance with Section 6.5 of the NSW BBAM (OEH2014a). Targeted surveys did not record any threatened flora species within the study area.

Fauna: A number of fauna species were identified as candidate species for further assessment, in accordance with Section 6.5 of the NSW BBAM (OEH 2014a). Targeted surveys recorded the presence of the koala species within the study area.

Species Polygon: The koala species polygon was determined using a combination of the Threatened Species Profile Database (TSPD) and targeted koala survey results. The koala species polygon is shown in Figure 6.9 and totals 45.8 hectares. This area was used to determine species credit requirements.

Geographic/habitat features

The occurrence of geographic habitat features was assessed, in accordance with Section 6.3 of the BBAM (OEH 2014a). Impacts on these habitat features potentially resulting from the proposed development were also assessed.

Aquatic Habitat

Water Quality Assessments

Deadman's Creek, to the east of the study area, is an ephemeral stream that flows from north to south. Despite Deadman's Creek being located outside of the project impact boundaries, an *in situ* assessment of water quality (pH, dissolved oxygen (DO), temperature, turbidity and electrical conductivity (EC)), stream order assessment and a HABSCORE assessment were undertaken at two sites located along Deadman's Creek, adjacent to and downstream from the study area. The sampling site locations are outlined in **Table 5.5:1.** Sampling was carried out using a Horiba Multi-parameter Water Probe, calibrated prior to sampling.

Table 5.5:1: Water quality site code and locations

Site Code	Location (decimal degrees)	Site Description
DMC-AQ1	-32.663236, 151.694585	Deadman's Creek at the upstream extent of the study area.
DMC-AQ2	-32.660686, 151.694286	Deadman's Creek alongside the study area.

Stream Order

A HABSCORE assessment was completed at Deadman's Creek to provide a measure of the relative health of aquatic habitat. HABSCORE assessments utilise visually based habitat characteristics to classify the quality of the water resource and the condition of the resident aquatic community. HABSCORE's range from Poor to Optimal condition reflects the current category condition of the water resource.

Aquatic fauna

There are no *Fisheries Management Act 1994* listed threatened fish species previously recorded or are predicted to occur within the study area. A targeted aquatic habitat assessment was not required or undertaken. Instead, a more general habitat assessment was completed to determine any particular aquatic constraints and the condition of Deadman's Creek and artificial water-bodies - storage and settlement dams.

Connectivity Links

State significant, regionally significant and local biodiversity connectivity links were assessed. The connectivity value of the study area was assessed in accordance with Appendix 4 of the BBAM.

5.5.2.3 *Impact Assessment*

Ecological values

Key ecological values identified by implementing the BioBanking Assessment Methodology, NSW Biodiversity Offsets Policy of Major Projects (OEH 2014a) include:

- Presence of Deadman's Creek, a third order stream, immediately adjacent to and outside the study area, and presence of a first order section of Bartie's Creek within the study area.
- A total of six Plant Community types (PCTs) covering 48.62 hectares.
- Identification of two threatened ecological communities, including;
    - 0.67 hectares of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast. Sydney Basin and South East Corner Bioregions.
    - 1.67 hectares of Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions.
- 45.8 hectares of Koala habitat across the study area.

Flora

Six PCTS were identified in the Study Area. See **Table 5.5:2** below;

Table 5.5:2: Plant community Types of the study area and corresponding formation and class (Keith 2004).

Plant community type	Vegetation formation	Vegetation class
HU814 Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter (PCT 1600)	Dry Sclerophyll Forest (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests
HU816 Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter (PCT 1602)	Dry Sclerophyll Forest (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests
HU591 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (PCT 1064)	Forested Wetlands	Coastal Swamp Forests
HU806 Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter (PCT 1592)	Dry Sclerophyll Forest (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests
HU812 Forest Red Gum grassy open forest on floodplains of the Lower Hunter (PCT 1598)	Forested Wetlands	Coastal Floodplain Wetlands
HU798 White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley (PCT 1584)	Wet Sclerophyll Forest (Grassy sub-formation)	Northern Hinterland Wet Sclerophyll Forests

All native vegetation within the study area was deemed to be in moderate or good condition with all PCTs in the same broad condition.

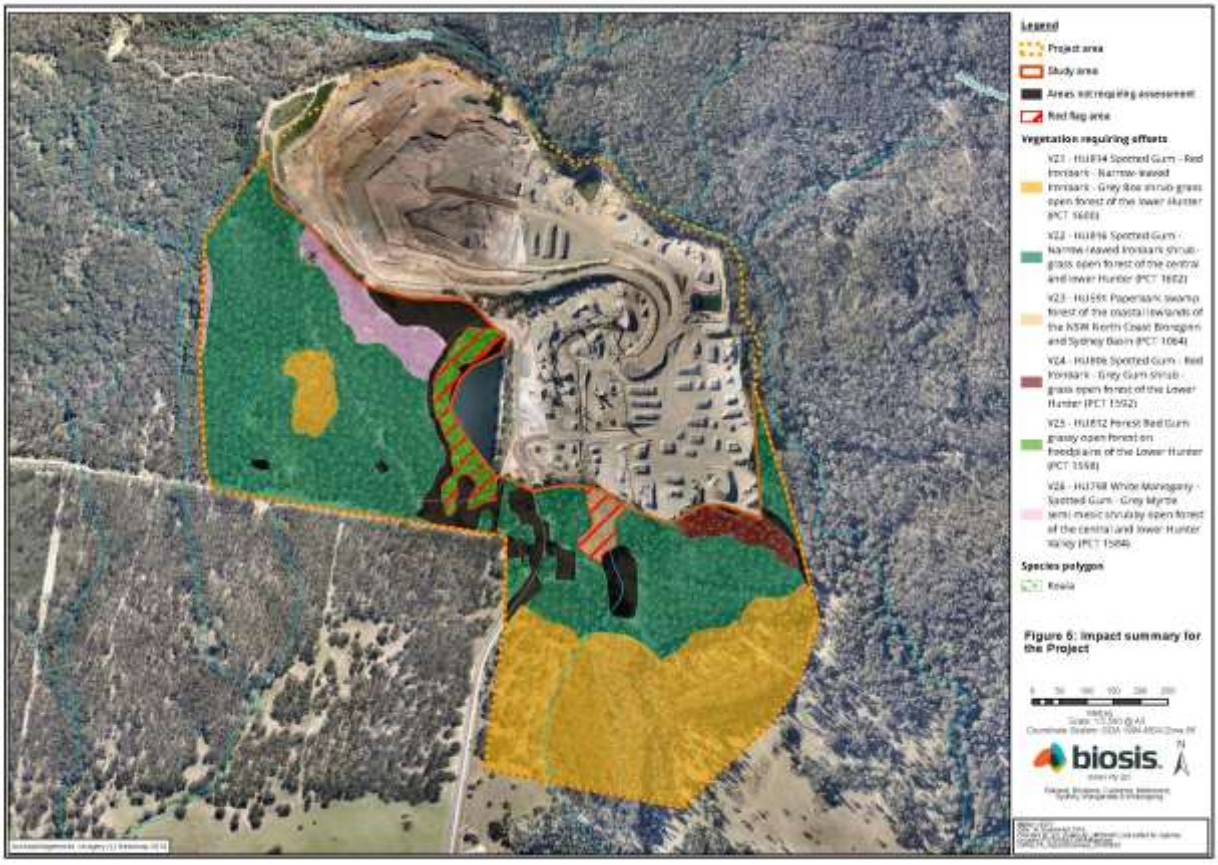

Figure 6.9 Impact Summary for the Project

Fauna

Species status within the study area.

Table 5.5:3 Sampling locations on Deadman's Creek measured approximately two metres in width and 25 centimetres in depth.

Common name	Scientific name	Habitat present in the study area	Justification	Recorded during targeted surveys	Impacted by development
Brush-tailed Phascogale	*Phascogale tapoatafa*	Yes	Species not recorded during targeted survey. No further assessment required.	No	No
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	No	Suitable habitat in the form of heathlands, wet heath or swamps, does not occur within the study area.	N/A	No
Eastern Pygmy-possum	*Cercartetus nanus*	Yes	Species not recorded during targeted survey. No further assessment required.	No	No

Golden Tipped Bat	*Kerivoula papuensis*	Yes	Species not recorded during targeted survey. No further assessment required.	No	No
Green and Golden Bell Frog	*Litoria aurea*	Yes	Species not recorded during targeted survey. No further assessment required.	No	No
Koala	*Phascolarctos cinereus*	Yes	Species not recorded during targeted. No further assessment required.	Yes	Yes
Pale-headed Snake	*Hoplocephalus bitorquatus*	Yes	Species not recorded during targeted survey. No further assessment required.	No	No
Red-backed Button-quail	*Turnix maculosus*	No	Suitable habitat in the form of grasslands or grassy woodlands with an open ground layer near water is not present in the study area.	N/A	No
Regent Honeyeater	*Anthochaera phrygia*	Yes	Species not recorded during targeted. No further assessment required.	No	No

Species Polygon

The koala was recorded within the study area during targeted surveys and will be impacted by the Project. A species polygon was created in accordance with Section 6.5.1.19 of BBAM (OEH 2014a).

The koala species polygon was determined using a combination of the Threatened Species Profile Database (TSPD) and targeted koala survey results. Any PCTs where the koala is predicted to occur by the TSPD, or any PCTs where more than 15 percent of the trees at any SAT location are considered koala feed trees under State Environmental Planning Policy 44 – Koalas and Koala habitat (SEPP) or Port Stephens Council (2002) were mapped as koala habitat.

Red Flag Assessment

Red Flags were assessed in accordance with Section 9.2 of the NSW Biobanking Assessment Methodology (OEH 0214).

Landscape Features

The study area does not support any 4th, 5th or 6th order streams, estuarine areas, important wetlands, or state or regional biodiversity links.

Native Vegetation

HU591 and HU812 are equivalent to Swamp Sclerophyll Forest on Coastal Floodplain Forest and Hunter Lowland Redgum Forest respectively and both are TECs under the TSC

Act. These PCTs are estimated to be more than 70 per cent cleared within the Hunter/Central Rivers CMA and are therefore eligible for red flag status.

No other areas were eligible for red flags, as they are not considered EECs and are less than 70 per cent cleared.

Threatened species and populations

The study area does not support threatened species or populations that cannot withstand further loss, a threatened species not previously recorded in the IBRA subregion or critical habitat listed under Section 55 of the TSC Act.

Aquatic Habitat Assessment

Site descriptions results

Sampling locations (Table 5.24) on Deadman's Creek measured approximately two metres in width and 25 centimetres in depth. 1.5 kilometres upstream of the study area the creek was dry. The substrate noted was generally sandy with small amounts of gravel and pebble material. Larger pools are scattered along the creek, but the channel was predominately shallow with little flow during the survey time.

Large tussocks of Spiny-headed Mat-rush were recorded along the banks and in the channel, however few true macrophytes were recorded. Riparian vegetation was dense, with an estimated over-storey foliage cover estimated at 60%.

Fish Habitat

Deadman's Creek is considered to provide Key Fish Habitat as defined by the NSW DPI (2014b) and is classified as a Class 3 fish habitat, being a third order creek sustaining ephemeral flow and semi - permanent pools providing habitat for aquatic species (Fairfull and Witheridge 2003).

HABSCORE

HABSCORE's range from Poor to Optimal condition and reflect the current category condition of the water resource. The habitat features at both the upstream and downstream sampling locations are considered to be Optimal as assessed using the HABSCORE habitat assessment methodology (Barbour et al. 1999). As per these assessment criteria, the **Optimal** categorisation is described as **"***watercourses that contain numerous large, permanent pools and generally have flow connectivity except during prolonged drought. They provide extensive and diverse aquatic habitat for aquatic flora and fauna*".

Water Quality

The water quality data is compared with guideline values including ANZECC guidelines for the Protection of Aquatic Ecosystems (ANZECC 2000). Oxygenation, turbidity and electrical conductivity levels were found to be within the ANZECC guidelines for lowland rivers. The

pH values were within ANZECC guidelines for sampling location DMC-AQ1 but very slightly higher for DMC-AQ2 sampling location.

Table 5.5:4: ANZECC guidelines and water quality data for the three assessment sites.

Parameter	ANZECC Guideline	DMC-AQ1	DMC-AQ2
Temp (ºC)	-	11.15	10.96
pH	6.5 – 8	7.97	8.06
Conductivity (mS/cm)	0.125-2.2	0.897	1.03
D.O. (ppm)	-	11.65	10.17
Saturation (%)	85– 110	109.6	95.2
Turbidity (NTU)	6 – 50	15.9	7.4

Some of these parameters typically exhibit a high degree of temporal variation and can change substantially over small periods of time such as weeks, days and even hours, particularly in response to significant rainfall events. A second replicate of both the water chemistry data and HABSCORE was due to be collected during the spring 2014 survey effort; however Deadman's Creek was found to be dry along its entire length in the study area. This was probably due to rainfall being below average for September, October and November 2014.

Surface Water Discharge

An assessment of basic water quality has been made upstream on the discharge point. It is important to note that Deadman's Creek is ephemeral in nature and hence regular water quality sampling has not historically been conducted, meaning that baseline data is not readily available. These results have been presented below, however continuing monthly water sampling is recommended (pending availability of water). This data should then be included in a site surface water management plan to record any potential impacts upstream of the current discharge point. The water tested is usually stagnant and pooled in Deadman's Creek due to the ephemeral nature of the creek.

Table 5.5:5: Surface Water Quality upstream of Discharge Point

Month	pH	Temp	EC uS/com
June 2015	6.4	13.9	306
November 2015	7.1	21.2	334
April 2016	7.0	22.8	698
May 2016	6.8	14.3	848
June 2016	6.4	13.0	120

July 2016	6.2	13.1	163
August 2016	6.4	11.3	330

The primary impact on aquatic ecological values relates to water discharge arising from the increased extent of extraction of stage 5, as this will result in the highest volume of surplus water. Based on a 95 percentile wet conditions year, predicted surplus water is modelled as 1441 ML/year. Water will only be discharged when all storages are at capacity and the water quality criteria specified in the EPL are met, typically during high rainfall events or prolonged periods of rainfall when Deadman's Creek would be flowing.

Martens Surface Water Assessment models stage 5 average flow as representative of less than 5 % of the channel capacity of Deadman's Creek.

Biosis has further considered potential impacts on aquatic ecology resulting from surface water discharge in an additional report titled *Brandy Hill Quarry Expansion – Addendum to Biodiversity Assessment Report, aquatic ecological impacts and mitigation advice* (**Appendix 7E**).

Biosis considers it unlikely that deleterious ecological impacts would occur as a result of additional surface water flows, beyond alterations in water chemistry particularly electrical conductivity (EC), pH, turbidity and nutrient loads (Total Nitrogen and Total Phosphorous).

Measures to avoid, minimise and mitigate potential impacts to aquatic ecological values are recommended below (Biosis, 2015 – See **Appendix 7E);**

- Ongoing monitoring of EC and nutrient levels within the water storages in the Surface Water Management Plan and implementation of appropriate management measures for high nutrient loads to reduce the occurrence or severity of algal blooms.
- Monitor the effects of increased surface flows in relation to bank erosion and stream bed composition of Deadman's Creek as part of the Surface Water Management Plan. This would inform the adaptive management of surface water flows/discharge and identify the need for remediation if adaptations to management do not yield beneficial results.

Biosis outlines a low level of potential impact on aquatic ecological values from the Project. The current maximum rate of discharge will not be increased as a result of the proposal neither will this increase the impact on Deadman's Creek beyond current conditions. The primary means of further reducing impacts are associated with monitoring of the effects of discharge on Deadman's Creek and the implementation of an adaptive management plan.

5.5.2.4 *Mitigation Measures*

Project specific recommendations are also presented in

Table 5.5:8 and **Table 5.5:11**. Mitigation measures that will be implemented for the Project are outlined below;

- A Biodiversity Offset Strategy will be finialised based on the findings of the BAR, post Project Approval and pending the EPBC Act Referral (being assessed under a Bilateral Agreement) and prior to construction, to include all offset requirements outlined within the BAR.
- The Project will develop a Biodiversity Management Plan to guide pre-clearance surveys, onsite management of water, threatened fauna such as koala, noxious weeds, and personnel inductions as well management of other native threatened and non-threatened fauna.
- Vegetated boundaries of the Project area will be clearly identified and sign-posted where required to exclude access by personnel or equipment.
- Development of a Project erosion and sediment control plan.
- Noxious weeds, Fire weed and Pampas Grass, will be removed and appropriately disposed of in an appropriate waste facility as required by NSW DPI through the Port Stephens Council under the Noxious Weeds Act.
- A 30 m buffer has been implemented between Deadman's Creek and the Project Area.
- Water bodies will be retained with native vegetation where possible to provide suitable habitat for native species. This does not include the Site Dams.
- Lighting associated with night works will be directed away from adjoining vegetation (to be retained) unless in the unlikely event that lighting is required on the periphery of the disturbance area to maintain safety during operations in low light.

5.5.3 Assessment under the EPBC Act Assessment

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

An assessment of the impacts of the proposed development on MattersNES, against heads of consideration outlined in "Matters of National Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999" (DoE 2013), was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required.

This assessment determined that two flora species and three fauna species had a moderate likelihood of occurrence in the study area, with one additional fauna species (being the koala) having a high likelihood of occurrence in the study area. Koala presence was confirmed during the spring/summer sampling effort 12 – 14 November 2014, conducted by Biosis Pty Ltd. To enable an accurate and detailed assessment of koala presence in the Project area a supplementary targeted field assessment was conducted by Biosis Pty Ltd 9 – 11 December 2014. A copy of this supplementary report and the referral have been in **Appendix 7.**

The presence of a Commonwealth-listed threatened species meant the Project was referred to the Department of the Environment for further assessment under the EPBC Act. Hanson commissioned Biosis Pty Ltd to complete additional koala field surveys to ensure accurate

quantification of the koala population. The referral assessment (dated 3 June 2015, **Appendix 7**) concludes that the proposed action is likely to have a significant impact on listed threatened species and communities (sections 18 & 18A). The Project is assessed as a bilateral agreement with the NSW Department of Planning and Environment. Further details are provided in **Appendix 7.**

5.5.3.1 *Existing Environment*

Background research indicates that 15 flora species and 17 fauna species have been recorded or are predicted to occur in the locality. An assessment of the likelihood of these species occurring in the study area was prepared by Biosis. This assessment determined that two flora species and three fauna species had a moderate likelihood of occurrence in the study area, with one additional fauna species having a high likelihood of occurrence in the study area. The rest of these species are not considered to have a medium or high likelihood of occurrence within the study area.

The following threatened biota is considered to have the potential to occur within the study area:

- Small-flower Grevillea
- Tall Knotweed
- Regent Honeyeater
- Spotted-tailed Quoll
- Swift Parrot
- Grey-headed Flying-fox

Significant Impact Criteria (SIC) were prepared for these species. Assessment against these criteria determined that a significant impact was unlikely to result from the Project.

The koala was recorded within the study area and a SIC assessment was prepared for this species, concluding that a significant impact was likely; hence an EPBC Referral has been prepared and submitted to Department of Environment.

The conclusion that the Project will have a significant impact on the koala means that, under the EPBC Act, the Project is defined as a "controlled action" and accordingly, approval by the Minister for the Environment is required.

5.5.3.2 *Methodology*

An assessment of the impacts of the proposed development on Matters of NES, against heads of consideration outlined in Matters of National Environmental Significance - Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DoE 2013), was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required.

This assessment determined that two flora species and three fauna had a moderate likelihood of occurrence in the study area, with one additional fauna species (being the koala) having a high likelihood of occurrence in the study area. Koala presence was confirmed during the spring/summer sampling effort 12th – 14th November 2014, conducted by Biosis Pty Ltd. The presence of federally listed threatened species meant the Project was

referred to the Department of the Environment for further assessment under the EPBC Act. Hanson commissioned Biosis Pty Ltd to complete additional koala field surveys to ensure accurate quantification of koala populations. The referral assessment (dated 3 June 2015, **Appendix 7**) considers that the proposed action is likely to have a significant impact on listed threatened species and communities (sections 18 & 18A of the EPBC Act). Based on the referral, it is considered that the proposed action is likely to have a significant impact on the following matters of national environmental significance (MNES);

- Koala *Phascolarctos cinereus* (vulnerable) and Grey-headed Flying-Fox *Pteropus poliocephalus* (Vulnerable). The proposed action will result in the clearance of habitat critical to the survival of these species.
- Spotted-tailed Quoll *Dasyurus maculatus* (SE mainland population) (Endangered). The proposed action will result in the clearance of suitable foraging and breeding habitat for the Spotted-tail Quoll.
- Swift Parrot *Lathamus discolour* (Endangered) and Regent Honeyeater *Anthochaera Phrygia* (Endangered). The proposed action will result in the clearance of foraging habitat for the Swift Parrot and Regent Honeyeater, including key foraging and drought refuge habitat.

Significant Impact Criteria (SIC) assessment has been prepared in accordance with the Matters of National Environmental Significance, Significant Impact Criteria guidelines 1.1 Environment Protection and Biodiversity Conservation Act (DoE 2013) for species determined to have moderate or high likelihood of occurrence within the project area. This applied to the below listed species;

- Koala *Phascolarctos cinereus* (vulnerable)
- Grey-headed Flying-Fox *Pteropus poliocephalus*
- Spotted-tailed Quoll *Dasyurus maculatus* (SE mainland population) (Endangered).
- Swift Parrot *Lathamus discolour* (Endangered)
- Regent Honeyeater *Anthochaera Phrygia* (Endangered)
- Small-flower Grevillea *parviflora* subsp. *parviflora*
- Tall Knotweed *Persicaria elatior*

Full details of this assessment can be found in the Biodiversity Assessment – **Appendix 7** of this report - however a summary of findings is presented below.

Koala

Approximately 45.8 hectares of suitable koala habitat was identified within the study area. Koalas and/or signs of koala activity were recorded throughout the study area. However, the results of targeted surveys indicate that the study area supports a relatively low density of koalas (≤ 0.1 Koala per hectare). Further, there was no evidence of breeding koalas (females with young). Given the low population density and the absence of breeding females it is unlikely that the study area supports an important population of koalas. The total area of the site owned by Hanson is 561 hectares, much of which supports koala habitat and will be retained. It is therefore unlikely that removal koala habitat by the Project will result in a significant reduction in the habitat of koalas in the locality, given the area of suitable habitat

that will remain on adjacent land, in the proponent's ownership and under their custody. The action will not therefore lead to a long-term decrease in the size of an important population of koalas.

Complete avoidance of habitat removal suitable for the threatened koala could not be undertaken due to other ecological constraints (i.e. Deadman's Creek) and limitations of environmental protection zoning, however Hanson is committed to minimising impacts on the koala by applying alternate avoidance/minimisation practices. Hanson has commissioned the undertaking of a separate and complete threatened species survey for the koala to more accurately quantify the activity, abundance and nature of koalas within the project area. This survey will assist in developing practical recommendations to minimise impacts through the staged progression of the Brandy Hill expansion project. Included in this targeted mitigation strategy; are:

- A Biodiversity Management Plan (incorporating management measures for Koalas) should be prepared to outline the clearance procedure (including protection measures for adjacent vegetation), protocols for koala finds and incidents, including an educational brochure for all workers to review prior to working on the Project.
- An ecologist undertaking pre-clearance surveys for koalas within the Project area immediately before removal of any vegetation.
- Should any koalas be identified, those specimens being removed and placed in the care of a koala/native fauna care group or ecologist before clearing proceeds.
- An ecologist or fauna rescuer being present during vegetation clearing to minimise impacts on koalas displaced or injured during clearing.
- An ecologist or regional koala care group being contacted if any koalas are injured and/or distressed during the construction and operation phases of the Project.
- Low vehicle speed limits being enforced on-site to reduce the potential for vehicle impacts on koalas.
- All drivers working on the Project being made aware of koalas and instructed to take precautions when driving on-site.

Hanson will avoid disturbance to surrounding adjoining vegetation and thereby enable local koala activity in other suitable habitat within the adjoining Hanson landholdings in the immediate local area.

Small-flower Grevillea *parviflora* subsp. *parviflora*

Based on the SIC assessment the project will not significantly impact Small-flower Grevillea as:

- The species was not recorded within the study area
- There are no associated impacts to important populations of Small-flower Grevillea
- Vegetation to be cleared is considered to be marginal and the nearest located individual are located 10 kilometres to the east of the study area.

Tall Knotweed *Persicaria elatior*

Based on the SIC assessment the project will not significantly impact the Tall Knotweed as:

- The species was not recorded within the study area

- There are no associated impacts to important populations of Small-flower Grevillea
- Vegetation to be cleared is considered to be marginal and the nearest located individual are located 4 kilometres to the east of the study area.

Regent Honeyeater *Anthochaera Phrygia* and Swift Parrot *Lathamus discolour*
Based on the assessment of the Regent Honey Eater and Swift Parrot the Project is unlikely to be significantly impacted by the project as;

- Targeted surveys in winter and spring did not record the Regent Honeyeater or the Swift Parrot within the study area.
- Larger areas of similar or better quality forage habitat for these species occurs throughout the wider locality.
- Both species are highly mobile blossom nomads.

Spotted Tailed Quoll
Based on the assessment of the Spotted-Tailed Quoll the Project is unlikely to be significantly impacted by the project due as:

- Spotted tailed quolls were not identified in the project area despite targeted surveys;
- Alternative habitat exists in the broader area; and
- There are known populations and alterative habitat within the broader area.

Grey-headed Flying-Fox *Pteropus poliocephalus*
Based on the assessment of the Grey-Headed Flying Fox the Project is unlikely to be significantly impacted by the project due as:

- There were no root or breeding camps within or in the proximity to the study area; and
- There is suitable habitat in the broader area.

It is also important to note that the area to the north of Hanson's land-holdings is currently being established as a BioBanking site which has similar PCTs to the Project area. This agreement is independent of Hanson's Project; however will act to provide suitable habitat in perpetuity additional to the Project's required offsets.

Additionally the project will not be removing remnant vegetation outside of the development footprint as part of this application, which constitutes approximately 450 ha.

5.5.3.3 *Impact Assessment*

A description of environmental and likely impacts on MNES has been summarised in **Table 5.5:6** below and included in full as **Appendix 7**.

Table 5.5:6: MNES Description

Matter of NES	Project specifics	Potential for significant impact
Threatened species (flora and fauna)	Background research indicates that 15 flora species and 17 fauna species have been recorded or are predicted to occur in the locality. An assessment of the likelihood of these species occurring in the study area was prepared and located in the BAR. This assessment determined that two flora species and three fauna had a moderate likelihood of occurrence in the study area, with one additional fauna species having a high likelihood of occurrence in the study area. The Koala was considered to have a high likelihood to occur and was recorded within the study area. The rest of these species are not considered to have a medium or high likelihood of occurrence within the study area.	**The following threatened biota are considered to have the potential to occur within the study area:** **Small-flower Grevillea** **Tall Knotweed** **Regent Honeyeater** **Spotted-tailed Quoll** **Swift Parrot** **Grey-headed Flying-fox** **SIC assessments were prepared for these species (Appendix 6 of the BAR). These assessments determined that a significant impact was unlikely to result from the Project.** **The Koala was recorded within the study area and a SIC assessment was prepared (Appendix 6 of the BAR). The project was deemed a controlled action and the project is undergoing a bilateral agreement.**
Threatened ecological communities	No EPBC Act EECs were recorded within the study area.	**N/A**
Migratory species	Thirty-one migratory species have been recorded or are predicted to occur in the locality.	**While some of these species would be expected to use the study area on occasion, some may do so regularly and others may be resident, the study area does not provide important habitat for an ecologically significant proportion of any of these species.**
Wetlands of international importance (Ramsar sites)	There are 12 Ramsar sites in NSW, the closest to the study area being the Hunter Estuary Wetlands within the estuary at the mouth of the Hunter River.	**The study area is located approximately 18 kilometres northwest of this Ramsar site and Deadmans Creek is a tributary of the Hunter River. However, as an ephemeral creek line, it is considered unlikely that the Project will have any direct or indirect impacts on this Ramsar Site.**

Under the EPBC Act the Department of Environment has provided Guidelines for Preparing Assessment Documentation relevant to the EPBC Act. As the Project will be assessed under the bilateral agreement, several of these components have been addressed through the remaining sections of this EIS. Additional assessment criteria identified by the Department of Environment are addressed below.

5.5.3.4 *Cumulative Impacts*

In The Wallalong Urban Release Area Planning Proposal (submitted to the Department of Planning and Environment) involved re-zoning of the existing Wallalong village for residential development at low to medium densities and proposes to permit business, industrial, recreation and environmental protection development, to facilitate a population increase from approximately 900 to 9000 people, to the southwest of the Project. This proposal was "Refused" at Gateway by the *Department of Planning and Infrastructure* and has not been assessed further in the ecology assessment.

Additionally, Daracon's Martin's Creek quarry which is situated 20km by road from the project site has submitted a *Preliminary Environmental Statement* for a proposed quarry expansion. This scoping document states that the area to be cleared as part of the proposed extraction operations within East Pit A will comprise approximately 23ha and some clearing of Lot 42 DP815628 (comprising 2.4ha) will also be included in the proposal. As Daracon has not lodged their Ecological Assessment Report, and there is reasonable distance between quarries, further ecological impact of this project has not been considered.

5.5.4 Recovery Plans

Table 5.5:7 below identifies recovery plans for EPBC listed species applicable to this Project.

Table 5.5:7: Applicable Recovery Plans

Species	Recovery Plan
Koala	• National Koala Conservation Strategy (ANZECC 1998) • Approved Koala Plan (DECC 2008)
Grey-headed Flying-Fox	• There is a draft national recovery plan for the Grey-headed flying fox (DECCW 2009).
Spotted-tailed Quoll	To date, there is currently no recovery plan for the Spotted-tailed Quoll however OEH lists 4 activities to assist with the recovery of this species: 1. Consult with OEH/NPWS if Spotted-tailed Quolls are raiding poultry, rather than taking direct action. 2. Consult with OEH/NPWS if poison baiting is planned in or near areas where Spotted-tailed Quolls are known or likely to occur. 3. Undertake cat and fox control using poison-baiting techniques least likely to affect quoll 4. Retain and protect large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines.
Regent Honeyeater and Swift Parrot	A recovery plan exists for the Regent Honeyeater and was developed in 1999 (Menkhorst et al. 1999). A national recovery plan for the Swift Parrot was developed in 2011 (Saunders and Tzaros 2011).

Tall Knotweed	There is currently no recovery plan for this species A targeted strategy for managing and assisting the recovery of Tall Knotweed has been developed within the site-managed species stream of the Saving Our Species program (OEH 2013i). The site-managed species stream means that 5 management sites where conservation activities are needed most have been identified. The study area is not listed as a management site for Tall Knotweed
Small-flower Grevillea.	There is currently no recovery plan for this species There is a targeted strategy for managing and assisting the recovery of Small-flower Grevillea. This has been developed within the site-managed species stream of the Saving Our Species program (OEH 2013). The study area is not listed as a management site for Small-flower Grevillea as there is no population known to occur there.

5.5.4.1 *Project Impacts*

Further information can be sourced from **Appendix 7**: BAR, Section 9.1.

Indirect and offsite impacts

Downstream or downwind**:** There are no wetlands or ocean reefs in the vicinity of the site. Sediment, fertilisers or chemicals are managed in accordance with the sites water management system and sediment control plan. All discharge water is monitored against applicable Environment Protection Licence (EPL) criterion.

The study area is located approximately 18 kilometres northwest of this Ramsar site and Deadman's Creek is a tributary of the Hunter River. Deadman's Creek provides only a minor contribution of flow into this Ramsar site.

The site manages air quality under the site's EPL requirements. Dust Deposition Gauges (DDGs) are strategically located around the site to measure deposited dust.

Upstream Impacts: The proposal includes the extraction of raw materials. All 'inputs' are strictly managed in accordance with the Company's environmental management policy, safe work practices and the site's EPL. The site has been in operation since 1983 and since then has developed stringent operational practices to minimise environmental harm. Upstream (and downstream?) impacts are considered to be adequately managed.

Facilitated Impacts: The proposal considers facilitated impacts consequent to the Proposal. For example the proposal is for the expansion of Brandy Hill Quarry, and a facilitated impact is the transportation of processed material. The EPBC Act referral and BAR identify vehicle strikes as a possible threat.

Unknown, Unpredicted or Irreversible

There is a level of scientific uncertainty regarding ecological impacts from most major projects; however a detailed ecological assessment has reduced unknown, unpredicted and irreversible impacts.

Unknown: Detailed biodiversity assessment has been conducted which includes ground-truthing ecological characteristics of the site, thereby identifying areas of suitable habitat and presence/absence of species through government-endorsed sampling techniques and guidelines. Based on information presented in the BAR, Hanson does not consider impacts on MNES to be unknown.

Unpredicted: Understanding potential impacts of the Project and the ecological characteristics of the site, gives Hanson an adequate understanding of potential impacts and ensures targeted and effective mitigation measures can be implemented. Based on information presented in the BAR, Hanson does not consider impacts on MNES to be unpredicted.

Irreversible: A detailed biodiversity assessment includes the five MNES and their (including potential) habitat in the project area. Understanding of both habitat and species presence (and potential habitat) has guided Hanson in understanding that actions associated with the project will not have an irreversible impact on identified NMES. Based on information presented in the BAR, Hanson does not consider impacts on MNES to be irreversible.

5.5.4.2 *Mitigation Measures*

Hanson plans to enter into a targeted impact minimisation strategy to reduce impact on EECs. Impacts are minimised in accordance with the proposed mitigation measures and practices outlined in the Statement of Commitments. Additionally, Hanson has offset any impacts that cannot be avoided or minimised through mitigation.

Mitigation measures have been applied to minimise potential or anticipated project impacts on biodiversity values, particularly threatened species and/or MNES. **Table 5.5:8** Summarises recommended mitigation measures to minimise identified ecological impacts. Columns one, two and four have been quoted from Biosis' BAR (Biosis 2014, Appendix 7).

The recommendations from **Table 5.5:8** have been incorporated into the Hanson's Statement of Commitments (**Section 7**).

Table 5.5:8: Mitigation Measures - Columns 1, 2 & 4 extracted from the BAR (Biosis 2014)

Ecological Values (1)	Project Impacts (2)	Scale/intensity of impacts (see below) (3)	Recommendations/Mitigation Measures (4)	On-ground benefits/Outcomes (5)
Native vegetation clearance	Removal of 48.65 hectares of native vegetation.	Scale: Medium Intensity: Moderate	1. Biodiversity Management Plan (BMP) to be prepared to outline the clearance procedure. 2. Pre clearance surveys will be conducted prior to any vegetation clearance in areas of identified threatened species habitat to ensure that threatened species are not present prior to vegetation removal. 3. Vegetated boundaries of the Project area to be clearly fenced off and signposted to ensure no access from personnel or equipment. 4. Exclusion fencing to be discussed during all site inductions. 5. Exclusion fencing to be routinely checked by an environmental representative. 6. Exclusion fence footings to be free of stockpiled soils and vegetation to allow routine checks and to ensure that the boundary fence and adjoining vegetation (e.g. root zones of trees) to be retained are not smothered with soil. 7. A Biodiversity Offset Strategy has been prepared to offset the residual impacts to biodiversity arising from the Project (**Section 5.5.8**)	Management procedures that effectively mitigate and manage clearance procedure. Ensure that threatened species are not present prior to vegetation removal. Ensure disturbance does not occur in to areas outside of the disturbance area. Ensure that all personnel are informed of the extraction/disturbance limits thereby reducing the potential for accidentally disturbing remnant areas to be retained as part of this application. Ensure the fencing is effective in delineating between remnant vegetation and the disturbance area. Ensure the boundary fence and adjoining vegetation are not smothered with soil. Offset any impacts of the project on MNES.
Impacts to Threatened	- Removal of 0.67 hectares of Swamp	Scale: Medium	1. Biodiversity Management Plan (BMP) to be prepared to outline measures to avoid or mitigate	Minimise impacts on MNES through the

Ecological Communities and threatened species habitat	Sclerophyll Forest. - Removal of 1.67 hectares of Hunter Lowland Redgum Forest. - Removal of 45.8 hectares of Koala habitat.	Intensity: Moderate	impacts to EECs. 2. Pre clearance surveys will be conducted prior to any vegetation clearance to confirm presence/absence of EECs prior to removal 3. A Biodiversity Offset Strategy has been prepared to offset the residual impacts to biodiversity arising from the Project.	mitigation of habitat control (i.e clearance procedures). Avoid or mitigate impacts to EECs. Confirm presence/absence of EEC's prior to removal. Offset any impacts of the project on MNES.
Adjoining vegetation and waterways	Erosion and sedimentation	Scale: Medium Intensity: Moderate	Hanson to develop a strict erosion and sediment control plan for the expansion to ensure that erosion and sediment is contained on site. Measures to include: Sediment fencing to be placed inside the exclusion fencing and routinely checked for sediment breeches and to ensure structural integrity is maintained through vegetation clearance activities. Vehicles and equipment to ensure that tyres and tracks are free of sediment entering/exiting site.	1. Ensure that erosion and sediment is contained on site 2. Ensure structural integrity is maintained through vegetation clearance activities 3. Reduce the spread of weeds and dispersion of sedimentation.
Koala	Displacement, loss of habitat and fatality of Koalas during construction and operation.	Scale: Medium Intensity: Moderate	1. BMP to be prepared to outline the clearance procedure, protocols for koala finds and incidents and include an educational brochure for all workers to review prior to working at BHQ. 2. Ecologist to undertake pre-clearance surveys immediately prior to the removal of any vegetation. 3. Ecologist or fauna rescuer to be present during vegetation clearing to minimise impacts on Koalas displaced or injured during clearing. 4. Koalas addressed in the site induction.	1. Educate workers on the clearance procedure and in the event of koala finds/incidents. This will assist in the event a koala incident occurs on site. 2. Reduce potential of harming koalas when vegetation removal will occur as part of the development. 3. Minimise impacts on Koalas displaced or injured during clearing.
Threatened fauna	Displacement, loss of habitat and fatality of threatened fauna during construction and operation.	Scale: Medium Intensity: Low (clearance efforts will occur in development stages).	1. Ecologist to undertake pre-clearance surveys in accordance with the BMP immediately prior to the removal of any vegetation. 2. Ecologist or fauna rescuer to be present during vegetation clearing to minimise impacts on threatened fauna displaced or injured during clearing. 3. BMP to be prepared to outline the clearance procedure, protocols for threatened fauna finds	Ensure no threatened fauna are harmed in clearance efforts. Ensure if threatened fauna are harmed in the clearance efforts, it is treated and attended to immediately. Educate workers on

			and incidents and include an educational brochure for all workers to review prior to working at BHQ. 4. A Biodiversity Offset Strategy has been prepared to offset the residual impacts to biodiversity arising from the Project	the clearance procedure and in the event of koala finds/incidents. This will assist in the event a koala incident occurs on site. Offset any impacts of the project on MNES.
Pests and pathogens	Spread of noxious weeds due to soil disturbance and equipment movement. Spread of pathogens to adjoining native vegetation or fauna.	Scale: Medium Intensity: Medium – Management Plans applied to the whole disturbance area.	1. Noxious weeds, including Fire weed and Pampas Grass recorded within vegetation clearance areas to be removed and management outlined in a BMP. These noxious weeds must be removed and appropriately disposed of in an appropriate waste facility as required by NSW DPI through the Port Stephens Council under the NW Act. 2. BMP to outline pathogen management control associated with vehicle movements and vegetation clearance.	Reduction in noxious weeds on site. Preservation of habitat for MNES. Reduction in pathogen introduction potential to the site and spread over the site if weeds are introduced.
In stream / aquatic habitat	Loss of, or alterations to, aquatic / in-stream habitat within and in the vicinity of the study area via hydrological change, deterioration in water quality, sedimentation and creation of threatened barriers to fish and other aquatic biota. Changes to aquatic fauna community structures due to alterations degradation/loss of riparian and in stream habitat.	Scale: Low Intensity: Minimal	Within the BMP, develop water management actions to prevent or mitigate the discharge of contaminated water arising from increased quarrying operations and manage potential water quality associated with new infrastructure. Where possible, implement a minimum 30 metre buffer to Deadman's Creek to the east of the study area. Minimise the removal of native vegetation adjacent to waterbodies and watercourses.	Prevent and/or mitigate the discharge of contaminated water into Deadman's Creek or offsite water bodies, arising from increased quarrying operations and manage potential water quality impacts associated with new infrastructure. Minimise any potential impact on Deadman's Creek Minimise habitat removal especially close to water bodies which MNES may utilise.
Water quality downstream	Downstream impacts to the Hunter River.	Scale: Low	The BMP/WMP will include water quality management strategies in accordance with the ANZECC and ARMCANZ Guidelines	1. Maintain downstream water quality and minimise impact of any MNES that may utilise

		Intensity: Minimal	(2000). Water quality management strategies to cover management of water storage, dewatering and discharge of water to Deadman's Creek.		the creek downstream. 2. Control water quality and minimise any adverse water quality impact of downstream water sources to MNES.
Adjoining vegetation and fauna.	24-hour operation causing noise, dust, vibration and lighting impact.	Scale: Low Intensity: Minimal	1. Lighting associated with night works to be directed away from adjoining vegetation at all times. 2. Heavy vehicle/machinery use to be limited to standard hours of operation as per Project Approval conditions.	1.	Reduce disturbance on native fauna especially nocturnal animals. 2. Maximise operational control and thereby minimise any operational impacts (i.e. noise/internal traffic) on MNES.

5.5.4.3 *Scale/Intensity of Impacts*

Table 5.5:9: Risk assessment for EPBC Act mitigation measures

Intensity	Scale	Action
Critical	Very large clearance area required: +75 ha	Action will result in irreversible environmental harm and the action cannot proceed.
High	Large amount of clearance required: 50 – 75 ha	Action will probably generate environmental harm. Hierarchal risk system must be assessed and the proposed action altered before proceeding. Risk controls must be applied.
Medium	Moderate clearance: 20 – 50 ha	A detrimental environmental outcome is possible. Effective mitigation measures should minimise impact to a manageable level.
Low	Small clearance: 5 – 20 ha	Detrimental environmental impacts are improbable. Mitigation measure may not be required.
Very Low	Minimal clearance: 0 – 5ha	No detrimental impacts. Mitigation measures not required.

5.5.4.4 *Cost Output for Mitigation Measures*

The cost associated with each mitigation measure will be assessed at the time of implementation. These include (and are not limited to);

1. Biodiversity Management Plan
2. Pre-Clearance native animal survey
3. Delineation/exclusion fencing
4. Water management controls
5. Ongoing weed control and disposal
6. Educational pamphlet and employee education
7. Erosion and Sediment Controls
8. Biodiversity Offsets
9. Feral Animal Control

Costs to carry out the proposed mitigation measures are dependent on numerous external factors and will be assessed prior to implementation. This analysis will be undertaken in consultation with the DoE.

A Biodiversity Management Plan is proposed for the site and will detail management measures to mitigate potential impact on MNES based on advice from the DoE, DP&E and NSW OEH during the assessment of the EIS. These measures are detailed in **Table 5.5:8**.

Upon project approval and following discussions with relevant departments of mitigation measures proposed, Hanson will calculate the costs associated with the implementation of proposed mitigation measures.

Whilst mitigation measures outlined in **Table 5.5:8** will enable effective management of MNES, the project will still result in unavoidable removal of potential habitat for the koala. Consequently, a biodiversity offset strategy is required, to reserve land for conservation purposes, equivalent to that proposed to be developed. The offset strategy is part of this EIS and will be finalised following approval.

5.5.4.5 *Agency responsible for endorsing or approving each mitigation measure or monitoring program*

The Project is assessed under a bilateral agreement between the NSW Department of Planning and Environment and the Commonwealth Department of Environment. Under the bilateral agreement both agencies must be satisfied with the mitigation measures proposed as part of the ongoing management for NMES and other nationally significant ecological matters.

As part of the Project review, other agencies will be involved in the assessment of ecological matters. In particular the NSW Office of Environment and Heritage is expected to provide a

response to the Department of Planning and Environment, during this EIS's assessment. Additional agencies which may review the EIS during the Project's public exhibition period include Department of Primary Industries (DPI), Port Stephens Council and the NSW Office of Water.

While these agencies may provide a submission during the public exhibition period, it is ultimately a bilateral decision between the NSW Department of Planning and Environment and the Commonwealth Department of Environment that will enforce proposed mitigation measures following approval.

5.5.4.6 *Project Alternatives*

Under EPBC requirements the project is required to review alternatives of the project in respect to its potential impact on MNES. **Table 5.5:10** provides a summary of short, medium and long term impact on MNES for each respective project alternative.

Table 5.5:10: Review of project alternatives on MNES

Alternative (see section 2.8 for Alternatives details)	Impacts on triggered MNES (see above)
Alternative material	Short term impacts to MNES would be minimal as Hanson exhausts the currently approved quarry limits. Hanson would be reliant on purchasing materials from other quarries to service customers in the region. Into the medium term transportation costs of moving materials increased distances from other sources would significantly increase costs and potentially make it unviable for Hanson to compete in regional markets. In order for Hanson to meet customer demand over the long term, it would in all likelihood be required to source hard rock from an alternative, greenfield location. This would likely generate impacts on MNES triggered and potentially MNES not addressed by this EIS. Short term: Very low as Hanson sources material from alternative quarries. Medium term: High – an alternative location would need to be identified in the region to allow Hanson to meet market demand which would likely contain similar ecological values to the current proposal area. If this new site is greenfield, a greater disturbance area would be required in comparison to the proposed project which utilises existing disturbance areas to minimise additional ecological impacts. This would potentially have a high impact on MNES. Long term: Same as medium impact.
Alternative Site	A greenfield site would require a larger footprint to accommodate all necessary infrastructure. Assuming an alternative site could be located with the same ignimbrite resource in the region, it is likely that large areas of natural vegetation will require clearance, which could result in greater ecological impacts on MNES, than the Project. Short, medium and long term impacts would be high as the company would immediately search for an alternative site or sites to source material.
Alternative quarry footprint	Land north of the quarry is zoned as "Environmental Management", which prevents northward expansion. Additionally Deadman's Creek runs NW – SW to the north of the quarry. Hanson has designed the quarry pit to minimise impact on the creek and any MNES which utilise the environmental resources it provides. The PEA initially identified an area of 47.2 hectares based on a drilling campaign undertaken in

	2012. This was reassessed prior to the drilling campaign of 2014; and a 121 hectare footprint was identified as the potential site. A final quarry footprint of 97.7 hectares is proposed for consent which minimises clearance of suitable habitat for all MNES. Of this 97.7 ha project area, 45.8 ha is suitable habitat as the remainder has already been disturbed as part of the current consent. Short term: medium to high impacts if the quarry pushed into undisturbed areas (i.e. Deadman's Creek). Medium term: medium to high impacts if the quarry is further pushed into undisturbed areas (i.e. Deadman's Creek). Long term: medium to high impacts if the quarry is further pushed into undisturbed areas (i.e. Deadman's Creek).
Alternative offset sites	A comprehensive Biodiversity Offset Strategy (BOS) has been prepared and will be finalised post submission to compensate for the removal of EECs and impact on threatened species. A comprehensive review of the ecological impact of the Project is outlined in **Appendix 7** – *Biodiversity Assessment Report*. The BOS addressed proposed offset sites. No conclusions can be drawn regarding impacts of alternative offset sites on MNES until the BOS has been prepared post approval.
Alternative to 24 hours 7 days a week sales and production	The site's existing consent currently permits 24/7 operations. Restricting operations to particular time frames will alter the interaction of the quarry with MNES in the following ways; - Vehicle interaction specifically striking: Alteration in the interaction reduces the hours in which NMES have interaction which vehicles. However appropriate mitigation measures including the implementation of a traffic management plan and staff inductions (Error! Reference source not found.) will ensure vehicle use is controlled, thereby reducing the potential MNES vehicle striking/road injury. There have been no recorded vehicle strikes of MNES at BHQ. - Light spill during night time operations: lights associated with the proposed project have the potential to impact adjoining vegetation and fauna. To mitigate this potential impact, lighting associated with night works will be directed away from adjoining vegetation (to be retained). - Noise, dust and vibration: noise dust and vibration will be mitigated through the various management procedures to minimise impact on adjoining vegetation and fauna. Specifically dust management controls and noise minimising controls will be used particularly during night time operations. Short, medium and long term impacts are unlikely to significantly change from the current, especially with the implementation mitigation measures (outlined in **Table 5.5:11**). In particular attention will be given to the objectives outlined the Port Stephens Comprehensive Koala Plan of Management (**See Section 5.5.5.1**).
Alternative of continuing with existing production limit	Maintaining the existing production limit would still require the same disturbance area (proposed in this Project) as the resource is nearing the extractable limit in the currently approved pit. Therefore impacts on MNES would only be associated with operations and include; light, vehicle movements, noise, vibration and dust impacts on adjoining vegetation and fauna. Short term: Same as current. Medium term: Low impact as the quarry would exhaust available resource approved for extraction and would be forced to expand the currently approved footprint or search for alternative resources in

	the region. Long term: Medium to high as Hanson would be forced to expand the current approved footprint or search for alternative resources in the region (assuming similar habitat exists at this location) to satisfy market demand.
Alternative of not proceeding with the development	If the development does not proceed, there will be no additional impact on MNES. There will however be significant socio-economic detrimental ramifications. Full time, casual and part time workers at the quarry would lose their employment. Carry on construction employment in the local area and region would be reduced. Additionally the Company would be required to investigate other land suitable for quarrying in the region to fulfil market demand. Short term: No impact Medium term: Medium to high impact, as Hanson would need to commission another quarry in the region to satisfy market demand. Long term: High impact, assuming another location in the region with the same or an equivalent resource is able to be secured.

5.5.4.7 *Continuing management, mitigation and monitoring*

The Project is expected to be the subject of an independent environmental audit approximately 18 months after Project approval is granted, and every three years thereafter under a State Significant Project Approval. An annual report will be prepared to document the status of management, mitigation and monitoring strategies. The report will be published on Hanson's website and presented to the Department of Planning and Environment. This is normally conditioned in any State Significant Development quarry Project Approval.

In addition to the independent environmental audit and annual report, the Project's management will aim to maintain or improve ongoing site biodiversity. A site biodiversity management plan is proposed and is expected to be conditioned by the Project Approval. Further specific details of management, mitigation and monitoring measures are presented in **Table 5.5:11.**

Table 5.5:11: Continuing management, mitigation and monitoring measures for review

Continuing Management, mitigation and monitoring initiative.	Description of the outcomes that will be achieved	Provisions for independent auditing
Biodiversity Management Plan (BMP)	Outline the clearance procedure and ensure that threatened species are not present prior to vegetation removal. Weed management. Minimise or avoid pathogen introduction potential and effectively address pathogen spread over the site should pathogens be introduced.	The Project will be the subject of an independent environmental audit approximately 18 months after Project approval is granted, and every three years thereafter. This audit will; 1. Ensure there has been a BMP prepared. 2. Review its application on site when the plan is implemented. 3. Confirm weed removal or weed management measures have been implemented.

Pre clearance surveys will be conducted prior to any vegetation clearance in areas of identified threatened species habitat	Ensure that threatened species are not present prior to vegetation removal. Should threatened species be identified, the environmental representative undertaking pre-clearance surveys will provide advice on further action and the animals removed before clearing begins.	Review the clearance report and/or photographs of any clearance effort to ensure it meets clearance guidelines in the BMP.
Exclusion fencing	Ensure minimal disturbance to areas outside of the approved disturbance area and reduce the risk of animals entering the area.	Ensure that: 1. Vegetated boundaries of the project area are clearly fenced off and signposted to ensure no access by personnel or equipment. 2. That fencing is routinely checked. 3. That exclusion fence-footings are free of stockpiled soils and vegetation to allow routine checks and to ensure that the boundary fence and adjoining vegetation e.g. root zones of trees to be retained do not get smothered with soil.
Biodiversity Offset Strategy (BOS)	Offset for any impacts of the project.	Report on the preparation and implementation of the BOS.
Erosion and sediment control plan	Ensure that erosion and sediment is contained on site. Reduce the spread of weeds and dispersion of sediments.	Ensure that: 1. Sediment fencing has been placed inside the exclusion fencing as required and routinely checked for sediment breeches and to ensure structural integrity is maintained through vegetation clearance activities. 2. Vehicles and equipment checked to ensure that tyres and tracks are free of sediment entering/exiting site.
Ecologist or fauna rescuer to be present during vegetation clearing	Minimise impacts on MNES displaced or injured during clearing.	Confirm with site personnel that this has occurred.
Prepare an educational brochure for workers to review. Increase awareness through suitable training.	Educate workers of onsite MNES and minimise detrimental impact due to lack of awareness and lack of training and systems not being in place to minimise operational impacts on wildlife.	Check this is displayed in the site office or documented on sit and that training includes increasing awareness on wildlife management and response.
Water management actions (within the BMP) and water quality management strategies in accordance with	Prevent or mitigate the discharge of contaminated water arising from increased quarrying operations and manage potential	Check; 1. Water management actions have been included in the BMP 2. Check water quality measures

the ANZECC and ARMCANZ Guidelines (2000) (recommended).	water quality impacts associated with new infrastructure.	included in the BMP (recommended).

5.5.5 Assessment under the Port Stephens Council Assessment Framework

5.5.5.1 *Port Stephens Comprehensive Koala Plan of Management*

The Port Stephens Comprehensive Koala Plan of Management (CKPoM) is consistent with the National Koala Strategy (ANZECC 1998), in that it seeks to conserve koalas in their existing habitat by identifying and protecting koala habitat and incorporating koala conservation into local government planning processes (Lunney et al. 1998). The Port Stephens Council CKPoM has been prepared in accordance with State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44).

Appendix 4 of the CKPoM defines the Performance Criteria for development applications (excluding development applications proposing agricultural activities). All development applications in the Port Stephens LGA will be required to comply with the provisions of Appendix (4) of the CKPoM, to comply with State Environmental Planning Policy No. 44 – Koala Habitat Protection. The Project will be assessed as a State Significant Development in which the Department of Planning and Environment is the regulatory body, and therefore SEPP 44 does not apply to this assessment. However SEPP 44's koala habitat definitions have been used to determine whether Potential and/or Core Koala habitat areas (as defined under SEPP 44) occur within the study area. These are detailed in the BAR **(Appendix 7)**.

All Development Applications (excluding development applications proposing agricultural activities) in the Port Stephens LGA must demonstrate that they are consistent with the following criteria.

The general aims and objectives of these performance criteria are as follows:

i) To ensure that the koala population in the Port Stephens LGA is sustainable over the long-term.
ii) To protect koala habitat areas from any development which would compromise habitat quality or integrity.
iii) To ensure that any development within or adjacent to koala habitat areas occurs in an environmentally sensitive manner.
iv) To ensure that acceptable levels of investigation are undertaken, considered and accepted prior to any development in or adjacent to koala habitat areas.
v) To encourage koala habitat rehabilitation and restoration.
vi) Maintain interconnection between areas of Preferred and Supplementary Koala Habitat and minimise threats to safe koala movements between such areas.
vii) To ensure that development does not further fragment habitat areas either through the removal of habitat or habitat links or through the imposition of significant threats to koalas.
viii) To provide guidelines and standards to minimise impacts on koalas during and after development, including any monitoring requirements.

ix) To provide readily understandable advice to proponents preparing development applications and for Council officers involved in the assessment of those applications.

Desktop mapping using the Port Stephens Koala Habitat Planning Map maps the study area as;

- Mainly Cleared
- Marginal
- Preferred
- 50m Buffer over Marginal
- Link over Cleared
- Link over Marginal
- 50m Buffer over Other

See **Figure 6.10** below**.**

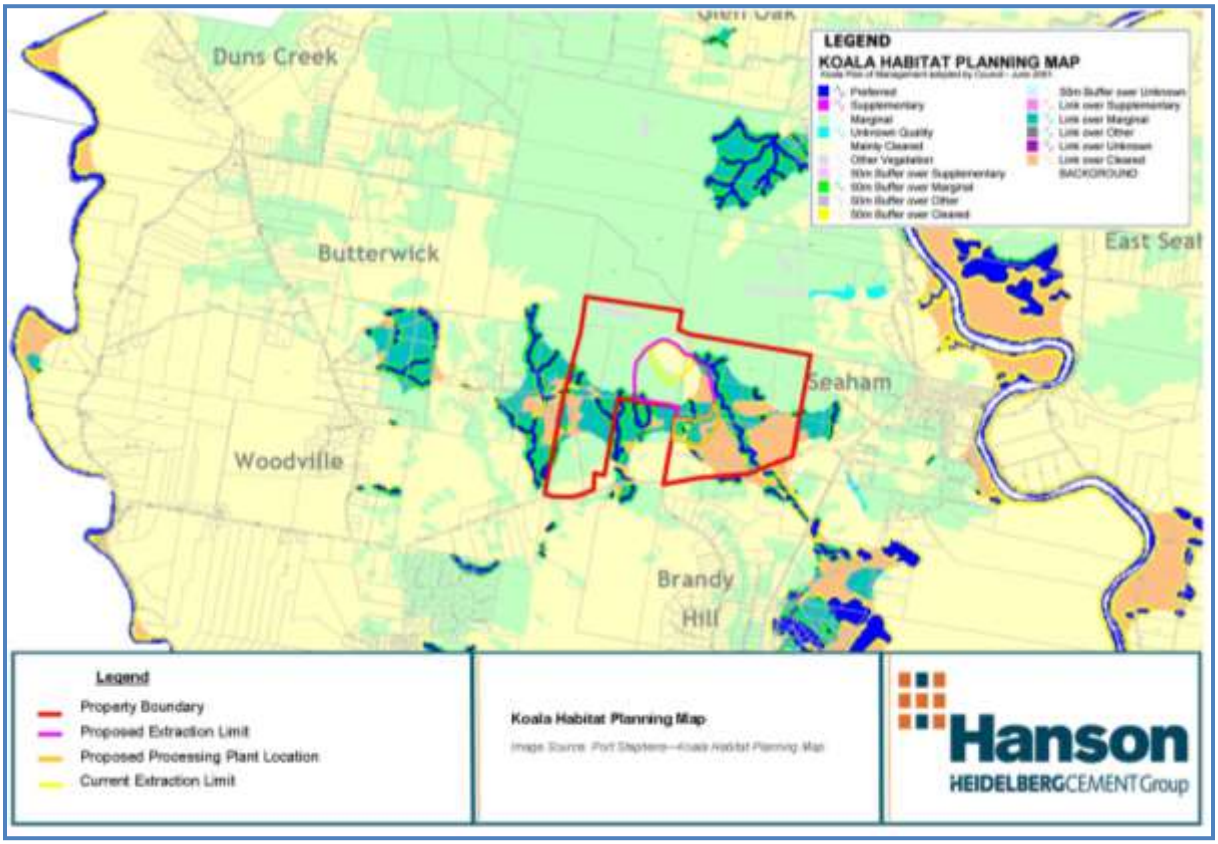

Figure 6.10: Koala Habitat Planning Map - Port Stephens Council

During preparation of the EIS, Hanson commissioned a *Biodiversity Assessment Report* (BAR), including a detailed Flora and Fauna Assessment in accordance with BioBanking Assessment Methodology. Additionally, Hanson commissioned a specialised koala field assessment and report to accompany a referral submitted to the Commonwealth Department of Environment. Comprehensive vegetation mapping was conducted during this process (See **Appendix 7**). These have been used as the basis for koala habitat appraisal opposed to the more generalised Port Stephens Koala Habitat mapping (See **Figure 6.12**).

The specific koala assessment report concludes that the Project area supports 45.8 hectares of koala habitat, all of which would be removed for the Project. The total area of the site owned by Hanson is 561 hectares, much of which supports koala habitat. It is therefore unlikely that removal of koala habitat for the Project will result in a significant reduction in the area of occupancy of Koalas in the locality, given the area of suitable habitat that will remain in adjacent land.

Nonetheless Hanson has addressed performance criteria for development in the Port Stephens CKPoM in accordance with Port Stephens Koala Habitat Planning Map**.** The Port Stephens CKPoM identifies performance criteria to avoid, minimise and offset development impacts of the Project on koalas:

> *Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers;*

Part of the existing stockpile area has been incorrectly mapped as “Preferred Koala Habitat” and “Habitat Buffers”. However, a larger and more extensive section of “Preferred Koala Habitat” and “Habitat Buffers” has been mapped running along Deadman’s Creek, outside of the disturbance area.

> *Maximise retention and minimise degradation of native vegetation within Supplementary Koala Habitat and Habitat Linking Areas;*

Not applicable to the project.

> *Minimise the removal of any individuals of preferred koala food trees, where ever they occur on a development site. In the Port Stephens LGA these tree species are Swamp Mahogany (Eucalyptus robusta), Parramatta Red Gum (Eucalyptus parramattensis), and Forest Red Gum (Eucalyptus tereticornis), and hybrids of any of these species. An additional list of tree species that may be important to koalas based on anecdotal evidence is included in Appendix 8.*

Hanson has refined the development footprint and prepared a Biodiversity Offset Strategy to compensate for the loss in koala feed trees. Complete habitat analysis is included in **Appendix 7** and full details of Hanson’s commitment to reduce impacts on koala habitat is detailed in **Section 5.5.4.2** of this EIS.

Make provision, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including Habitat Buffers and Habitat Linking Areas over Mainly Cleared Land. In instances where Council approves the removal of koala habitat (in accordance with dot points 1-4 of the above waive clause), and where circumstances permit, this is to include measures which result in a "net gain" of koala habitat on the site and/or adjacent land;

Hanson has committed to the preparation and implementation of a biodiversity offset strategy. The BOS has been developed based on credit requirements to compensate for the removal of koala habitat (amongst other requirements). Additional rehabilitation requirements are presented in **Section 5.16** and include the planting of species endemic to the area, to ensure consistency with the surrounding natural amenity and supplement the presence of koala feed trees.

The project's assessment is the subject of a bilateral agreement with the Commonwealth Department of Environment and also the NSW Department of Planning and Environment, which means that Port Stephens Council does not assess the project. The project will be bound by the offset requirements of the finalised Biodiversity Assessment Methodology and will not be determined by Port Stephens Council.

Make provision for long term management and protection of koala habitat including both
Hanson is committed to preparation and implementation of a BOS. This biodiversity offset strategy will make provision for long term management and protection of koala habitat including both existing and restored habitat. Additionally Hanson proposes to prepare a Biodiversity Management Plan (BMP) which will provide for the management of koalas.

Not compromise the potential for safe movement of koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to koala movement, such as would be imposed by certain types of fencing. The preferred option for minimising restrictions to safe koala movement is that there be no fencing (of a sort that would preclude koalas) associated with dog free developments within or adjacent to Preferred or Supplementary Koala Habitat, Habitat Buffers or Habitat Linking Areas. Suitable fencing for such areas could include:

Hanson will assess appropriate mitigation measures for koala movement on site as part of the BOS and BMP.

Be restricted to identified envelopes which contain all buildings and infrastructure and fire fuel reduction zone. Generally there will be no clearing on the site outside these envelopes. In the case of applications for subdivision, such envelopes should be registered as a restriction on the title, pursuant to the Conveyancing Act 1919; and

The project site plan is included in this EIS (see **Figure 1.3**).

This Project does not propose subdivision of land.

Include measures to effectively minimise the threat posed to koalas by dogs, motor vehicles and swimming pools by adopting the following minimum standards.

Hanson has prepared a Traffic Management Plan to manage vehicle speed and hazards, including environmental hazards. The Traffic Management Plan will be updated post approval and will include driver awareness of threatened fauna on-site – including the koala. The BMP will address koala management actions to avoid and minimise potential impacts of the Project on koalas.

Hanson also conducts targeted wild dog baiting to manage the threat posed to koalas by dogs, in conjunction with the NPWS.

There are no swimming pools on site.

Information to Accompany Applications

This is only applicable for development applications to Port Stephens Council. For completeness, Hanson has opted to address these points.

1. *An assessment of koala habitat, by a suitably qualified person, in accordance with the attached Guidelines for Koala Habitat Assessment, which appear in Appendix 6.*

Biosis conducted a comprehensive flora and fauna assessment as well as a Koala Assessment Report which detailed koala habitat located within the project area (**Appendix 7**).

2. *Clear details concerning which vegetation is to be cleared or disturbed and that which is to be retained.*

Biosis conducted a comprehensive flora and fauna assessment as well as a Koala Assessment Report which details koala habitat located within the project area (**Appendix 7**). These reports show that this area will be cleared/disturbed by the Project.

3. *Details of any proposed building envelopes and fire fuel reduction zones and the means by which they are to be enforced.*

Figure 2.2 illustrates the proposed expansion footprint and Figure 2.14 illustrates the proposed layout of the infrastructure area (including building and plant location).

The Hazard Impact Assessment (**Appendix 16)** addresses fire hazards and enforcement mechanisms applicable to the development.

4. *Proposed measures to restore or rehabilitate koala habitat, including measures which will result in the net gain of koala habitat.*

Hanson will complete a BOS to ensure the removal of koala habitat is effectively offset. Additionally Hanson has prepared a Rehabilitation Strategy for the project (**Appendix 18)** which includes the planting and preservation of koala habitat and koala feed trees.

5. *Proposed measures to allow the safe movement of koalas across the site including road designs and speed mediation measures, fence construction details where fencing is proposed, and swimming pool specifications.*

Hanson has a Traffic Management Plan to manage vehicle speed and hazards. The Traffic Management Plan will be updated post approval and will include driver awareness of threatened fauna on site – including the koala.

Hanson will assess appropriate mitigation measures for koala movement within the site as part of the BMP.

There are no swimming pools on site.

6. *Proposed measures to mitigate the impacts on koalas by dogs.*

Hanson also engages targeted wild dog baiting to manage the threat posed to koalas by dogs in conjunction with Hunter Local Land Services, a division within NSW Trade and Investment.

7. *Details of any proposed program to monitor koalas and koala habitat, during and following development activity on a site. Monitoring programs would not be required for single lot developments. Rather, they would be expected for subdivisions.*

Mitigation measures are proposed in the BAR and also within the supplementary Koala Assessment Report. A Biodiversity Management Plan has been prepared and will be finalised as part of the project approval. A Biodiversity Management Plan will be prepared for the project and will outline management and monitoring requirements for the project.

8. *Proposed measures to mitigate the impacts by dogs on koalas which occupy adjacent habitat. This must include measures (such as education of dog owners, appropriate signs, or restrictions on dog ownership) that reduce the likelihood of domestic dogs straying into koala habitat.*

The site is fenced where the Project area is adjacent to neighbouring properties. This limits dog access to the Project area from adjoining properties.

Hanson also engages targeted wild dog baiting to manage the threat posed to koalas by wild dogs in conjunction with Hunter Local Land Services, a division within NSW Trade and Investment.

9. *Proposed measures to mitigate the impact on koalas of motor vehicles travelling to the site. This must include appropriate traffic control measures on roads which run through or adjacent to nearby koala habitat and which are subject to increased traffic volumes due to the development on the site.*

Hanson has a Traffic Management Plan to manage vehicle speed and hazards. The Traffic Management Plan will be updated as part of the project approval and will include driver awareness of threatened fauna on site – including the koala. The TMP also addresses driving behaviour off-site through the LGA which includes "adjacent to preferred or supplementary koala habitat".

5.5.5.2 *Summary*

Hanson has extensively mapped koala habitat on site to gain an accurate understating of the koalas' use of the site. This research concludes that the Project area supports 45.8 hectares of Koala habitat, all of which would be removed for the Project. The total area of the site owned by Hanson is 561 hectares, much of which supports Koala. To address the impact of the Project on koalas, the project has prepared a biodiversity offset strategy which includes the provision the purchase of offsets on the market.

5.5.6 Assessment of Avoid, Minimise, and Offset

The Project has aimed to avoid and minimise direct and indirect impacts on biodiversity values. Further assessment should consider the project justification outlined – **Section 2.8.**

5.5.7 Scale of the proposed project

The Commonwealth Department of Environment requires an assessment of the Project scale under the EPBC Act with respect to triggered MNES. The below (**Section 5.5.7**) provides details of this assessment.

Footprint

The current quarry footprint is nearing the approved extraction limits (both depth and footprint size). An expansion in depth and/or size of the quarry footprint will be required to continue the quarrying of ignimbrite to supply aggregate for application in the construction industry. There are three options to do this utilising the existing infrastructure and area at Brandy Hill;

1. Increasing the extraction depth
2. Increasing the quarry footprint
3. Increasing both the quarry footprint and extraction depth.

<u>Increasing the extraction depth</u>

The practice of quarrying applies benches to the quarry pit which function to provide a safe environment for personnel and equipment accessing the quarry pit. Benches at Brandy Hill are assessed based on bench faces, bench crests, bench width and long-term access availability. These characteristics enable sufficient arrest and mitigate danger or rock falls by containing any

spillage from the benches above. Put simply, ensuring benches are engineered in a safe manner ensures stability and reliability of in pit geology. Additionally, bench engineering must enable access for operators to conduct slope monitoring and clean-up of rock fall and spillage. Brandy Hill Quarry cannot deepen the pit without compromising safe engineering of benches. The pit footprint would need to likewise expand in association with pit deepening to maintain safe bench design. Deepening the pit whilst maintaining the current approved extraction boundaries is not possible as this would make working the pit unsafe.

Increasing the quarry foot print

The quarry is currently approved for extraction to 30m AHD. The proposed extraction boundary requires the movement of approximately 2 million cubic meters of overburden before ignimbrite resources can be accessed for extraction. The movement of overburden is expensive, time consuming and involves fuel consumption and emissions. Maintaining the current extraction limit (footprint) would reduce the overall amount of ignimbrite reserve available for extraction. Implications of not increasing the footprint would include a potential reduction in the quarry life and acceleration of another site (potentially Greenfield) being developed in another location in the region. A Greenfield location would likely require the movement of a similar amount of overburden, thereby multiplying the impacts of transporting overburden (i.e. cost, time, emissions). By deepening the pit to the proposed -78 m AHD, Hanson will be extracting the majority of the available hard rock resource, whilst minimising the detrimental costs associated with moving reasonable quantities of overburden.

Increasing both the quarry footprint and extraction depth

The size and dimensions of the quarry footprint have been determined based on the available ignimbrite resource. Hanson conducted extensive diamond core drilling to accurately determine the location and size of the extractable reserves, thereby constraining disturbance to the smallest possible area. A 30 year project life is requested, to progressively extract resources as required to meet market demands.

Increasing both the quarry footprint and extraction depth ensure safe work practices can be implemented for the project (see "*increasing the extraction depth*" in **Section 5.5.7**).

Development Life

The measured and known resource equates to approximately 78 million tonnes of ignimbrite, sandstone and conglomerate. Should the project extract the maximum allowable reserve of 1.5 million tonnes per annum, the reserve would last approximately 56 years. Therefore the reserves exceed the maximum 30 year project life that is able to be approved.

Maximum Production Capacity

Hanson currently operates BHQ and produces up to 700,000 tonnes of products per year, from a source material that is primarily ignimbrite to a depth of RL 30 m (AHD). This ignimbrite resource is extracted through the process of drill and blast. From the pit, the material is transported from the blasted face to either the processing plant or sold directly as armour rock. The material is then processed into different aggregate sizes for varying uses in the construction industry commonly being road base or application in concrete production. Hanson proposes to

increase the annual production limit to 1.5 M tpa for such applications in the construction industry.

The recent closure of Wallgrove and Penrith quarries means that there is increasing pressure on Hanson's Kulnura and Bass Point (Shellharbour) quarries to meet the demands of the Sydney market. Brandy Hill Quarry will therefore be increasingly utilised in both the Newcastle and Central Coast markets. Whilst the quarry is unlikely to reach the requested 1.5 million tonne limit immediately, it will likely be required to accommodate both fluctuations in the market and increases in market demand. Council's planning strategies predict population increases in the Port Stephens Local Government Area, and construction resources from Hanson's BHQ will assist in meeting regional growth for new infrastructure.

5.5.7.1 *Proposed development footprint*

The configuration of the extraction area and the location of the material processing/ancillary infrastructure areas have been selected to firstly avoid and secondly minimise impacts on biodiversity values. In essence, configuration of the expansion area is designed around the geology and availability of hard rock resource. Hanson has considered various project designs to minimise ecological impacts and refine the resource location. Extensive drill campaigns were conducted in 2012 and 2014 to these ends. These enabled Hanson to refine the disturbance area thereby avoiding additional biodiversity impacts to the south, east and west of the proposed extension area.

In terms of avoidance, Hanson has chosen to restrict the northward disturbance to the current pit area, thereby avoiding disturbance of Deadman's Creek and its catchment.

The proposed extraction footprint size is a predicted disturbance area based on a project life of 30 years, resource availability, ease of extraction, proposed maximum annual extraction rate, plant upgrade and relocation, and development of a concrete batching plant. The proposed size is required to meet these requirements over a project life of 30 years, thereby reducing the requirement to develop in a Greenfield site and associated increased biodiversity impacts.

5.5.7.2 *Location of proposed processing plant and opportunities to minimise footprint*

The proposed infrastructure area indicated by the orange line (see Figure 2.2) equates to approximately 18ha. The infrastructure area is proposed to include;

- Concrete batching plant
- Pug mil
- Precoat plant
- Office
- Weighbridge
- Processing plant
- Stockpiles
- Concrete recycling facility

- Other auxiliary structures

Note that the plant cannot be located in the current disturbed pit as the proposal includes the deepening and widening of the existing pit over a project life of 30 years. Therefore a new location is required, examined in detail below.

The designs shown in Figure 2.14**,** illustrates the proposed layout of the infrastructure area. The project configuration cannot be reduced without compromising components of the project or reducing the scale of the development (which has been justified above). The majority of the proposed infrastructure area has been mapped as PCT 1600 – Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box shrub grass open forest of the lower Hunter.

Hanson has considered locating the infrastructure area in different locations however proximity of the infrastructure area to the pit is vital to keeping construction costs low by minimising haulage distances, reducing staffing costs, maintaining safe operating procedures, and optimising overall efficiency. Additionally the proposed infrastructure location has level terrain and is close to the current quarry entry road. Another aim was to maintain infrastructure location within existing property boundaries, which has been achieved. The following configuration options were considered:

Hanson opted not to move the infrastructure or extraction area to the north/east over Deadman's Creek to reduce ecological impacts. Land use zoning and availability of the resource in this area also restricts expansion northward.

Hanson also considered locating the infrastructure area to the west of the proposed extraction boundary. However this configuration would involve construction of an additional haul road linking the weighbridge to Brandy Hill Drive. The proposed location doesn't require construction of an additional (or extension to the existing) haul road. Reducing the length of the haul road thereby minimising disturbance associated with road construction while reducing the risk of operational vehicle strikes (on fauna) by reducing the distance travelled by trucks on site. The proposed infrastructure location is also relatively level and would not require extensive land levelling works to prepare the site (as the area to the west of the proposed pit would).

Land to the southwest is not Hanson-owned and has not been considered for project design.

It is important to note that the infrastructure area will not be extensively disturbed until stage four (in approximately 20 years' time) which will involve relocation of plant. Until this time, activities in the proposed infrastructure area will include (but and not be limited to) the construction of a visual bund, movement of stockpiles as required and planning and construction of a concrete batching plant and pug mil on site.

Due to the reasons outlined above, Hanson concluded that current and proposed configurations both effectively manage environmental impacts and enable overall sound operational practices for the proposed 30 year project life.

5.5.7.3 *Specific opportunities to avoid and minimise impacts*

1. Biodiversity Management Plan: to be prepared to outline the procedure for managing biodiversity on-site post approval.
2. Vegetation exclusion: Vegetated boundaries of the project area are to be clearly defined to ensure no access by personnel or equipment.
3. Pre-clearance surveys: Will be conducted prior to any vegetation clearance in areas of identified threatened species habitat to ensure that threatened species are not present prior to vegetation removal.
4. Biodiversity Offset Strategy (BOS): has been developed based on the findings of the BAR and will be finalised in consultation with OEH, DP&E and DoE.
5. Erosion and Sediment Control Plan: will ensure that erosion and sediment is contained on site.
6. Weed Management Control/Plan: Noxious weeds, including Fire Weed and Pampas Grass recorded within vegetation clearance areas will be removed and disposed of.
7. BMP to outline pathogen management controls associated with vehicle movements and vegetation clearance.
8. Water management actions to prevent or mitigate the discharge of contaminated water arising from increased quarrying operations and manage potential water quality impacts associated with new infrastructure.
9. Deadman's Creek: Where possible, implement a minimum 30 metre buffer to Deadman's Creek to the north east of the study area. Minimise the removal of native vegetation adjacent to waterbodies and watercourses.
10. Lighting associated with night works to be directed away from adjoining vegetation at all times.
11. Water quality testing upon discharge into the receiving water body (i.e. Deadman's Creek).

5.5.8 Biodiversity Offset Strategy

The project has applied *NSW OEH interim policy on assessing and offsetting biodiversity impacts, State significant development (SSD) and State significant infrastructure (SS/) projects* (OEH 2011). This Policy aims to achieve long-term conservation outcomes whilst enabling development which will have unavoidable impacts on biodiversity. Offset credits are based on the ecological characteristics of habitat being cleared and threatened species located in the disturbance site.

Hanson has developed a biodiversity offset strategy based on the biodiversity credit report prepared by Biosis in accordance with the SEARs for the Project. This section provides a summary of biodiversity credits required to impact on the biodiversity values within the study area, following consideration of measures to avoid, minimise and mitigate impacts.

The Project has, where feasible, been designed to firstly avoid ecological impacts and secondly minimise project impacts on local biota. The project has developed comprehensive impact mitigation strategies to reduce the impact of the Project on ecological values. These impact

mitigation measures have been outlined in the body of this EIS and will be further developed within a *Biodiversity Management Plan,* to be as part of the project approval. Impact avoidance, minimisation and mitigation strategies are projected to result in a reduced impact of the project on biodiversity within the locality.

The Project's offset strategy essentially involves the purchase of credits in the market, in accordance with the above-cited OEH policy.

Areas not requiring offset

The following areas do not require an offset in accordance with Section 9.4 of BBAM (OEH 2014a);

- Cleared areas that have been subject to varying levels of disturbance.
- Water bodies are considered areas not requiring assessment.

These areas are shown in **Figure 5.11** and do not require further assessment.

Project Offset Requirements

In accordance with the Secretary's Environmental Assessment Requirements issued on 11 November 2014 the Project has been assessed according the abovementioned OEH policy.

The project requires an assessment of both ecosystem credits and species credits based on the findings of Biosis' BAR. A total of 2799 ecosystem credits would be required to offset the impacts of the Project, as shown in **Table 5.5:12.** A total of 1191 Koala species credits would be required to offset the impacts of the Project, as shown in **Table 5.5:13.**

Table 5.5:12: Ecosystem credits required to offset impacts of the

PC type code	Plant community type name	Management zone area (ha)	Ecosystem credits required
HU814	Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	17.1	984
HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	25.9	1491
HU591	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	0.67	46
HU806	Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	1.12	64
HU812	Forest Red Gum grassy open forest on floodplains of the lower Hunter	1.67	111
HU798	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	2.16	103
TOTAL			**2799**

Table 5.5:13: Species credits required to offset impacts of the Project

Common name	Scientific name	Extent of impact (individuals)	Species credits required
Koala	*Phascolarctos cinereus*	45.8	1191
TOTAL			**1191**

Biodiversity Offset Strategy

The Biodiversity Offset Strategy for the project involves the purchase and retirement of the biodiversity credits. Using criteria from the OEH policy, credits are available on the market for all PCTs within the study area. Credit requirements and proposed offset options are shown in **Table 5.5:14**.

Offset requirements adopt of a three-tiered offsetting approach. The offsetting requirements and subsequent status of the credits are identified in **Table 5.5:14** based on the three aforementioned Tiers being;

- Tier 1 Improve or Maintain
- Tier 2: No Net loss
- Tier 3: Mitigated Net Loss

Tier 1: Where possible, credits have been provided to achieve a Tier 1 (improve or maintain) outcome. This was achieved by providing credits, per the offset options outlined in the BioBanking credit report (See Appendix 7 of the BAR – **Appendix 7**). The offset strategy will fulfil the Tier 1 requirements for four of the six PCTs recorded within the study area (**Table 5.5:14**).

Koala credits will be purchased, fulfilling a Tier 1 outcome. This will ensure any offsets for the koala and fulfil the direct offset requirements of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) (See **Table 5.5:14**).

Tier 2: The project area contains two Endangered Ecological Communities namely; Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter (HU812) and Paperbark Swamp Forest of the Coastal Lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (HU591). Due to the presence of two EECs with a site value score of more than 34 within the study area Tier 1 offsets could not be provided for HU591 and HU812.

For these communities Tier 2 (no net loss) offsets were investigated. However, no offsets that meet the offset options outlined in the BioBanking credit report (See Appendix 7 of the BAR – **Appendix 7**) were found to be available (See **Table 5.5:14**). Therefore tier 3 requirements were met for these credits (see below).

Tier 3: Variation criteria A, as outlined in the interim policy (OEH 2011) were applied to achieve a Tier 3 (mitigated net loss) outcome for the two EECs. Credits from the same vegetation formation and the same IBRA region were investigated. Both PCTs are part of the Forested

Wetlands vegetation formation, and the study area is located within the NSW North Coast IBRA region (see **Table 5.5:14)**.

All credit requirements can be fulfilled by purchasing and retiring credits. Upon receiving project approval Hanson proposes to fulfil its credit obligations.

Table 5.5:14 Required biodiversity credits and proposed offset options

Credit requirements				**Offset options**			
Ecosystem credits							
PCT code	PCT name	Red flag?	Credits required	PCT code	PCT name	Credits available	Tier
HU814	Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	No	984	HU802	Grey Ironbark - Broad-leaved Mahogany - Forest Red Gum shrubby open forest on Coastal Lowlands of the Central Coast	160	1
				HU815	Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter	55	1
				HU804	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	769	1
HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	No	1491	HU804	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	46	1
				HU804	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	15	1
				HU815	Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter	295	1
				HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central	1135	1

					and lower Hunter		
HU591	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Yes	46	NR217	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	46	3
HU806	Spotted Gum - Red Ironbark - Grey Gum shrub - grass open forest of the Lower Hunter	No	64	HU804	Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest, (HU804)	64	1
HU812	Forest Red Gum grassy open forest on floodplains of the lower Hunter	Yes	111	NR217	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	45	3
				NR254	Swamp Mahogany swamp forest on coastal lowlands of the NSW North Coast Bioregion and northern Sydney Basin Bioregion	66	3
HU798	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	No	103	HU798	White Mahogany - Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	103	1
Species credits							
Koala		No	1191	Koala		1191	1

EPBC Act Credit Requirements

Koala credits will be purchased, fulfilling a Tier 1 outcome. This will ensure any offsets for the Koala fulfil the direct offset requirements of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) (See **Table 5.5:14**). Credits are not required for any other species as the project will not result in a significant impact on those species.

5.6 Traffic and Transport

5.6.1 Background

The SEARs stipulate that the EIS should include an assessment of:

SEAR Requirements

- accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for the transportation of quarry products, the public roads in the Dungog Shire, Maitland City and Port Stephens LGAs likely to be so used and the times during which those roads would be used;
- an assessment of potential traffic impacts on the safety and efficiency of the road network; and
- a detailed description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the development.

Supplementary Information

Guide to Traffic Generating Development (RTA)

Road Design Guide (RTA)

5.6.2 Existing Environment

5.6.2.1 *Existing Road Network*

The existing quarry operates with its main access off Clarence Town Road, Seaham. The access forms the north leg of the Brandy Hill Drive / Clarence Town Road intersection. Hard rock extracted from the site generally services the local lower Hunter Valley market. The primary haulage route is south via Brandy Hill Drive to Seaham Road to Adelaide Street, Raymond Terrace and then on to the Pacific Highway to Newcastle. A very small number of trips head west towards Maitland or east towards Clarence Town and north to Dungog. The westerly route towards Maitland is restricted due to difficulties crossing the Paterson River at Hinton and Woodville. The main haulage route is reproduced from Intersect's Traffic Impact Assessment as shown below in **Figure 6.12.**

Figure 6.12: Brandy Hill Quarry Heavy Vehicle Route for Proposed Quarry Expansion

5.6.2.2 *Existing Traffic Generation*

Brandy Hill Quarry operates a weighbridge at the main access to the quarry which collects and stores data on all traffic movements to and from the site. The main information to extract from this data for use in the traffic impact assessment is as follows;

- In recent years the peak sales day recorded 170 deliveries during the day on the 26 July2013.
- In 2014 the peak sales day generated only 135 deliveries during the day on the 11 June 2014.
- In recent years the peak sales hours have been 32 deliveries per hour on the 7 August 2013 and 23 deliveries per hour on the 5 June 2014.
- The peak hourly deliveries do not occur on peak delivery days.
- Traffic generation from the site is not consistent over the year.
- The majority of heavy vehicle traffic to and from the site is made up of rigid truck and trailer combinations (truck and dog).
- There are approximately 20 employees on site, travelling by car to work.

Peak daily traffic = Deliveries + employee traffic

= (170 vpd + 20 vpd) X2

= **380 vtpd**

Peak hourly traffic = Deliveries + employee traffic

= 32 x 2 + 20

= 84 vph

5.6.2.3 *Existing Road Capacity*

Load of Service (LoS)

- Clarence Town Road east of quarry: LoS A*
- Clarence Town Road west of quarry: LoS B**
- Brandy Hill Drive south of quarry: LoS A

*LoS A – *This, the top level, is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.*

**LoS B - T*his level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than that of the level of Service A*.

The desirable LoS for rural road before upgrading works to increase the capacity of the roads need to be considered is a LoS C. A LoS D may still be acceptable in certain circumstances.

The existing road network around the Brandy Hill Quarry is currently operating with excellent levels of service, better than a LoS C (see **Appendix 8**).

5.6.2.4 *Existing Intersection Capacity*

Roadway capacity is normally controlled by the intersection capacities within the road network. The TIA considered two main intersections of direct interest based on the current and proposed haulage route being along Brandy Hill Drive. These intersections are:

Clarence Town Road / Brandy Hill Drive

Brandy Hill Drive / Seaham Road

Sidra modelling shows the Seaham Road/Brandy Hill Drive intersection and the Clarence Town Road/Brandy Hill Drive intersection currently operate with excellent levels of service for all movements indicating little or no delay and/or queuing for motorists. Sidra is a software program used to measure intersection and network capacity, level of service and an array of performance measures.

5.6.2.5 *Road Safety*

Road safety considerations include the type of traffic, road geometry and intersection safety. An increase in traffic volumes increases the risk of traffic accidents and consequently impacts on

the standard of road geometry required for the road. Road design characteristics affect safe travelling speed and include lane widths, vertical alignment and horizontal alignment. Intersections represent the major traffic conflict points on a road network and thus are locations of increased accident risk and hence have been investigated as part of this Traffic Impact Assessment (See **Section 5.6.3.3**).

The project will involve the generation of a high proportion of heavy vehicles particularly rigid truck and trailer combinations. Traffic volumes are below 500 vdp with a minimum road width of 7.0 m, which satisfies design requirements for road-widths of the Ausroads *Guide to Road Design (2009).*

5.6.2.6 *Traffic efficiency*

Assessment of existing traffic volumes, road capacity and intersection capacity reveals that the local road network around the site is currently operating at the highest levels of efficiency.

5.6.2.7 *Alternative Transport Modes*

There are no public transport services in the area with convenient walking distance to the site. The closest bus stops for regular routes are located 4km west of the site at the Woodville Shops. School bus services do run past the site along Brandy Hill Drive. At the time of assessment these stops were of poor construction and did not in most cases allow the bus to pull off the road sufficiently to provide a suitable level of road safety at these locations. This is considered to be a problem that the road authority needs to address.

The area is mainly zoned rural residential and there are no constructed footpaths along the local road network (i.e. Brandy Hill Drive & Clarence Town Road). Facilities for pedestrians and cyclists are non-existent. Pedestrians walking along the local road network would be required to use the unformed verges or the road shoulder. Cyclists would be required to use the formed road shoulders or share traffic lanes. Residents of Brandy Hill (and the surrounding locality) have been lobbying Port Stephens Council for a footpath along Brandy Hill Drive for some time.

There are currently no alternatives to the current road haulage route to and from the site.

5.6.3 Methodology

Hanson commissioned Intersect Traffic Pty Ltd (Intersect Traffic) to prepare a *Traffic Impact Assessment* for the Brandy Hill Quarry Expansion Project. The Traffic Impact Assessment includes the following key components;

- Traffic Volumes: **Section 5.6.3.1**
- Road Capacity: **Section 5.6.3.2**
- Intersection Capacity: **Section 5.6.3.3**
- Road Safety: **Section 5.6.3.4**

5.6.3.1 *Traffic Volumes*

Automatic tube traffic classifiers were installed approximately 200m from the Clarence Town Road / Brandy Hill Drive intersection to quantify existing traffic volumes. Data was collected on

each leg of this intersection, as well on the quarry access road for a 2 week period from Monday 8th September 2014 to Monday 22nd September 2014.

It is noted that the traffic classifiers were picked up on the first Monday of the school holiday period in September 2014 however the data collected on the Monday of the school holidays was not used in preparing the summary results.

NOTE: the Noise Impact Assessment used a second collection of traffic data using classifiers on Brandy Hill Drive, 500m from Clarence Town Road for a one week period from Friday 6th March 2015 – 12th March 2015.

5.6.3.2 *Road Capacity*

Road capacity was assessed by applying NSW Roads and Maritime Services (RMS) RTA's *Guide to Traffic Generating Developments.* The guide provides some direction on likely levels of service being experienced on two lane two way rural roads for different terrain types and is shown below (**Table 5.6:1)**

Table 5.6:1: Peak Hour Flow Two Lane Rural Roads (Source – RMS)

Terrain	*Level of Service*	*Percent of Heavy Vehicles*			
		0	*5*	*10*	*15*
Level	*B*	*630*	*590*	*560*	*530*
	C	*1030*	*970*	*920*	*870*
	D	*1630*	*1550*	*1480*	*1410*
	E	*2630*	*2500*	*2390*	*2290*
Rolling	*B*	*500*	*420*	*360*	*310*
	C	*920*	*760*	*650*	*570*
	D	*1370*	*1140*	*970*	*700*
	E	*2420*	*2000*	*1720*	*1510*
Mountainous	*B*	*340*	*230*	*180*	*150*
	C	*600*	*410*	*320*	*260*
	D	*1050*	*680*	*500*	*400*
	E	*2160*	*1400*	*1040*	*820*

5.6.3.3 *Intersection Capacity*

Brandy Hill Drive/Clarence Town Road and Clarence Town Road/Seaham Road intersections have been modelled using the Sidra 6 intersection modelling package. Assessment of modelling results is based on the level of service requirements of the RMS (**Appendix 8**). Intersection capacity was modelled for 30 years (quarry life) at normal background growth levels i.e. 1 %

growth rate based on historical traffic counts obtained from Port Stephens Council.

Figure 6.13: Clarence Town Road / Brandy Hill Drive Intersection - *Source TIA Intersect Traffic*

The Sidra 6 software package predicts likely delays, queue lengths and thus levels of service that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below (**Table 5.6:2**)

Table 5.6:2: Level of Service Requirements

Level of service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 – 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays.	At capacity, requires other control mode.

Roundabouts require other
control mode.

5.6.3.4 *Road Safety*

The road safety assessment of intersection safety considered the amount of traffic passing through and turning at the intersections, the availability of sight distance, and intersection geometry.

5.6.4 Impact Assessment

5.6.4.1 *Road Safely*

Clarence Town Road / Brandy Hill Drive intersection and Brandy Hill Drive / Seaham Road intersection has suitable road geometry and the available sight distance exceeds Austroads requirements as specified within *Guide to Road Design (2009)*.

Sight distance to the east at the intersection was observed to be at minimum requirement. The approach sight distance for Brandy Hill Drive and the quarry access road were observed to be satisfactory. The sight distance requirements are easily met for sight distance to the west along Clarence Town Road.

There have been 5 accidents in the vicinity of the intersection within the last 6 years. None of these involved tucks. Road safety would be improved if the speed limit on Clarence Town Road was reduced to 80km/h.

The speed limit on Clarence Town Road is 100 km/h and the speed limit on Brandy Hill Drive is 80 km/h.

5.6.4.2 *Intersection Capacity*

Modelling shows that intersections are currently operating with an excellent level of service.

Over the life of the project at normal background growth levels (1 %) both intersections will continue to operate satisfactorily. Existing intersections have significant spare capacity to cater for additional traffic resulting from development in the area.

The detailed Sidra modelling results of traffic volumes are shown in full in the Traffic Impact Assessment (**Appendix 8**).

5.6.4.3 *Proposed Traffic Generation*

Heavy vehicle traffic on the local road network around the site was found to be in the order of 14% to 25% of total traffic.

The proposed traffic generation increase as a result of this development is shown in **Table 5.6:3** below;

Table 5.6:3: Proposed Traffic Generation Increase

Traffic and Transport	Proposed Traffic Generation Increase (incl. quarry deliveries, employees, concrete batch plant)
Daily Vehicles	524 vehicle trips per day (vtpd).
Peak Hour Vehicles	66 vehicle trips per hour (vtph) i.e. a total of 150 vtph (84 + 66) from the site
8AM – 9AM period	56 vtph

Total traffic volumes on the local road network are within the environmental road noise threshold levels of 200 vph to 300 vph for local roads and 300 vph to 500 vph for collector roads quoted within the RMS' RTA's *Guide to Traffic Generating Developments.*

It is important to note this peak traffic generation would not occur every day and every hour, but would be a short term peak associated with a number of concurrent major orders.

Vipac Consultants completed a Traffic Noise Impact Assessment (See **Section 5.7.4.3/Appendix 9**), which determined truck movements will comply with traffic noise criteria levels provided the number of truck movements on Brandy Hill Drive is kept within the acceptable limit of 584 truck movements during the day and 78 truck movements at night.

The access road and off-site haulage route is sealed and as such dust generated from the haulage traffic will be insignificant provided all loads are covered as required by law in NSW.

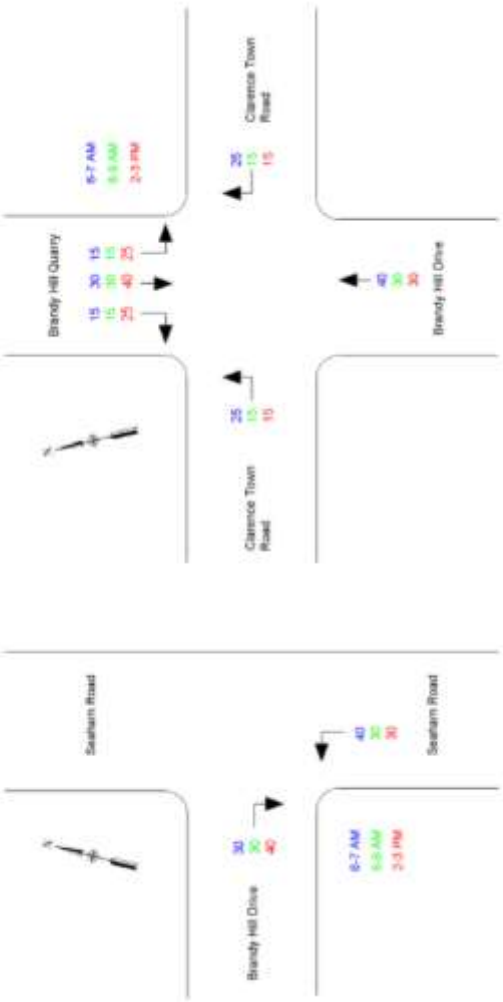

Figure 6.14: Development Traffic Distribution

The total peak traffic (current and additional) from the quarry used in the Sidra assessment has been distributed through the road network as shown in **Figure 6.14** based on likely origin/destinations for deliveries and staff.

5.6.4.4 *Concrete Batching Plant Traffic*

The concrete batching plant will generate approximately 11 deliveries per day. A 9 or 10 hour day would result in a peak trip generation of two deliveries per hour of 4 vtph.

Concrete Recycling: The proposed development will result in the site receiving concrete washout material (15, 000m^3 per annum) from Hanson's concrete batching plants. All material will be received as back loads on the quarry trucks delivering material from the quarry to the batching plants and therefore resulting in no additional traffic movements.

5.6.4.5 *Traffic Efficiency*

The Project is predicted to increase vehicle trips per day to 524vtpd or 66 vtph during peak days. It will not cause the two way mid-block technical capacity of the road network to be

reached and therefore satisfactory levels of service will be experienced by motorists on the road network after the extension and future upgrading of the quarry.

Allowance of 5 inbound and outbound trips has been made in the modelling for likely traffic increases resulting from the expansion of Martin's Creek Quarry, which is expected to partly use the same haulage routes as Brandy Hill.

The Project will not adversely impact on the efficiency of the local road network which has sufficient spare capacity to cater for the expansion without any upgrading works.

5.6.4.6 *Road Capacity*

The existing road network has significant spare capacity to cater for traffic growth generated by additional development in the area. The average delay, levels of service and queue lengths for all movements remain well within the thresholds determined by the RMS as representing satisfactory operation for the Project.

5.6.4.7 *Amenity*

The more common amenity issues to result from extractive industries-related transportation relate to noise and dust generation.

Dust: the entire haulage route is sealed and as such dust generated from the haulage traffic will be insignificant provided all loads are covered as required by law in NSW.

Noise: the operation of large haulage trucks can generate significant noise particularly when returning to the quarry empty. This is managed through the application of various management controls such as driver code of conduct, speed controls and minimisation of compression breaking.

5.6.4.8 *Cumulative Impacts*

Martin's Creek Quarry

Daracon are proposing a production increase from the existing Martin's Creek Quarry with the main transportation route (as identified in the PEA) to Maitland via Paterson and Tocal Toads, and to northern markets via Butterwick Road, Clarence Town Road, Brandy Hill Drive and Seaham Road to Raymond Terrace.

Whilst no traffic figures are available at this stage the preliminary report acknowledges this as a minor transportation route for the quarry as most of their market is within the Newcastle and Maitland areas. During manual traffic counts at the Brandy Hill Quarry entrance up to 3 or 4 Daracon trucks were observed using the route, possibly being used to access the Martin's Creek Quarry. Daracon have advised however that during a major order in the Newcastle area in September 2014 up to 78 vehicles per day were directed along Brandy Hill Drive. This data obtained from Daracon is provided within Attachment D of the Traffic Impact Assessment ***(Appendix 8)***. Based on a 10 hour day this represents a peak hourly movement of 8 trucks per hour with one outbound movement and one inbound movement assumed i.e. 16 vtph.

Sensitivity analysis suggests that the Martin's Creek Quarry Proposal will allow for an additional four (4) truck movements in each direction along the proposed haul route, which is representative of a doubling in production. Therefore, the Martin's Creek Quarry extension will

not increase traffic on the local road network significantly and will not impact on the efficiency of the network.

On this basis, analysis of road network performance including the impacts of the Martins' Creek Quarry proposal will allow for an additional 16 truck movements in each direction along the proposed haulage route. The preliminary assessment by Monteath & Powys did not provide specific details of current extraction / production rates per annum. The application seeks to limit the extraction rate at 1.5 mtpa. Therefore the proposed doubling of Martin's Creek Quarry traffic on the local road network is an estimation based on the available information and assuming the Martin's Creek Quarry has similar current extraction rates as the Brandy Hill Quarry.

Wallalong Investigation Area

A large parcel of rural land to the west and south of the Brandy Hill Quarry has been earmarked for rezoning to allow residential allotments to be approved. Whilst this proposal has been in existence for some time it is receiving some opposition and has not been approved to date. It is understood Port Stephens Council has requested more work on the planning proposal with access and the impact on the local road network among the concerns of Council. One of the main access routes for the site will be via Clarence Town Road and Brandy Hill Drive thereby passing the Brandy Hill Quarry access.

The current traffic assessment for this proposal was viewed at Port Stephens Council administration building on Tuesday 21st October 2014. The report by Better Transport Futures (November 2012) provided the following relevant traffic data. The Wallalong Investigation Area proposes approximately 3,300 residential lots and thus the likely total traffic generation from the site will be in the order of 2,800 vtph during the peak hour periods. The report identifies two scenarios for trip distribution based on either 80 % or 60 % of traffic having an origin / destination towards Raymond Terrace. This is based on the constraints associated with the crossing of the Paterson River reducing the likelihood of Maitland being a popular origin / destination. This could however change should a third river crossing be proposed as part of the development.

It is noted that there are currently two main transport routes to Raymond Terrace from the site being;

1. South via Hinton; or
2. East via Brandy Hill Drive.

The eastern route would therefore impact on the same transportation route as the Brandy Hill Quarry proposal.

Better Transport Futures predicts the following peak hour traffic volumes along the eastern route i.e. Clarence Town Road, Brandy Hill Drive and Seaham Road.

- 1,234 vph (80 % traffic to Raymond Terrace)
- 925 vph (60 % traffic to Raymond Terrace)

These traffic volumes are well in excess of the additional traffic generated by this proposed expansion of the Brandy Hill Quarry. In fact the increase in traffic from the quarry expansion project is only 2% - 3% of the traffic increase generated by the Wallalong planning proposal.

It is considered unreasonable for this proposed expansion of Brandy Hill Quarry to consider the traffic impacts of the Wallalong Investigation Area in this assessment for the following reasons;

- There is no certainty that the Wallalong proposal will proceed;
- The large traffic volumes generated by the Wallalong proposal will result in major road upgrading works and the proportion of additional traffic generated by the Brandy Hill Quarry proposal is insignificant compared to these volumes. Therefore any likely contribution from Brandy Hill Quarry would be extremely small.
- As a major traffic generating development the Wallalong Investigation Area will be required to undertake a more detailed traffic assessment at a future stage.

Therefore it is considered the traffic impacts of the Wallalong Investigation Area do not need to be considered any further by this assessment.

5.6.5 Mitigation and Conclusion

The findings from Intersect's Traffic and Transport Impact Assessment support the Brandy Hill Quarry Expansion Project as it will not have an adverse impact on the local road network within the vicinity of the site and complies with the requirements of Port Stephens Council and NSW Roads and Maritime Services (RMS). However Hanson notes that the community has raised concerns in respect to the traffic/transport aspect of the proposed project. Particularly concerns regarding safety of walking/cycling along Brandy Hill Drive due to the road shoulder width, as well as the noise associated with truck movements have been raised (complete details can be found in the Community Consultation (**Section 3.3)** of this report). Hanson will mitigate any impacts by:

- Minimising road traffic impacts on the environment, by limiting truck movements outside of standard operations where reasonable and feasible.
- Maintaining its commitment to building the footpath along Brandy Hill Drive in some capacity and giving it further consideration with Port Stephens Council.

5.7 Noise and Vibration

5.7.1 Existing Environment

The SEARs stipulate that the Noise Impact Assessment must address the following specific issues:

SEAR Requirements

A qualitative assessment of potential:

- Construction, operational and off-site transport noise impacts;
- Reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and
- Monitoring and management measures, in particular real-time and attended noise monitoring.

Supporting Documents

NSW Industrial Noise Policy (DECC)

Environmental Noise Management – Assessing Vibration: a technical guide 2006 (DECC)

NSW Road Noise Policy 2011 (DECCW)

Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC)

Environmental Criteria for Road Traffic Noise (EPA)

5.7.2 Existing Environment

5.7.2.1 *Noise Sensitive Receptors*

The project identifies 19 potential sensitive noise receptors which range from 1.0 km – 4.3 km from the quarry. These are illustrated in **Figure 6.15, Figure 6.16** and **Figure 6.17** below.

The noise sensitive receivers are representative of the nearest existing noise sensitive receiver to both the existing operations Brandy Hill Quarry and the proposed expansion area of the Brandy Hill Quarry Expansion Project.

There are no third party sensitive receivers located on the parcel of land located to the southeast of the quarry between the quarry and Clarence Town Road. Hanson understands that the owner of this land parcel does not reside on these premises.

The distances represented in the Blast Impact Assessment differ from the distances presented in the Noise Impact Assessment as the distances presented in the Noise and Vibration Impact Assessment report refer to the separation distance from residential properties to the overall site boundary of the quarry, and take account of the proposed expansion area of the quarry and the relocation of the processing plant to the south of the plant's current position.

Figure 6.15: Noise Monitoring Location (N01, N04, N05 and N06) and Receiver Locations (R1 to R10 and R17 to R18)

Source: Noise Impact Assessment (Appendix 9)

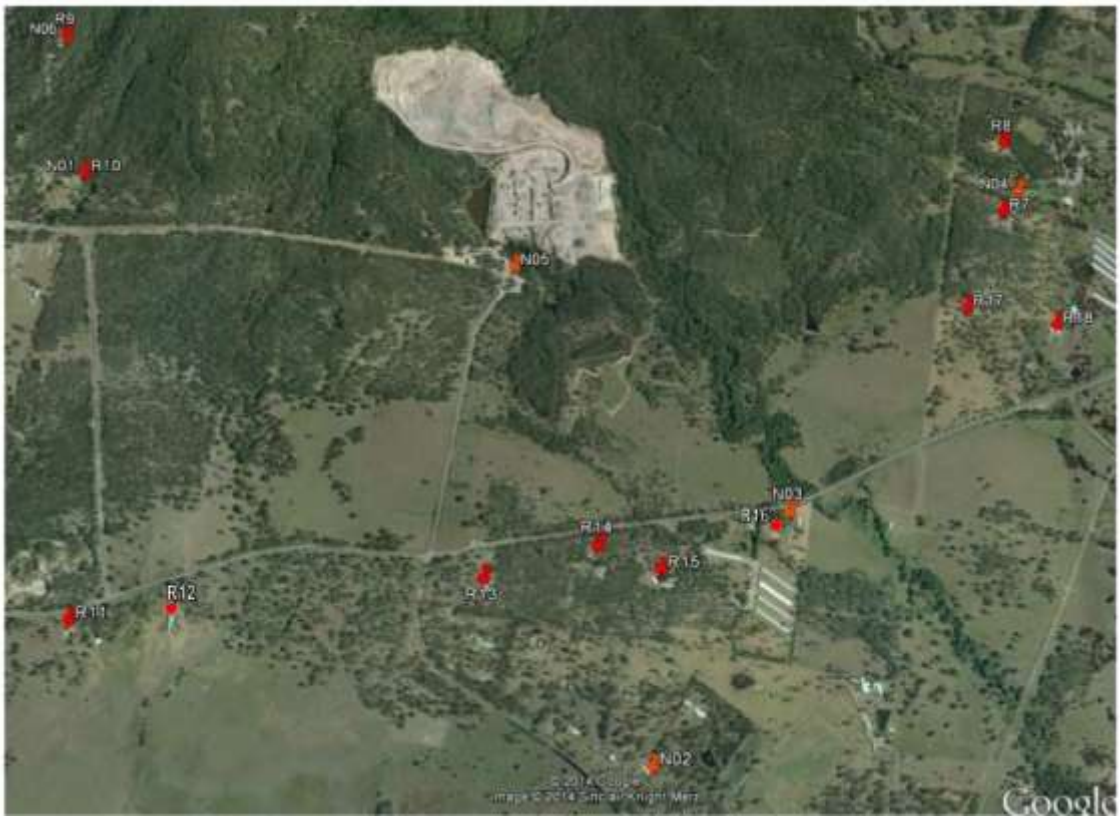

Figure 6.16: Noise and Monitoring Locations (N01 to N06) and Sensitive Receivers (R7 to R18)

Source: Noise Impact Assessment (Appendix 9)

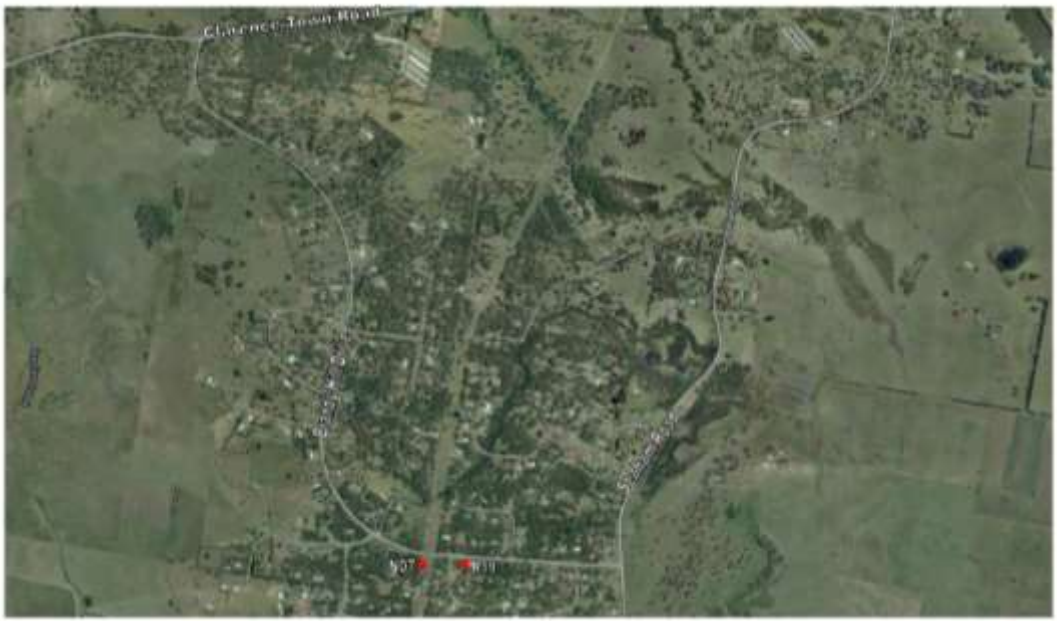

Figure 6.17: Noise Monitoring Location (N07) and Sensitive Receiver (R19)

Source: Noise Impact Assessment (Appendix 9)

5.7.3 Methodology

Hanson commissioned Vipac Engineers and Scientists Ltd to prepare a Noise and Vibration Impact Assessment report to determine the potential noise impact associated with the proposed expansion of the existing Brandy Hill Quarry. Full details are provided in the *Noise and Vibration Impact Assessment* report (**Appendix 9**), and this section provides a summary of the *Noise and Vibration Impact Assessment*.

Noise prediction modelling was undertaken using the SoundPLAN computational noise prediction software package. Use of the SoundPLAN noise prediction modelling software and referenced modelling methodology is accepted for use in the state of NSW by the Environmental Protection Authority (EPA) for environmental noise modelling purposes. SoundPLAN is a proprietary noise prediction modelling package that has been used for numerous quarrying, mining and industrial noise impact assessments conducted by Vipac and other consulting firms.

Vipac conducted attended noise logging surveys to quantify the dominant and contributory noise sources associated with the overall ambient noise levels in the area. Logging of this nature occurred in locations N01 – N07 (see **Figure 6.15, Figure 6.16, Figure 6.17**)

- N01: dominant noise sources were chirping birds. Traffic, aeroplane and breeze were influential noise sources at times.
- N02: dominated by traffic noise on Brandy Hill Drive. Secondary noise sources included domestic activities such as lawn mowing and music playing.
- N03: dominant noise was from Clarence Town Road. Bird noise was also significant at times. An operational tractor generated influential noise.
- N04: noise sources were dominated by a chainsaw, and distant road traffic. Bird noise was also significant. Noise from the quarry was slightly audible at times, when traffic noise was absent and during brief periods when bird noise reduced temporarily.
- N05: Dominated by quarry trucks on the weighbridge, secondarily from quarry activity in the stockpile area. Bird noise was audible but insignificant. N05 is located at the weighbridge, within the BHQ property.
- N06: Dominant noise sources included breeze and bird chirping. Secondarily, dog barking and traffic noise was also faintly audible.
- N07: Noise environment is dominated by traffic noise on Brandy Hill Drive. Domestic activities and birds are also audible.

5.7.3.1 *Existing Noise Environment*

Vipac installed noise logging equipment at seven locations to measure baseline environmental noise levels at representative noise sensitive receptor locations in the vicinity of the existing (and proposed quarry expansion) site. In addition to the noise sensitive receptors, noise monitoring was also undertaken on-site near the weighbridge at the quarry (N05). The location of the monitoring points is listed in the *Noise and Vibration Impact Assessment* with details regarding the setting/location of noise monitoring. Contributors to the noise environment at

each location have been identified in Section 4.1 of the Noise and Vibration Assessment and detailed in **Figure 6.15, Figure 6.16** and **Figure 6.17** above.

Vacant Land: There are no third party sensitive receivers located on the parcel of land located to the south west of the quarry between the quarry and Clarence Town Road. It is understood that no person inhabits this land parcel. Consequently, there is no vacant land significantly closer to the Brandy Hill Quarry than the noise sensitive prediction location assessed in the report. Any noise emissions associated with the Quarry on Hanson's own property are assessable against health & safety criteria to protect the health of employees.

5.7.3.2 *Noise Sources*

A noise emissions survey of the quarry infrastructure (mechanical plant & equipment) was conducted during typical operations on 17 & 23 September 2014. Subsequently, sound pressure measurements taken for all major infrastructure components were analysed. Sound power levels were calculated, derived from machinery (noise source contributor) associated with current quarry operations. Existing quarry plant will also be assessed for the proposed expansion area of the quarry.

In order to determine the noise emissions from the concrete wash out plant, Vipac conducted a noise emission survey on the 26 September 2014 at a Hymix concrete plant, also owned by Hanson. The concrete plant monitored at the Hymix site is similar to the plant to be installed at Brandy Hill Quarry within the identified infrastructure area.

5.7.3.3 *Noise prediction modelling*

Noise prediction modelling has been undertaken for each of the five (5) project operational stages of both the neutral and worst-case conditions during the day, evening and night periods.

5.7.3.4 *Quarry Noise*

Existing Operational Phase

Calibration of the operational quarry noise prediction model was undertaken by comparing the predicted noise levels with the measured noise levels at monitoring point N05 based on the proximity of this monitoring point to site operations. Monitoring point N05 represents a reference point on-site at Brandy Hill Quarry. Other receptors were considered, however these were influenced by extraneous noise sources including traffic noise, insects, birds, agriculture and domestic activities and not dominated by Brandy Hill Quarry Noise Sources.

The results of the noise prediction model show general agreement between the predicted levels and measured noise levels (See **Table 5.7:1).**

Table 5.7:1: Existing Quarry Operations - Predicted Noise Impact

Location	Quarry Contribution LAeq (dB)	
N05	Predicted Noise Levels	Measured Noise Levels
	52	54

Proposed Expansion Operations Phase

Noise prediction modelling has been applied to identify the potential impact of the proposed quarry expansion on the existing noise environment at the nearest noise-sensitive receptors. Predicted noise levels associated with quarry operations are calculated for neutral and worst-case weather conditions, as well as during the evening/night. This is presented in the *Noise and Vibration Impact Assessment* (**Appendix 9**).

Construction Noise

Construction noise is assessed using the NSW Interim Construction Noise Guideline developed by the NSW – Department of Environment and Climate Change (DECCW). The guidelines contain detailed procedures for the assessment and management of construction noise impacts. A quantitative construction noise assessment was undertaken for the project to ascertain noise management levels at receptors based on land uses.

Activities associated with the initial development of the expanded area of the quarry will compromise excavators and dump trucks transporting overburden in the extraction area. These have been modelled for each stage.

5.7.3.5 *Traffic Noise Impact*

Vipac applied the Calculation of Road Traffic Noise (CoRTN) method of traffic noise prediction, which is a method approved by the Environment Protection Authority (EPA). Vipac has assessed the potential quarry traffic noise impact for the proposed Brandy Hill Quarry expansion by determining the allowable maximum number of truck movements that can be accommodated on Brandy Hill Drive before the overall road traffic noise levels exceed applicable noise criteria at the noise sensitive receivers located along Brandy Hill Drive.

The model was calibrated with the noise data from the baseline noise monitoring surveys. The predicted L_{10}, (15hrs) and L_{10}, (9hrs) was compared with the L_{10}, (15hrs) and L_{10}, (9hrs) calculated from logging data, and a calibration constant was determined.

One noise-sensitive receptor has been modelled to assess the road traffic noise impact from Brandy Hill Quarry traffic travelling on Brandy Hill Drive. This receiver the nearest receiver to the road, and is situated at a set-back distance of approximately 31 metres from Brandy Hill Drive (R19, 25 Brandy Hill Drive, See **Figure 6.17**). Details of the traffic volumes in the noise predictions are outlined in Section 6.5 of the *Noise and Vibration Impact Assessment.*

Auto-tube counters were used to determine the existing traffic volumes on Brandy Hill Drive, Clarence Town Road and the Brandy Hill Quarry Access. This determined the volumes of all traffic travelling on the road network in the vicinity of the quarry. Additionally the tube counts separately determined the volume of Brandy Hill Quarry-generated traffic movements on the road network in the area. The associated existing traffic noise levels in the area were

determined during the baseline noise logging surveys as the noise loggers were in place during the same time period that the road traffic auto-tube counters were in place.

Background Traffic Noise

Prediction of traffic noise over a 30-year period (the life span of the Project) is not standard practice, due to variables such as development growth and road network upgrades which can result in inaccuracies in noise modelling and generate unreliable forecasts. The Traffic Impact Assessment adopts a 1 % traffic growth per annum on Brandy Hill Drive. As this is a small percentage of background traffic growth, traffic noise impact will be insignificant (See **Appendix 9B**).

NOTE: The traffic data presented in Table 16 of the Noise Impact Assessment – **Appendix 9** is data obtained from the traffic counts undertaken in March 2015. Data presented in the Traffic Impact Assessment (**Appendix 8**) used data from September 2014.

5.7.3.6 *Sleep Disturbance*

The DECC NSW Road Noise Policy (RNP) and RTA (now RMS) Practice Note 3 protocol were applied as the method for assessing and reporting on maximum noise levels that may cause sleep disturbance. The latter indicates that;

- Maximum internal noise levels below 50-55dB(A) are unlikely to cause awakening reactions, and
- One or two noise events per night within maximum internal noise levels of 65-70dB (A) are not likely to significantly affect health and well-being.

5.7.4 Impact Assessment

The project involves five stages (See **Section 2.3).** Noise prediction modelling has been undertaken for each of these stages during the day, evening and night time periods. Results over all five stages show that all predicted noise impacts associated with the proposed expansion on noise sensitive receivers range between 1 and 41dB(A). These results fall within the applicable Project Specific Noise Level criteria during the daytime, evening and night period.

5.7.4.1 *Existing Noise Environment and Noise Sources*

Sound power levels of the current mechanical plant and equipment were measured to quantify the acoustic contribution of operational quarry machinery. Results range from 90 LWA – 122 LWA, Truck Idling and Screen 3 of the processing plant respectively.

Sound power levels of current mechanical plant and equipment associated with existing operations and activities at the Quarry are shown in **Table 5.7:2** below.

It is expected that the plant and equipment modelled and identified in **Table 5.7:2** will be representative of ongoing operations and used for the proposed expansion area.

Table 5.7:2: Sound Power Levels (Lw) - dB for Quarry Operations

Plant and Equipment	LWA	Frequency – Linear										
		16	31.5	63	125	250	500	1k	2k	4k	8k	16k
Crusher 3 +4	114	118	109	108	107	108	111	109	108	103	98	87
Primary Crusher	115	115	114	118	114	114	113	110	108	102	95	86
Secondary Crusher	120	121	112	115	114	115	115	115	115	110	100	87
Screen 5	107	119	108	108	103	104	102	100	100	99	96	89
Screen 3	122	124	107	111	111	110	113	117	117	113	102	89
Dump Truck CAT 773B Tipping into Crusher	113	109	108	118	112	109	109	107	107	100	92	83
Dump Truck CAT 773B	112	104	102	107	109	104	104	104	109	95	84	76
Excavator – PC600	99	99	94	104	107	99	98	93	87	84	78	69
Loader WA 500	101	99	96	111	106	101	100	95	91	84	79	72
Watercart	103	96	89	106	97	98	101	99	96	89	82	75
Excavator	96	92	91	99	100	96	93	91	87	82	73	65
Pugmill	111	105	106	110	102	108	109	107	103	99	91	85
Volvo L250G	101	94	91	99	106	96	97	97	94	84	76	66
Truck Idling	90	81	92	92	93	89	91	90	91	93	91	84
Truck being loaded	107	103	91	104	101	101	103	100	101	97	91	82
Truck revving	105	93	95	95	95	99	102	99	98	94	88	79

5.7.4.2 *Quarry Noise*

A range of contributory noise sources was noted at all baseline noise monitoring locations when attended daytime noise measurements were taken.

Ambient and background levels recorded at N01 during the evening period are raised slightly above the corresponding levels recorded during the day. VIPAC considers this is most likely

associated with the level of insect noise apparent at N01 during the evening period. Similarly, ambient (LAeq) and background (LA_{90}) levels recorded at N04 during the night are raised slightly above corresponding levels recorded during the day. VIPAC considers these elevated noise levels during the evening and night-time periods are also considered most likely to be associated with the level of insect noise apparent at N04 during the evening and night-time periods. Additionally, a poultry farm is located approximately 330m to the south east of the residential property at N04 and VIPAC notes there were fans on the western end of the poultry sheds, which likely contributed to increased sound levels.

It is noted that the patterns of the Rating Background Levels (RBL) determined during the evening and night time periods at these locations appear unusual in that such levels would typically be lower than the levels determined during the daytime period.

Whilst Vipac did not undertake attended noise measurements at the noise monitoring locations during the evening and night periods, the Vipac engineers undertaking the noise surveys for the Brandy Hill Impact Assessment, have extensive experience of conducting environmental noise monitoring surveys during evening and night-time periods in similar settings in rural and urban locations in the Hunter Valley and Newcastle regions of NSW. Vipac have experienced similar patterns during attended noise surveys in other rural locations, where elevated noise levels were recorded during evening and night-time periods, due to increased noise associated with insects during these periods, particularly during Spring, the time of year when the noise surveys were conducted at N01 and N04 (i.e. September 2014).

Construction Noise

The results of predicted noise levels for the construction phases of proposed quarry expansion indicate that the noise levels are within the applicable Noise Management Level criteria at all of the noise sensitive locations (**Table 5.7:3 & Table 5.7:4**).

Table 5.7:4 below sets out management measures and levels for noise at residences and sensitive land uses.

Table 5.7:3: Noise at residence using Quantitative Assessment

Recommended Hours	Time of Day	Management Level LAeq(15min)
Recommended standard hours	Monday to Friday – 7am to 6pm Saturday – 8am to 1pm No work on Sundays or public Holidays	Noise affected RBL [2] + 10 dB
		Highly noise affected [3]
Outside recommended standard hours		Noise affected RBL [2] + 5dB

Table 5.7:4 below outlines the noise management levels associated with the initial development of the proposed expansion area of the quarry.

Table 5.7:4: Project Specific Noise Levels at Noise Sensitive Receptors dB(A) - Residential

Location	Period	LAeq	RBL	Noise Management Levels
N01 (rural residential R10)	Day	58	48	58
	Evening	60	52	57
	Night	59	47	52
N02* (suburban residential)	Day	53	42	52
	Evening	49	42	47
	Night	57	36	41
N03* (suburban residential (R011 to R018))	Day	53	37	47
	Evening	52	36	41
	Night	49	33	38
N04 (rural residential) (R011 to R08)	Day	63	56	66
	Evening	56	53	58
	Night	65	56	61
N06 (rural residential) (R01 to R03, R09)	Day	45	32	42
	Evening	56	30	35
	Night	37	30	35

*In accordance with Section 2.2 of the INP, the monitoring locations N01 and NN03 have been classified as suburban residential locations on the basis of their proximity to Brandy Hill Drive and Clarence Town Road respectively and the increased contribution to traffic noise on these locations. This contrasts with the other monitoring locations classified as rural residential locations which were influenced to a greater extent by natural noise sources and experienced very little direct traffic noise exposure.

Additional assessment included quantification of the noise associated with the proposed expansion area over the 5 project stages. A summary of the results is shown in **Table 5.7:5** below.

Table 5.7:5: Initial Development (Construction) of Proposed Quarry Expansion - Predicted Noise Impact

	Stage 1		Stage2		Stage3		Stage4		Stage 5	
	Neutral	Worst	Neutral	Worst	Neutral	Worst	Neutral	Worst	Neutral	Worst
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	22	29	18	26	18	26	17	26	17	25

5.7.4.3 *Traffic Noise Impact*

The predicted increase in traffic noise levels from the traffic generated by the Brandy Hill Quarry Expansion is expected to comply with the relative increase criteria requirements of the Road Noise Policy.

The setting of noise monitoring varied between locations that were classified as rural residential or suburban residential. This was due all monitoring locations being close to residential properties (with the exception of N05), three of those properties were relatively removed from Clarence Town Road and Brandy Hill Drive (which are the main roads in the area) and were less influenced by traffic noise as a contributor to the overall ambient noise sources noted. However, one of the monitoring points was situated relatively close to Clarence Town Road and

two points were situated relatively close to Brandy Hill Drive – these locations were influenced to a greater extent by intermittent traffic noise on these roads during the daytime.

Noise prediction modelling results indicate that it would be acceptable for a total of 584 truck movements to occur during the daytime on Brandy Hill Drive, without exceeding the applicable noise criteria at the nearest noise sensitive receptor to the road, located along Brandy Hill Drive. The predicted noise level at the residential property associated with a total of 584 trucks passing during the daytime is 64.4dB(A), which is within 2.0dB of the existing noise levels at the nearest property to the road, located along Brandy Hill Drive. This acceptable number of truck movements is equivalent to an average of approximately 39 truck movements per hour. An increase of up to 2dB represents a minor impact that is considered barely perceptible to the average person.

During the night-time period, it is predicted that the maximum allowable number of truck movements would be 78, which is equivalent to an average of 9 truck movements per hour, without exceeding the applicable night-time noise criterion. Night-time noise levels were influenced to a greater extent by noise sources such as birds and insects throughout the night, rather than traffic noise.

5.7.4.4 *Sleep disturbance*

The predicted external noise level was calculated at nearest receiver along Brandy Hill Drive (R19- see **Figure 6.17)**, which has a setback distance of 31 meters from the road. The external predicted noise levels are shown in **Table 5.7:6.**

Table 5.7:6: External Predicted Noise Level

Existing Noise Level		**Future Noise Level**	
LAeq,9hr	LAmax,9hr	LAeq,9hr	LAmax,9hr
54	72	56	74

The internal predicted noise level applies a degree of attenuation to the inside amenity of the buildings based on building façade openings (i.e. doors/windows). The results for the internal predicted noise level is displayed in **Table 5.7:7** below. The internal noise levels are predicted to be below maximum noise level criteria.

Table 5.7:7: External Predicted Noise Level

Existing Noise Level		**Future Noise Level**	
LAeq,9hr	LAmax,9hr	LAeq,9hr	LAmax,9hr
32	52	36	54

The potential sleep disturbance impact from the overall level of road traffic generated noise, including potential traffic movements associated with the proposed Brandy Hill Quarry Expansion would be within the applicable criteria at the nearest noise sensitive receiver.

5.7.5 Mitigation Measures and Conclusion

5.7.5.1 *Traffic Noise Mitigation Measures*

The relative increase criteria is outlined in **Section 2.4** of the Road Noise Policy require consideration of any increase in the total traffic noise level at a location due to a proposed project. Residences experiencing increases in total traffic noise levels above the relative increase criteria in **Table 5.7:8** below should be considered for mitigation.

Table 5.7:8: Relative increase criteria for residential land uses.

Road Category	Type of project/development	Total traffic noise level increase dB(A)	
		Day (7am – 10pm) 15-hr	Night (10pm to 7am) 9hr
Sub-arterial roads	Land use development with the potential to generate additional traffic on existing road	Existing LAeq, 15 hour + 12dB (external)	Existing traffic LAeq, 9hour + 12dB (external)

Should existing traffic noise levels be raised above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against the excessive reduction of amenity that may be caused by the Project by applying the relative increase criteria

In assessing feasible and reasonable mitigation measures, an increase of up to 2dB represents a minor impact that is barely perceptible to the average person.

Hanson will prepare a Noise Compliance Management Strategy post approval which will include a contingency response plan to provide guidance on mitigating any traffic noise exceedances should they occur.

5.7.5.2 *Operational and Construction Mitigation Measures*

There are no specific mitigation measures required in conjunction with the proposed expansion of the Quarry. Nonetheless a Noise Management Strategy (or similar Management Plan) will be implemented for the Brandy Hill Project. This Strategy/Plan will include provision for a noise monitoring programme to monitor operational noise emissions from Brandy Hill Quarry in accordance with current and applicable NSW EPA requirements.

Hanson will conduct annual noise monitoring to demonstrate compliance at the nearest sensitive receptors unless otherwise approved by the Secretary of the DP&E. It is expected that

this will be documented in a Noise Management Strategy/Plan conditioned as part of the Project Approval.

5.8 Blast

5.8.1 Overview

The SEARs stipulate that the EIS must address the following blasting related impacts;

SEAR Requirements

Proposed hours, frequency, methods and impacts.

Supplementary Resources

Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC)

5.8.2 Existing Environment

A list of the nearest potentially affected noise sensitive receivers to the quarry is provided below in **Table 5.8:1.** The table lists the minimum distance from the residential structure to the maximum proposed future quarry pit, as opposed to the overall quarry site boundary. All noise sensitive receivers are located 1,000m or more from the nearest future quarry pit boundary. A separation distance of 1,000m is usually an acceptable buffer for blast impacts from quarries. The location of the properties is illustrated in **Figure 6.18** and **Figure 6.19.** Currently the quarry blasts approximately 20 to 25 times per annum.

NOTE: distances from residential properties presented in **Table 5.8:1** relate to the separation distance from the residential dwellings to the proposed future quarry pit boundary. The Blast Impact Assessment has taken into consideration the separation distances from the future quarry pit boundary as this delineates the extent of the area where blasting will occur. The overall proposed quarry site boundary includes the processing area, weighbridge, workshop, proposed concrete plant, etc. The *Noise Impact Assessment* (**Appendix 9**) refers to separation distances from sensitive receptors to the overall proposed quarry site boundary. Therefore the distances stated in **Table 5.8**:1 below will differ from those presented in the *Noise Impact Assessment* **(Appendix 9).**

Sensitive receptors are located the west, south and east of the quarry.

Table 5.8:1 Blast Sensitive Receptors

Property ID	Distance approx. (m)	Address	Description
L01 (R09)	1,100	13 Giles Road, Seaham	Residential property
L02 (R10)	1,000	13B Giles Road, Seaham	Residential property
L03 (R13)	1,300	994 Clarence Town Road, Seaham	Residential property
L04 (R14)	1,300	1034 Clarence Town Road, Seaham	Residential property

L05 (R16)	1,400	1094 Clarence Town Road, Seaham	Residential property and poultry farm to rear
L06 (R17)	1,400	1189 Clarence Town Road, Seaham	Residential property
L07 (R07)	1,450	13 Mooghin Road, Seaham	Residential property

Figure 6.18: Location of Sensitive Receptors (L01 (R09) & L02 (R10))

Figure 6.19: Location of Sensitive Receptors (L03 (R13), L04 (R14), L05 (R16), L06 (R17) & L07 (R07))

5.8.3 Methodology

Hanson commissioned Vipac Engineers and Scientists Ltd to prepare a Blast Impact Assessment report to determine potential blast impacts associated with the proposed expansion of the existing Brandy Hill Quarry. Full details are provided in the *Blast Impact Assessment* report **Appendix 10**.

Blast impacts from the quarry have been measured by an independent specialist blast monitoring company for several years. Data from the blasts has been reported and provided to Vipac for analysis. The records show that compliance with the criteria of the site EPL. Blast Fume Impacts are assessed in **Section 5.9.4.6 and Appendix 11** of this EIS.

Blast Assessment Components

Blast analysis includes analysis of the following components;

Ground Vibration: measured as Peak Particle Velocity (PPV) in mm/s.

Blast Overpressure Monitoring: measured as overpressure in dBL. Airblast can be defined as the shockwave generated by the detonation of explosives.

The following information was used determine the Maximum Instantaneous Charge (MIC) permissible to ensure compliance with ground vibration and blast overpressure criterion.

Relevant Assessment Regulations

5.8.3.1 *EPA Conditions*

Brandy Hill Quarry has specified limits for blasting, these being;

- The airblast overpressure level from blasting operations in or on the premises must not exceed 115 dB (Lin Peak) for more than 5% of the total number of blasts during each reporting period;
- The airblast overpressure level from blasting operations in or on the premises must not exceed 120 dB (Lin Peak) at any time.
- The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed 5 mm/second for more than 5% of the total number of blasts during each reporting period; and
- The ground vibration peak particle velocity from blasting operations carried out in or on the premises must not exceed 10 mm/second at any time.

The maximum overpressure level and maximum ground vibration peak particle velocity level are defined and are identical with the ANZEC guidelines. The conditions also require all blasts to be monitored at or near the nearest residence or noise sensitive location that is likely to be most affected by the blast.

5.8.3.2 *ANZECC*

The Australian and New Zealand Environment Council (ANZEC) provides the following guidelines to minimise the annoyance due to blasting overpressure and ground vibration.

- The recommended maximum level for airblast overpressure is 115 dBL. This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dBL at any time.
- The recommended maximum level for ground vibration is 5 mm/s peak particle velocity. This level may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 10 mm/s peak particle velocity at any time.

5.8.3.3 *AS2187.2*

Appendix J of AS2187.2 provides information on ground vibration and airblast overpressure from blasting. Guidance is provided for the measurement, prediction and control of blast impacts. The importance of blast management and blast monitoring records in minimising blast impacts is stated.

Blast Design Parameters

The assumed blast design parameters pertinent to the anticipated future vibration and overpressure impacts are:

- bench height = 10 to 15 m, sub-drill 0.5 m;
- blast hole diameter = 89 to 102 mm;
- explosive type = Rioflex (ANFO) (1.2 -1.3 density g/cc in hole);
- stemming length 3 to 3.5 metres.

Based on the information above, blasts will typically;

- contain up to 145 kg of explosive per blast hole; and
- range from 55 to 145 kg.

The maximum instantaneous charge (MIC) can therefore be kept below the required limit of 230 kg.

5.8.4 Impact Assessment

Blast impacts have been measured by both ground vibration and overpressure monitoring. This impact assessment demonstrates that these parameters will be within applicable criteria through the continued application of existing blast practices.

Ground Vibration

The data indicates that ground vibration will be less than 5mm/s at 1,000m for 95% of blasts when the MIC (mass instantaneous charge) of the blast is less than 230kg (see dotted line in **Figure 6.20**). Therefore the assessment indicates that blast ground vibration for the project will be compliant with the relevant criterion.

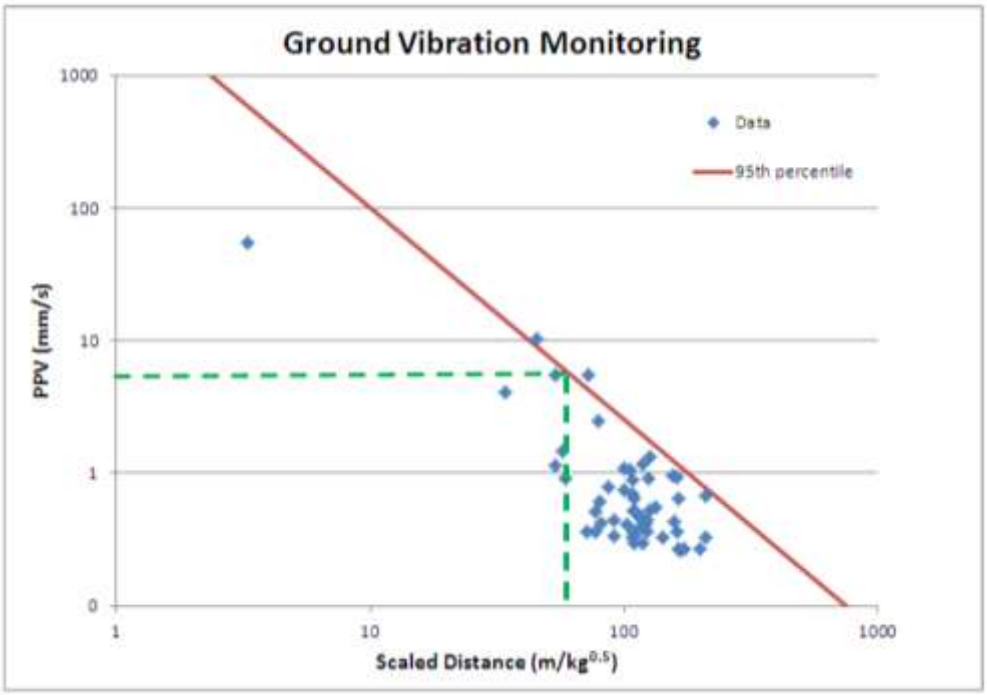

Figure 6.20: Vibration vs scaled distance for data collected during Brandy Hill blasts

Overpressure Monitoring

Analysis indicates that ground vibration will be less than 115dBL at 1,000m for 95% of blasts when the MIC (mass instantaneous charge) of blasts is less than 240kg (see dotted line in **Figure 6.21)**. Therefore the assessment indicates that overpressure monitoring for the project will be compliant with the relevant criterion.

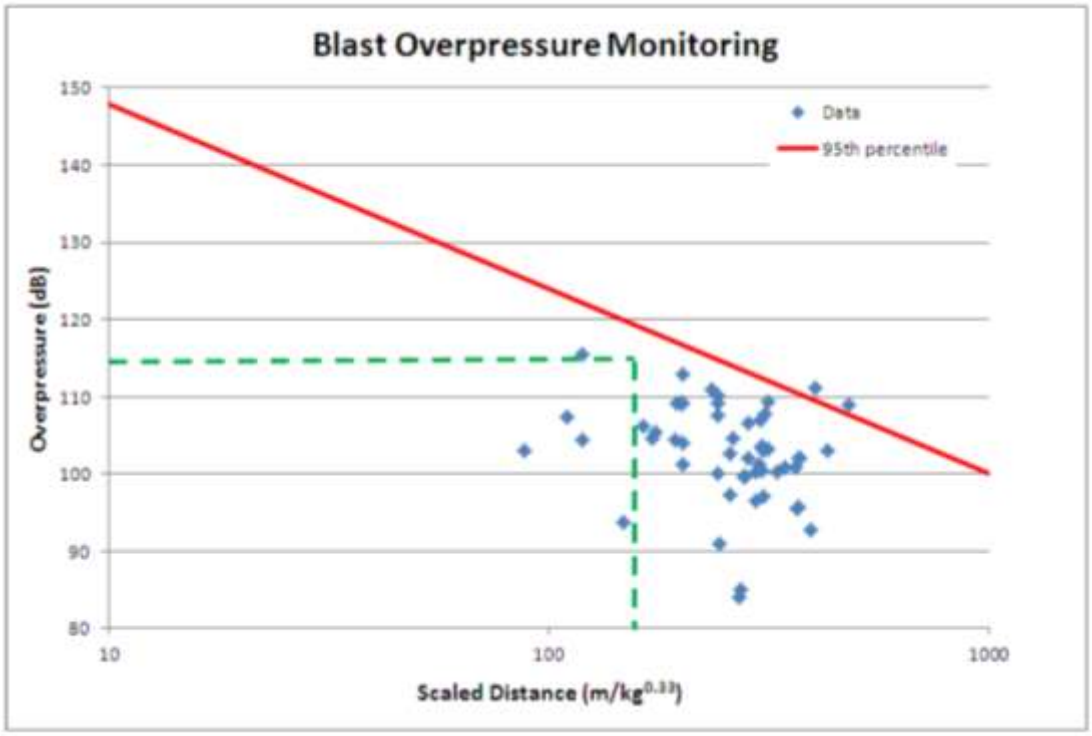

Figure 6.21: Overpressure vs scaled distance for data collected during Brandy Hill blasts

5.8.5 Mitigation and Conclusion

Vipac determined that blast impacts from the proposed quarry extension can be readily controlled within acceptable limits using existing blast practices. Generation of ground vibration and air overpressure is adequately controlled, primarily resulting from the separation distance between the quarry pit and the closest receptor.

Historical data shows that compliance with the relevant criteria has been achieved, and that future blast impacts can remain within acceptable levels using typical blast designs, good blasting practice and the established blasting Site Laws.

However, blasting will be monitored using best practices including monitoring pads (able to record blast parameters - blast over pressure and ground vibration) where reasonable and feasible. Additionally the Project will prepare and utilise a Blast Management Plan post approval. The Blast Management Plan will be prepared and approved by the consent authority and is expected to include blast monitoring and mitigation measures.

5.9 Air Quality

5.9.1 Background

The SEARs stipulate that the EIS should include an assessment of:

Requirements under the SEARs

A quantitative assessment of potential:

- construction and operational impacts, with a particular focus on dust emissions including $PM_{2.5}$ and PM_{10};
- dust generation from blasting and processing, as well as diesel emissions;
- reasonable and feasible mitigation measures to minimise dust and diesel emissions, including evidence that there are no such measures available other than those proposed; and
- monitoring and management measures, in particular real-time air quality monitoring;

Supplementary Information

Protection of the Environment Operations (Clean Air) Regulation 2002

Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2005 (DEC)

Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC)

Guidelines from the USEPA, the California EPA Office of Environmental Health and EPA Victoria relating to respirable crystalline silica

The Brandy Hill Quarry Expansion Project requires as assessment of impacts of air pollutants generated from Project activities. Should air quality impacts be generated from the Project, Hanson must identify appropriate measures to mitigate any potential impacts on sensitive receptors.

5.9.2 Existing Environment

Brandy Hill Quarry is located in an area predominantly zoned as rural landscape with minimal primary production. The site lies to the north of Brandy Hill community which is zoned large lot residential. Seaham lies to the east and is zoned as a rural-residential area. An environmental management area is located to the west and northwest of the BHQ extraction area.

The land surrounding Brandy Hill Quarry is forested with two commercial poultry farms located at Mooghin Road and south of Clarence Town Road. Sensitive receptors in the surrounding locality are identified in **Figure 6.15, Figure 6.16 & Figure 6.17**.

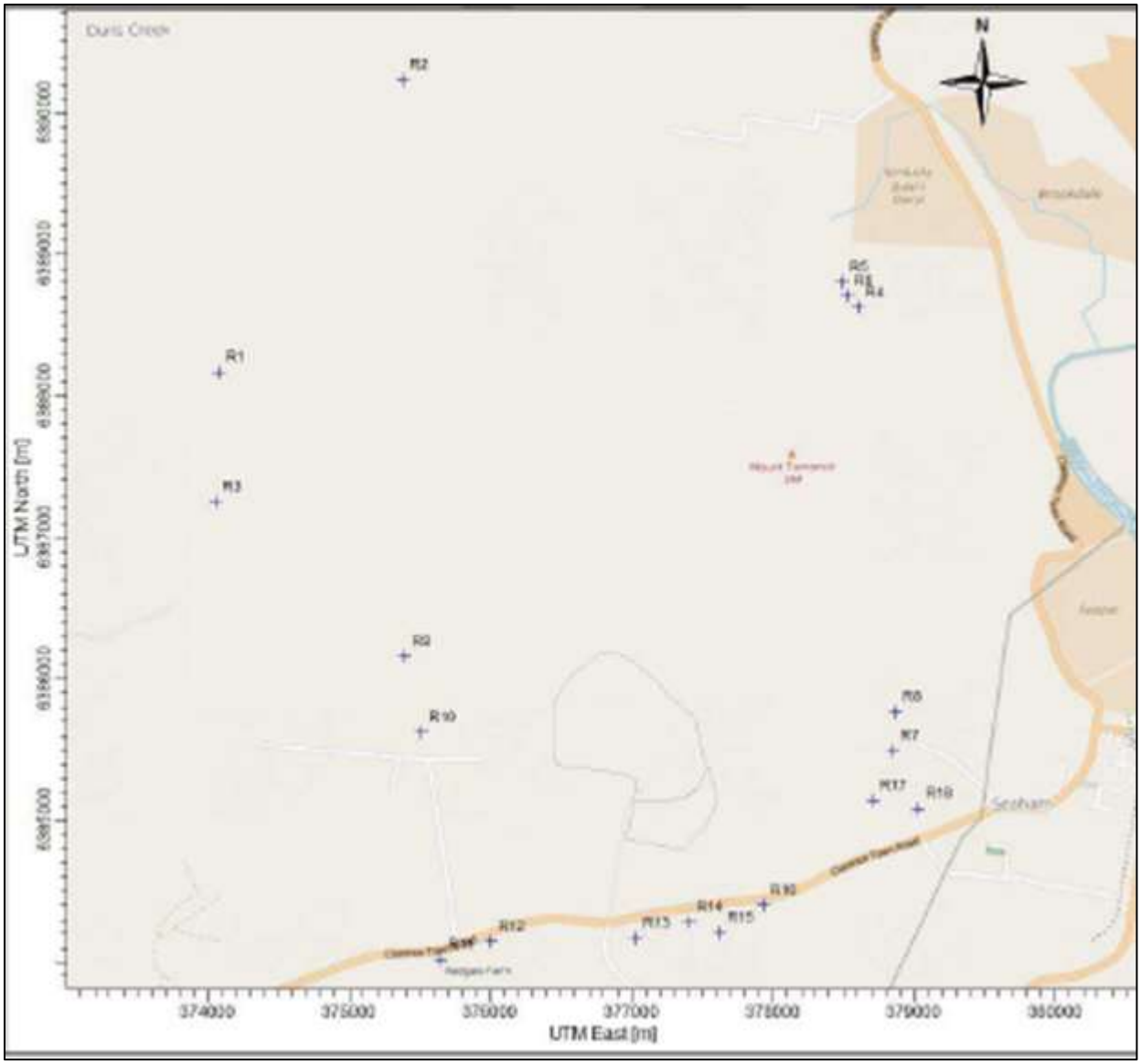

Figure 6.22: Sensitive Receptor Locations with the Quarry Boundary and Proposed Plant Area

5.9.2.1 *Local Topography*

The BHQ is situated approximately 26km from the coast and sits at the base of a mountain range. The local topography is modelled and is presented in **Figure 6.23.** The red dot represents the approximate location of BHQ. The quarry sits in a 'bowl' with mountains to the west, north and east.

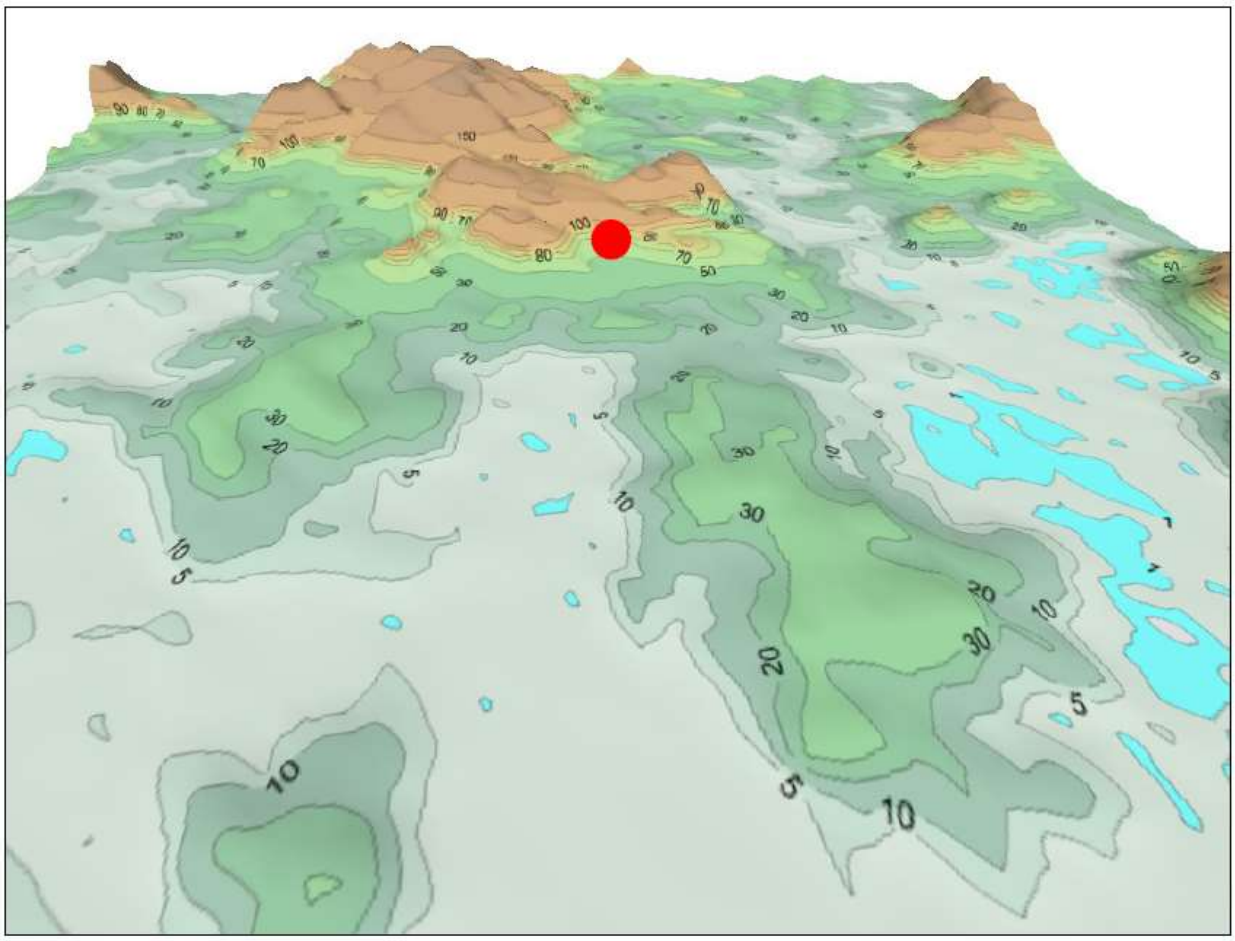

Figure 6.23: Local Topography Surrounding BHQ

5.9.2.2 *Baseline Deposited Dust Data*

Hanson conducts dust deposition monitoring at three locations as per the Site's Environmental Protection Licence (EPL). Dust Deposition results from September 2013 – August 2014 is summarised in **Table 5.9:1** and **Figure 6.24;**

Table 5.9:1: Bassline Deposited Dust Data

Location	Average (g/m^2/month)	Highest Monthly Rate (g/m^2/month)
Giles Road	0.5	0.9
Front gate	2.1	6.3 (6 mm of rainfall in this month)
Cattle Yards	0.5	6.0 (52 mm of rainfall in this month)

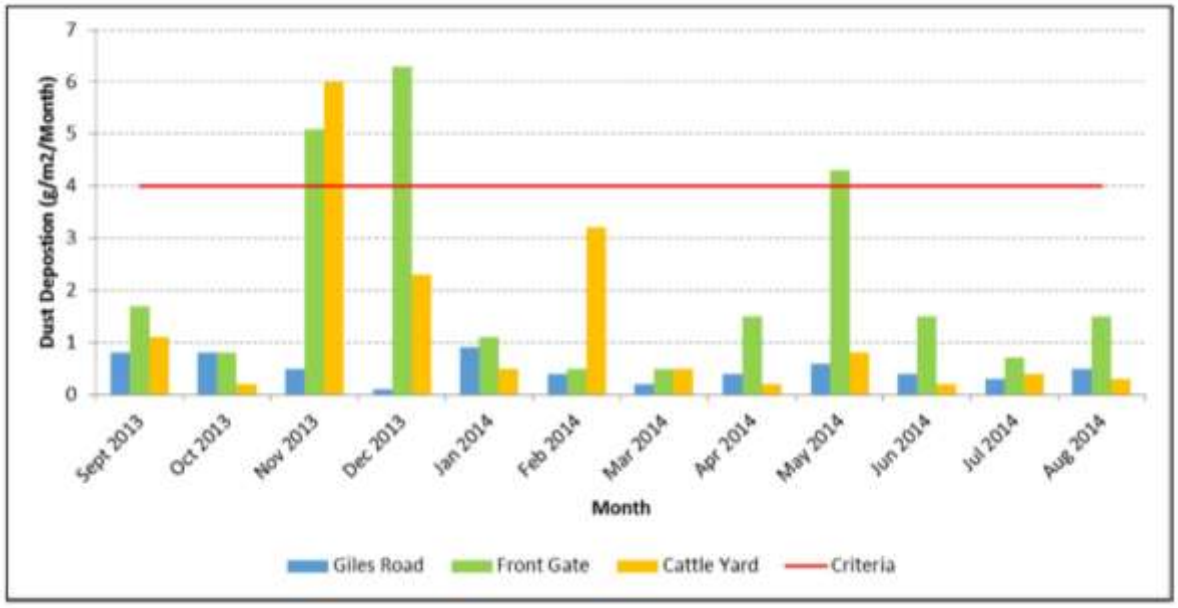

Figure 6.24: Dust Deposition (Insoluble Solids) Results [Hanson 2014]

Hanson commissions an external environmental consultant to collect and analysis the Dust Deposition data at Brandy Hill. The reports generally comment on the condition of the gauge and/or samples during each respective month. The commentary during the months showing exceedances (see above **Figure 6.24)** stated that the samples were affected by bird droppings or the gauge was compromised. There is no commentary relating to weather conditions or operational activities. It is consequently difficult to identify the corresponding operational or climatic drivers attributable to the reported exceedance. These are made more difficult to identify due to the month long exposure period.

It is thought that exceedances may have been driven by the stockpiling of road construction material near the front of the quarry by council. This may elevate the levels on occasion.

The Dust Deposition Gauge located near the front gate is adjacent to the sealed entrance road which is watered by the water truck. These circumstances would result in limited wheel generated dust. Additionally dust generation is a local issue, which means that no conclusions can be drawn as to the origin or the spatial extent of these exceedances. However, these exceedances appear to be infrequent and over the annual averaging period, deposited dust readings are compliant.

The location of the three DDGs is shown in **Figure 6.25** below

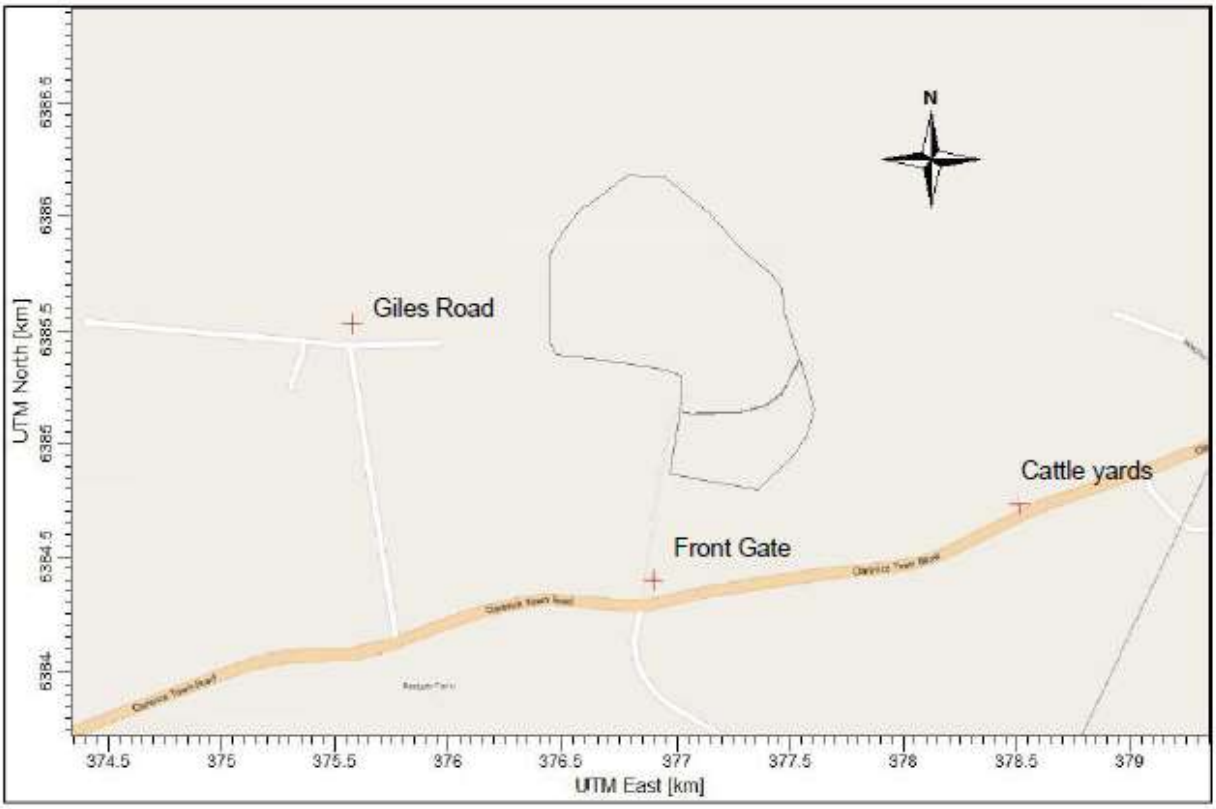

Figure 6.25: Approximate Dust Deposition Monitoring Locations (Hanson 2014)

5.9.2.3 *Pollutants of Concern*

The main emissions to air from quarrying operations are caused by wind-borne dust, vehicle usage, materials handling and transfers. Dust emissions considered in this air quality impact assessment include;

- Total Suspended Particles (TSP) - Particulate matter with a diameter up to 50 microns;
- PM_{10} - Particulate matter less than 10 microns in size;
- $PM_{2.5}$ - Particulate matter less than 2.5 microns in size;
- Respirable Crystalline Silica (RCS); and
- Dust Deposition – deposited matter that falls out of the atmosphere. Also referred to as nuisance dust.

5.9.2.4 *Emission Sources*

The main air quality issue associated with the Project will be dust generation associated with;

- the emissions from vehicles entering or leaving the site;
- mobile equipment exhaust emissions; and
- blast flume.

5.9.3 Methodology

Hanson commissioned Vipac Engineers and Scientists Ltd (Vipac) to prepare an *Air Quality Impact Assessment* for the proposed expansion of Brandy Hill Quarry. A detailed Air Quality Impact Report (AQIR) has been included in this EIS as **Appendix 11**. **Section 5.9.3.1 – Section 5.9.3.4** provides an overview of the methodology applied to the Air Quality Impact Assessment.

5.9.3.1 *Ambient Particulate Modelling*

PM_{10} is not currently monitored for compliance in the vicinity of Brandy Hill Quarry and therefore substitute data was used from Beresfield monitoring station which is the closest monitoring OEH monitoring station to the site. The Station is located approximately 14.2 km south west of BHQ.

$PM_{2.5}$ is likewise not currently monitored for compliance in the vicinity of Brandy Hill Quarry and therefore substitute data was used also from the Beresfield monitoring station. $PM_{2.5}$ concentrations in the regional of BHQ have been analysed in the year 2013.

Total Suspended Particles (TSP) are not currently monitored in the vicinity of the BHQ either. TSP concentrations have been assumed to be twice those of the measured PM_{10} concentrations at Beresfield. It is noted that the PM_{10} subset is typically 50% of the TSP mass in regions where road traffic is not the dominant particulate source (NSW Minerals Council, 2000).

Respirable crystalline silica (RCS) annual average background concentration is estimated to be 0.7µg/m^3 Toxikos (2005) as collected in Victoria (SLR, 2012). See Toxikos (2005) *Health Risk Assessment of Crystalline Silica from Alex Fraser's proposed Recycling/Transfer Station of Construction Waste, Clarinda*, Prepared by Toxikos Pty Ltd, February 2005, TR080105 RF. As there was not any local data, it is assumed that a suitable annual average background for RCS for the Project Site is 0.7µg/m^3.

5.9.3.2 *Assigned Background Concentrations*

The assigned Project background concentrations are detailed in

Table 5.9:2**.** It is noted that the annual $PM_{2.5}$ annual average already exceeds the 8 µg/m^3 criterion and the highest 24-hour PM_{10} concentration is 48.8 µg/m^3, which is just below the applicable criterion of 50 µg/m^3.

Table 5.9:2: Assigned Background Concentration

Parameter	Air Quality Objective	Period	Applied Background	Comments
TSP	90 µg/m^3	Annual	41.8 µg/m^3	Double annual average PM_{10}
PM_{10}	50 µg/m^3	25 Hour	Varies	Daily Beresford Data for 2013
	30 µg/m^3	Annual	20.9 µg/m^3	Annual Average Beresford Data
$PM_{2.5}$	25 µg/m^3	24 Hour	Varies	Daily Beresford Data for 2013
	8 µg/m^3	Annual	8.1 µg/m^3	Annual Average Beresford Data
Dust Deposition	4 µg/m^3	24 hour	2.1 µg/m^3	BHQ
Silica	3 µg/m^3	Annual	0.7 µg/m^3	No Local data – Vic used

5.9.3.3 *Meteorology*

Brandy Hill Quarry does not have any site-specific meteorological data available. Long term weather data has been obtained from the Bureau of Meteorology weather station Patterson Street (Tocal) Automatic Weather Station (site number 061250). Complete details regarding long term weather data recorded from Patterson AWS can be found in the Air Quality Impact Assessment.

The assessment used The Air Pollution Model (TAPM) used meteorological data to generate site meteorological data. The Patterson AWS is located approximately 10km west and 4 km north of the Project site and is influenced by mountains immediately to the west and north-west. The TAPM wind roses were extracted from the 1 km grid, therefore the overall location does not align with the AWS location. The wind rose could not be extracted from CALMET (California Meteorological Model) as the grid did not extend far enough.

The terrain between the AWS and the quarry is generally flat; however the quarry sits in a bowl with mountains in the west, north and east. Any differences in the wind fields will be addressed in the CALMET model.

The Approved methods for the Modelling and Assessment of Air Pollutants in New South Wales (Department and Environment and Conservation, 2005) provide detail in respect to the assessment methodology and criteria for air quality assessments. A Level 2 assessment (as stipulated by Department and Environment and Conservation, 2005) was applied to predict air

pollutant concentrations in accordance with NSW guidelines and is based on computational modelling and to determine controls where needed. The emission rates for individual mining activities were calculated in accordance with the *National Pollutant Inventory (NPI) - Emissions Estimation Technique (EET) Manual for Mining.*

Computational modelling of air dispersion is used to predict the maximum levels of air pollutants based on local topography, weather conditions and emission rates for various sources of pollutants. The maximum levels are compared with applicable criteria, and air quality controls are applied to reduce emission rates when non-compliance is predicted. The TAPM, CALPUFF, and CALMET models were used to simulate air quality impacts from BHQ. Further details of the methodology applied to model air quality associated with the BHQ proposed development are found in **Appendix 11**.

- **TAPM**: The Air Pollution Model is a 3-dimensional prognostic model which was both developed and verified for air pollution studies by the CSIRO. The output from TAPM was used in the CALPUFF modelling system.

- **CALPUFF**: CALPUFF also employs three-dimensional meteorological fields generated from the CALMET model by simulating the effects of time and space varying meteorological conditions in pollutant transport, transportation and removal.

- **CALMET**: CALMET is a diagnostic meteorological model used to reconstruct 3-dimensional wind and temperature fields. Overwater and overland boundary layers are used to run the CALMET simulation. CALMET is the meteorological pre-processor for the CALPUFF modelling system.

5.9.3.4 *Sources and Emission Estimation*

In general, the location of the mobile plant and blasting will be at a sufficient distance from the sensitive receptors such that the pollutants, including blast fume, will be dispersed fully and will not cause an impact. Additionally, the emissions from vehicles entering and leaving the site will potentially be double when compared to the existing situation; the vehicles will be using heavily trafficked roads and the increase in exhaust emissions associated with these vehicles will be negligible when compared to the existing (and expected) traffic flows on these roads.

Modelling simulated different phases of the Project as detailed below:

- Current: Current site operations with an annual production rate of 0.7 Mtpa;

- Stage 1: Proposed site operations with an annual production rate of 1.5 Mtpa with the construction of the bund but without the proposed concrete batching plant;

- Stage 2: Proposed site operations with an annual production rate of 1.5 Mtpa including the construction of the bund and the concrete batching plant; and

- Stage 4: Proposed site operations with an annual production rate of 1.5 Mtpa including the concrete batching plant and relocation of the fixed plant. At stage 4, the bund to the southern boundary will be complete and stand 18m high, however this bund had not

been modelled in CALLPUFF due to a limitation of the software. As such Stage 4 is representative of the relocation of the processing plant with the proposed mitigation measures for the new fixed plant.

Dust impacts from the trucks are calculated based on the capacity of the trucks and the production data from the quarry. The Noise Impact Assessment (**Appendix 9**) has assessed the potential noise impacts by considering the maximum number of truck movements that can be accommodated by Brandy Hill Drive, within the applicable noise criteria at the noise sensitive receivers located along Brandy Hill Drive.

Emission estimation for individual activities has been derived from NPI Emission Estimation Technique manuals and US EPA AP42 documentation. Estimation rates for $PM_{2.5}$ are limited; so to derive the ratio of PM_{10} to $PM_{2.5}$ US EPA AP42 documentation and the Western Regional Air Partnership study (WRAP, 2006), have been used.

All emissions are classed as fugitive and there are no point sources associated with the project. Fugitive emissions relate to pollutants released from points in a process e.g. windblown dust from stockpiles.

5.9.4 Impact Assessment

5.9.4.1 *Meteorology*

Findings showed that winds blowing from the west are dominant in spring, autumn and winter, carrying pollutants towards sensitive receptors R7, R8, R17 and R18. Receptors R11 to R16 is likely to be affected by north easterly winds during the summer months.

Atmospheric stability is the tendency of the atmosphere to resist or enhance vertical motion, and is categorised into six Stability Classes (A-F). The air quality impact assessment for Brandy Hill identifies that site falls into Stability Class D which is indicative of neutral conditions, neither enhancing nor impeding pollutant dispersion.

Mixing height is the height of the layer adjacent to the ground cover over which a tracer will be mixed (by turbulence) over a time period of approximately an hour. Data for the Project demonstrated diurnal variations in mixing depths, over which an increase in mixing depth during the morning was illustrated, and an onset of vertical mixing following sunrise. Maximum mixing depths were shown to occur in the mid to late afternoon.

Full meteorological assessments and associated explanation can be found in the Air Quality Impact Assessment (**Appendix 11**).

5.9.4.2 *Sources and Emission Estimation*

Emissions of TSP, PM_{10} and $PM_{2.5}$ are increased, when current operations and proposed operations are compared. During the construction of the bund (stages 1 and 2), one item of mobile plant has been relocated to the bund construction source rather than mobile plant source. The highest emissions of the total operations are mobile plant, crushers and screens, haul truck movements and unpaved roads and conveyors. Stage 4 will see the processing plant replaced and best practice mitigation measures adapted including enclosed conveyors.

5.9.4.3 *Modelled mitigation measures*

Mitigation measures have been included in the modelling conducted in this Air Quality Impact Assessment (AQIA). Where mitigation measures were unable to be modelled, they have been identified as proposed in **Table 5.9:3** below.

Table 5.9:3: Overview of mitigation measures included in the AQIA

Mitigation Measure	Modelled or proposed
Watering of haul roads	Modelled
Enclosed Screens	Modelled
Enclosed crushers	Modelled
Loading Stockpiles	Modelled
Enclosed conveyors	Modelled
Bund	Proposed

5.9.4.4 *Overview of Findings*

The main air emissions from BHQ operations are caused by wind-borne dust, vehicle usage, materials handling and transfers. A major source of dust will be from the construction of an18 m high bund at the southern boundary of the quarry, which once built will aid in reducing dust from exiting the site. Modelling is unable to consider the 18m high bund which will protect some sensitive receptors.

The results of the dispersion modelling include individual sensitive receptor and contour plots that are indicative of ground level concentrations. A complete summary of the air modelling results can be found in the *Air Quality Impact Assessment;* however this section provides an overview of the results.

Table 5.9:4: Air Quality Impact Assessment Summary

Pollutant	Time Basis	Criteria	Maximum Predicted Concentrations at Any Receptor				Compliant
			Current	Stage 1	Stage 2	Stage4	
TSP	Annual	90 ug/m3	50.3	58.9	61.0	48.5	Yes
PM_{10}	24 hour	50 ug/m3	50.4	68.0	70.8	53.1	No[1]
	Annual	30 ug/m3	23.5	26.5	26.9	22.8	Yes
$PM_{2.5}$	24 Hour	25 ug/m3	24.7	24.5	24.6	26.1	Yes
	Annual	8ug/m3	8.4	9.2	9.2	8.67	No[2]
Dust Deposition	Monthly Total	4 g/m2/month	2.4	2.9	2.9	2.3	Yes

	Monthly Increase	2 g/m2/month	0.3	0.8	0.8	0.2	Yes
RSC	Annual	3 µg/m^3	0.73	0.74	0.74	0.72	Yes

[1]Driven by high background concentrations on the 22nd October 2013 likely linked to the October 2013 bushfires.
[2] Exceedances driven by the high background concentration with already exceeds the criterion of 8µg/m^3.

Total Suspended Particles

It is noted that incremental increases in annual average TSP will be no greater than 19 µg/m^3 at all sensitive receptor locations. Vipac applied the annual average background concentration of 41.8 µg/m^3 to the model, with the result being less than 61 µg/m^3 annual average TSP. This is below the applicable criteria (90 µg/m^3), and as such TSP emissions from Brandy Hill are not predicted to adversely impact upon the sensitive receptors.

PM_{10}

Results and analysis

The results of the modelling show that Hanson's air quality emissions contribution falls within applicable criteria. However when modelled with background concentrations, 24 hour PM_{10} exceed applicable criteria in some stages due to high levels of background concentrations in 2013.

These exceedances are driven by high background concentrations on the 22/10/2013 which was recorded at 48.8 µg/m^3. This value is already close to the upper 50 µg/m^3 criteria limit, and has resulted in exceedances modelled during stages 1, 2 and 4 based on background concentrations measured on 22 October 2013.

Annual Average

PM_{10} will be less than the 30 µg/m^3 for all sensitive receptor locations. The highest annual average PM_{10} concentration is 26.9 µg/m^3 with a background concentration of 20.9 µg/m^3 (as presented in brackets in Table 9-6 of the Air Quality Impact Assessment).

$PM_{2.5}$

Results have been presented in the same manner as $PM_{10,}$ with average $PM_{2.5}$ concentrations presented in the table and background concentrations in brackets.

The results of the modelling have shown that Hanson's air quality emission contributions fall within applicable criteria. However when modelled with background concentrations annual $PM_{2.5}$ exceed applicable criteria during some stages of the Project due to high levels of background concentrations in 2013 and high background concentrations.

Again these exceedances are resultant of high background concentrations on 22 October 2013 and 24 October 2013.

Respirable Crystalline Silica (RCS)

RCS annual average criterion of 3 µg/m^3 has been applied for this assessment. The highest predicted RCS concentration is 0.74 µg/m^3, which will occur during stage 2. Therefore RCS concentration is below the criterion and not expected to impact on nearby sensitive receptors.

Dust Deposition

Predicted monthly average incremental dust deposition (g/m^2/month) is measured against the applicable maximum incremental increase criteria of 2g/m^2/month. Modelling shows compliance with the permitted maximum incremental increase. The maximum incremental criterion is based on NSW Approved Methods for the Sampling and Analysis of Air Pollution.

Additionally, when the background 2.1 g/m^2/month level is applied to the predictions, the highest monthly average is 2.88 g/m^2/month. The results fall below the total dust deposition criterion of 4 g/m^2/month.

5.9.4.5 *Impacts on Vacant Land*

The extent of the property boundary, with regard to the surrounding area of land under the ownership of Hanson, shown in ***Figure 2-1*** of the *Air Quality Impact Assessment* (**Appendix 11**). This illustrates that the majority of land between the Quarry and nearby receptors is owned by Hanson. There are no third party sensitive receivers located on the parcel of land located to the southeast of the Quarry between the Quarry & Clarence Town Road (Lot 25, DP1101305). There is no vacant land that is significantly closer to air emission sources than the sensitive prediction locations assessed in this report. Vipac notes that any emissions associated with the Quarry on Hanson's own property are assessable against health & safety criteria, to protect the health of employees.

5.9.4.6 *Blast Fume - ANFO*

Blast impacts generate dust and potentially noxious gases such as Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO). Blast Fume Impacts are also addressed in the GHG **Section 5.13** of this EIS.

Blast fumes can vary greatly depending on a number of factors but largely depend on the tendency of a particular blast to generate significant NO_2 emissions. Hanson currently commission Maxam Australia to undertake blasting at the quarry. Maxam use RIOFLEX MX 10000 as the explosive.

The NPI Emission Estimation Technique Manual for Explosives Detonation and Firing Range (Department of Sustainability, Environment, Water, Population and Communities, 2012) provides the following emission factors:

- NOx – 0.2 kg/tonne of explosive; and
- CO-17 kg/tonne of explosive.

The assessment has applied similar blasting requirements (i.e. applied average quantity of explosives per blasts [12,035kg]).

Assuming that the blasting requirements remain similar to the current situation; using the average quantity of explosives per blast (12,035kg) the resultant emissions are:

- NOx – 2,407 kg/blast or 28.9 tonnes/annum; and
- CO – 204, 600 kg/blast or 2,455.2 tonnes/annum.

The NSW EPA emissions inventory for the site shows similar values for the human emissions inventory for NOx and CO between the current operations and proposed project. Therefore an increase in NOx and CO emissions is not expected.

5.9.5 Mitigation and Conclusion

The main air emissions from BHQ operations are caused by wind-borne dust, vehicle usage, materials handling and transfers. A major source of dust will be from the construction of an 18m high bund at the southern boundary of the quarry, which once built will aid in reducing dust exiting the site.

Table 5.9:5 provides an overview of the mitigation measures.

Table 5.9:5: Overview of Mitigation Measures

Mitigation Measures Considered	Modelled/proposed
Watering of Haul Roads	Modelled (See Appendix B3 of the AQIA for more information)
Enclosed Screens	Modelled (See Appendix B3 of the AQIA for more information)
Enclosed Crushers	Modelled (Stage 4 only)
Loading Stockpiles	Modelled (See Appendix B3 of the AQIA for more information)
Enclosed conveyors	Modelled (Stage 4 only)
Bund	Proposed
Air Quality management plan (Appendix D of the AQIA).	Proposed procedures for ongoing dust control

Bund

As demonstrated in the air quality modelling results, the Project complies with the relevant criterion with the application of mitigation measures (see **Table 5.9:5**). Further to this the visual bund around the proposed infrastructure area is expected to provide further mitigation in limiting the dispersal of airborne particulate emissions. The height of the conveyors and other plant

components are not anticipated to protrude above the bund and therefore the emissions are expected to be significantly reduced at sensitive receptors along Clarence Town Road.

It should also be noted that constructing the bund will be temporary and these activities will be managed to minimise off site impacts. As the impacts will be temporary in nature and dust suppression and management techniques will be applied, high PM_{10} levels are considered a worst-case concentration.

General Mitigation

The Proponent will prepare an Air Quality Management Plan post approval for the ongoing air quality management of the project. The air quality management plan will include the following mitigation measures;

- Watering of stockpiles to minimise dust emissions from wind erosion as required;
- Minimising dust emissions from the construction of the bund by either watering, screening or revegetating;
- Watering unpaved haul roads and exposed ground as required, particularly in dry weather conditions; and
- Variable stacking heights.

Implementing modern design features for the plant upgrade including:

- Housing and screening of the processing plant once relocated; and
- Enclosure of conveyors.

5.10 Aboriginal and European Heritage

5.10.1 Overview

The SEARs stipulate that the EIS conduct an assessment inclusive of:

Requirements of the SEARs

An Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:

demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures;

outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); and

A historic heritage assessment (including archaeology) which must

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 the effectiveness and reliability of the measures).

Supplementary Information

Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005)

Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH)

Code of Practice for Archaeological Investigations of Objects in New South Wales 2010 (OEH)

Historic NSW Heritage Manual (NSW Heritage Office)

The Burra Charter (The Australia ICOMOS charter for places of cultural significance)

The Heritage Assessment is broken into two distinctive assessments being:

1. European Heritage; and
2. Aboriginal Heritage.

5.10.2 European Heritage

5.10.2.1 *Background*

The region in which the Project is located was originally inhabited by members of the Worimi tribe. Following European settlement, the first recorded European at Seaham was Captain

Paterson in 1823, who had sailed up the Williams River. Early exploration after Captain Paterson was undertaken by Henry Dangar, and a government cottage was constructed in 1920s in the township which is now known as Seaham. Brandy Hill was subdivided in the 1980s.

The Project site was owned previously by Thomas Bartie in 1831, however it appears that he primarily occupied land outside of the current Hanson owned property. Crown Plans show no evidence of any structures having been built within the Project Area, and few historic uses for the Project Area have been documented. The land was likely used for grazing of cattle and potentially the cultivation of crops. Logging took place in the Project area throughout the 19th and 20th centuries.

Whilst the Defence Forces utilised the land between Brandy Hill and Seaham for training prior to WWI and during WWII, there does not appear to have been any permanent industry or settlement within or nearby the Project area. A bushfire spread through the area in 1895.

Brandy Hill was opened as a quarry in 1983.

Greer and Brayshaw undertook an archaeological survey of the original Brandy Hill Quarry in 1983, which included an assessment area of 650m X 550m. The survey did not identify any archaeological sites in the area. Past land disturbance and poor visibility were noted as potential explanations for this, given the vulnerability of sites such as artefact scatters due to landscape modification.

5.10.2.2 *Existing Situation*

The *Historic Period Assessment and Statement of Heritage Impact Assessment* identifies whether archaeological remains exist within the Project area. Assessments of significance and any proposed impacts to archaeological remains and/or built structures have been made to determine the most appropriate management strategy. Full details of the assessment are included in **Appendix 12. Table 5.10:1** summarises the assessment's findings.

Table 5.10:1: Summery of Historical Analysis

(Biosis - Historic Period Assessment and Statement of Heritage Impact Assessment)

Date	Theme	Physical Evidence
? – Early 1800s	Aboriginal Past	Biosis has undertaken an Aboriginal Cultural Heritage Assessment of the Project Area as a separate assessment.
Early 1800s – 1838	Exploration and Early Settlement	There is no physical evidence of exploration or early settlement in the Project area.
1813 – 1950	Agriculture and Pastoralism	There is no physical evidence of exploration or early settlement in the Project area.
1820 – Present	Logging and Forest Management	While the majority of the trees in the area are not old growth, and it is obvious that the land has been cleared in the past, there is no other evidence of land clearance practices in the Project area.
1838 – Present	Town of Seaham	There is no physical evidence of the origins or development of the town of Seaham in the Project area.
1961 – Early 1900s	Historical Quarrying and Mining	No evidence of historical quarrying practices is evident within the Project area.

1911 - 1950	Defence	There is no physical evidence of Defence Force use of the Project area.
1983 – Present	Modern Quarry	The northern and eastern areas of the Project area have been heavily disturbed by quarrying activity and the installation of infrastructure associated with the quarry since 1983.

5.10.2.3 *Methodology*

A desktop assessment has been undertaken to review existing archaeological studies for the Project Area and the Brandy Hill and Seaham area.

A field inspection of the Project Area was undertaken on the 9 October 2014 by Biosis. The field inspection involved pedestrian survey of the Project Area in order to identify whether any historical items are present and to understand the character of any potential heritage items. The field investigation also sought to more accurately determine the nature and extent of the archaeological resources. A photographic record was prepared and the location of each photograph was recorded using a hand-held Global Positioning System and the Map Grid of Australia.

5.10.2.4 *Impact Assessment*

This assessment has established that there are no listed heritage items present in the Project area, and further research and field inspection did not identify any new heritage items, values, or potential archaeological deposits present within the Project area. The Project area has been assessed as having no heritage significance. Accordingly, there is no potential for the proposed development to impact on any non-Aboriginal heritage items or values within the Project Area.

5.10.2.5 *Mitigation and Conclusion*

Provided that the recommended procedure for the discovery of Unanticipated Historical Archaeological Sites (**Appendix 12**) is followed for the life of the Project as well as any additional conditions of approval, the Project is able to proceed.

No potential archaeological deposits were identified within the Project Area during the survey. The archaeological potential of the entire Project Area has been assessed as low. Accordingly, impacts to Aboriginal sites or areas or archaeological potential as a result of the proposed works are unlikely.

Should archaeological deposits or sites be identified during the project, salvage of features, retrieval of information through excavation or collection and interpretation will be investigated.

5.10.3 Aboriginal Cultural Heritage Assessment Report

5.10.3.1 *Background*

Aboriginal cultural heritage broadly refers to things that relate to Aboriginal culture and hold cultural meaning and significance to Aboriginal people (DECCW 2010, p.3). In the broader region surrounding Brandy Hill Quarry, the majority of artefacts are located close to water courses suggesting that water played a significant role in the location of Aboriginal occupation sites.

5.10.3.2 *Existing Situation*

Aboriginal people have inhabited the Australian continent for the last 50, 000 years, and the NSW area, for over 42, 000 years (Allen and O'Connell (2003); Bowler et al. (2003)). Evidence suggests that occupation of the Hunter region extends to 35, 000 years BP (AMBS 2012 pp. 19-20). The majority of sites fall into the period around 10, 000 years BP.

Few investigations of aboriginal cultural heritage have been conducted in the immediate vicinity of the Project Area. A number of projects have been undertaken in the nearby towns of Hexham, Tomago, Maitland, Black Hill, and Stroud.

5.10.3.3 *Methodology*

A search of the NSW Office of Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) database detected 16 previously recorded Aboriginal archaeological sites within a 10km x 10km search area centred on the Project Area. No previously recorded sites are located within or close to the Project Area.

A model was formulated to assist in predicting the type and character of Aboriginal cultural heritage sites likely to exist or have existed within the Project Area. All site types were predicted to have very low, low or moderate potential to occur or have occurred within the Project Area.

A field inspection of the Project Area was undertaken on the 9 October 2014 by Biosis. The field inspection involved pedestrian survey of the Project Area in order to identify whether any historical items are present and to understand the character of any potential heritage items. The field investigation also sought to more accurately determine the nature and extent of the archaeological resources. A photographic record was prepared and the location of each photograph was recorded using a hand-held Global Positioning System and the Map Grid of Australia. Representatives of the RAPs attended the field survey of the Project Area on 9 October 2014.

The heritage assessment criteria in NSW falls broadly within the significance values outlined in the Australian International Council on Monuments and Sites (ICMOS) Burra Charter (Australia ICOMOS 2013). Additional guidelines have been prepared by the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), the OEH and the Heritage Branch, NSW Department of Planning.

Consultation

The Aboriginal community has been consulted about the heritage management of the Project throughout its lifespan. Consultation has been undertaken in accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

The appropriate government bodies were notified and an advertisement was placed in the *Newcastle Herald* on Friday 18 July 2014. A search conducted by the Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW) listed no Aboriginal Owners with land within the Project Area. However, it was noted that the area is close to the Worimi Conservation Lands (WCL) and recommended that the Board of Management for the WCL be contacted. A search conducted by

the National Native Title Tribunal listed no Registered Native Title Claims, Unregistered Claimant Applications or Registered Indigenous Land Use Agreements within the Project Area.

The following Aboriginal groups registered an interest;

- Worimi Local Aboriginal Land Council (LALC)
- Gomeroi Namoi
- Lower Hunter Aboriginal Incorporated
- Maaiangal Aboriginal Heritage
- Mur-roo-ma Inc
- Nur-Run-Gee Pty Ltd

On 22 August 2014, Biosis provided the registered Aboriginal parties (RAPs) with details about the proposed development works (Project Information Pack) and a copy of the Project Methodology Pack outlining the proposed Aboriginal cultural heritage assessment process and methodology for this project.

Comments on the Project Methodology were received from Worimi LALC, Nur-Run-Gee, and Mur-roo-ma. All parties stated their support for the methodology put forward by Biosis, with Mur-roo-ma emphasising the importance of employing local knowledge holders in order to gain the most accurate assessment of the significance of the site. Representatives of the RAPs attended the field survey of the Project Area on 9 October 2014.

Registered stakeholders were given the opportunity to review the draft ACHAR and Archaeological Reports, and comment on the significance of cultural heritage relevant to the Project Area. Comments were received from Lower Hunter Aboriginal Incorporated, Maaiangal Aboriginal Heritage, Mur-roo-ma, Nur-Run-Gee, and Worimi LALC. No parties raised any issues with the draft reports, and all comments received are included in **Appendix 12.**

5.10.3.4 *Impact Assessment*

No Aboriginal sites or areas of Potential Archaeological Deposit (PAD) were identified during the field survey within the Project Area and no previously recorded sites are located within or close to the Project Area. The archaeological significance of the entire Project Area has been assessed as low. Overall, the Project Area has been assessed as having low Aboriginal cultural heritage significance. Accordingly, impacts to Aboriginal cultural heritage as a result of the proposed works are unlikely.

5.10.3.5 *Mitigation and Conclusion*

It has been determined that no further Aboriginal archaeological or cultural heritage assessment is required prior to the proposed works commencing. The proposed works may proceed with caution, contingent upon the following:

- **Discovery of Unanticipated Aboriginal Objects**

It is an offence to knowingly disturb an Aboriginal site under the *NSW National Parks and Wildlife Act 1974* without consent permit issued by the office of environment and heritage (OEH). Should any Aboriginal objects be encountered during works associated with this

proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. An archaeologist should be consulted for further recommendations should the find be determined to be an Aboriginal object.

- **Discovery of Aboriginal Ancestral Remains**

If any suspected human remains are discovered during any activity Hanson will:

- Immediately cease all work at that location and not further move or disturb the remains;
- Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location; and
- Not recommence work at that location unless authorised in writing by OEH.

- **Continued consultation with the registered Aboriginal stakeholders**

Hanson will meet the recommendations of the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010a) – or most updated document – regarding the consultation with Aboriginal parties should Aboriginal cultural heritage sites within the Project Area be identified.

- **Lodgement of Final Report**

A copy of the final report will be send to;

- OEH Hunter Central Coast Region
- Worimi LALC
- Nur-Run-Gee Pty Ltd
- Gomeroi Namoi
- Mu-roo-ma Inc
- Maaiangal Aboriginal Heritage
- Lower Hunter Aboriginal Incorporated

5.11 Water Resources

5.11.1 Background

The SEARs stipulate that a Water Impact Assessment should include:

Requirements under the SEARs

A detailed assessment of the potential impacts of the development on:

- the quantity and quality of regional water supplies;
- regional water supply infrastructure; and
- affected licensed water users and basic landholder rights (including downstream water users); and include;

A detailed site water balance, including 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;

An assessment of proposed water discharge quantities and quality/ies against receiving water quality and flow objectives;

Identification of any licensing requirements or other approvals under the Water Act 1912 and/or Water Management Act 2000;

Demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP);

A description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo; and

A detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;

Supplementary Information

NSW Water Management Act 2000

National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC)

National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC)

Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)

State Water Management Outcomes Plan Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009

NSW Government Water Quality and River Flow Objectives (DECC)

Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)

Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries.

Managing Urban Stormwater: Treatment Techniques (DECC)

Managing Urban Stormwater: Source Control (DECC)

Floodplain Development Manual (DIPNR)

Floodplain Risk Management Guideline (DECC)

A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

Technical Guidelines: Bunding & Spill Management (DECC)

Environmental Guidelines: Use of Effluent by Irrigation (DECC)

Groundwater NSW Water Management Act 2000

NSW Water Act 1912

Office of Water Guidelines for Controlled Activities (2012)

National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)

NSW State Groundwater Policy Framework Document (DLWC, 1997)

NSW State Groundwater Quality Protection Policy (DLWC, 1998)

NSW State Groundwater Quantity Management Policy (DLWC, 1998)

Guidelines for the Assessment & Management of Groundwater Contamination (DECC, 2007)

Any relevant Water Sharing Plan for groundwater and surface water resources

NSW Aquifer Interference Policy (2012)

The Water Impact Assessment comprises two distinct sections being;

1. Surface Water Impact Assessment; and
2. Groundwater Impact Assessment.

5.11.2 Surface Water

5.11.2.1 *Background*

Martens and Associates (Martens) reviewed the site's current surface water cycle and demand to predict the impact of the proposed Project on surface water in the locality. This involved preparing a comprehensive surface water management plan, water balance assessment, impact assessment, and long term surface water management plan. Detailed findings of the Surface Water Assessment are presented Martens' Surface Water Assessment (**Appendix 13A).**

The Surface Water Impact Assessment should be read in conjunction with Martens and Associates *Hydrogeological Assessment* (**Appendix 13B**). The Hydrogeological Assessment is summarised in Section 2.4 of the *Surface Water Impact Assessment*, which provides a brief summary of groundwater characteristics. Further clarification is available in the Hydrogeological Assessment provided in **Appendix 13B**.

5.11.2.2 *Existing Situation*

Drainage Lines and Surface Water Bodies

Three main drainage lines exist around Brandy Hill Quarry (see **Figure 6.26**);

1. Deadman's Creek forms the northern and eastern boundaries of the quarry and drains to the Williams River which flows to the Hunter River.
2. The site drainage path to the south of the quarry is also to Deadman's Creek.
3. The various unnamed drainage paths to the south west of the quarry drain to Barties Creek which flows to the Hunter River.

These drainage lines represent grassed depressions in the topography. No channel or standing water was observed in any of the drainage lines.

One storage dam and five sedimentation basins exist on the site:

1. Storage dam
    a. Bunds currently divert surface water around the pit at the top of the catchment. Diverted surface water south of the pit flows to the western dam.
    b. The western dam is fed by surface water with no significant groundwater inflows.
    c. The approximate catchment area of the western dam is 13.0 ha.

d. Site water is stored in the western dam for use in road, pit and plant dust suppression, product moisture conditioning, maintenance and vehicle washing.

e. The western dam has a surface area of 1.12 ha and is estimated to be approximately 6 m deep based on the embankment height in the site survey

f. Based on these parameters and the Farm Dams Assessment Guide (1999) the estimated capacity of the western dam is 27 ML.

2. Sedimentation basins

a. The crushing plant, stockpile area and western dam overflows drain to sedimentation basin 1.

b. Sedimentation basin 1 flows to sedimentation basin 2 and then polishing basin 3 for treatment via settlement.

c. The haul roads and quarry void drain to the northern and eastern sedimentation basins.

d. Sedimentation basins are fed by surface water with no significant groundwater inflows.

e. Sedimentation basin surface areas are detailed in full in Appendix 13A – *Surface Water Impact Assessment*

Discharge Points: The site has three licenced discharge points of which Hanson currently discharges water primarily from Discharge Point 1 (DP1).

Licencing: There are currently no surface water or groundwater access licences for the site. The only water licences on-site apply to the nine groundwater monitoring bores and are covered by six licences.

Water Quality: Site specific water quality monitoring has been undertaken at site groundwater bores, site surface water bodies and in Deadman's Creek by VGT Environmental Compliance Solutions.

Clean Water Diversion System: Bunds currently divert surface water around the pit at the top of the catchment. Complete details are outlined in **Appendix 13A** – *Surface Water Impact Assessment.*

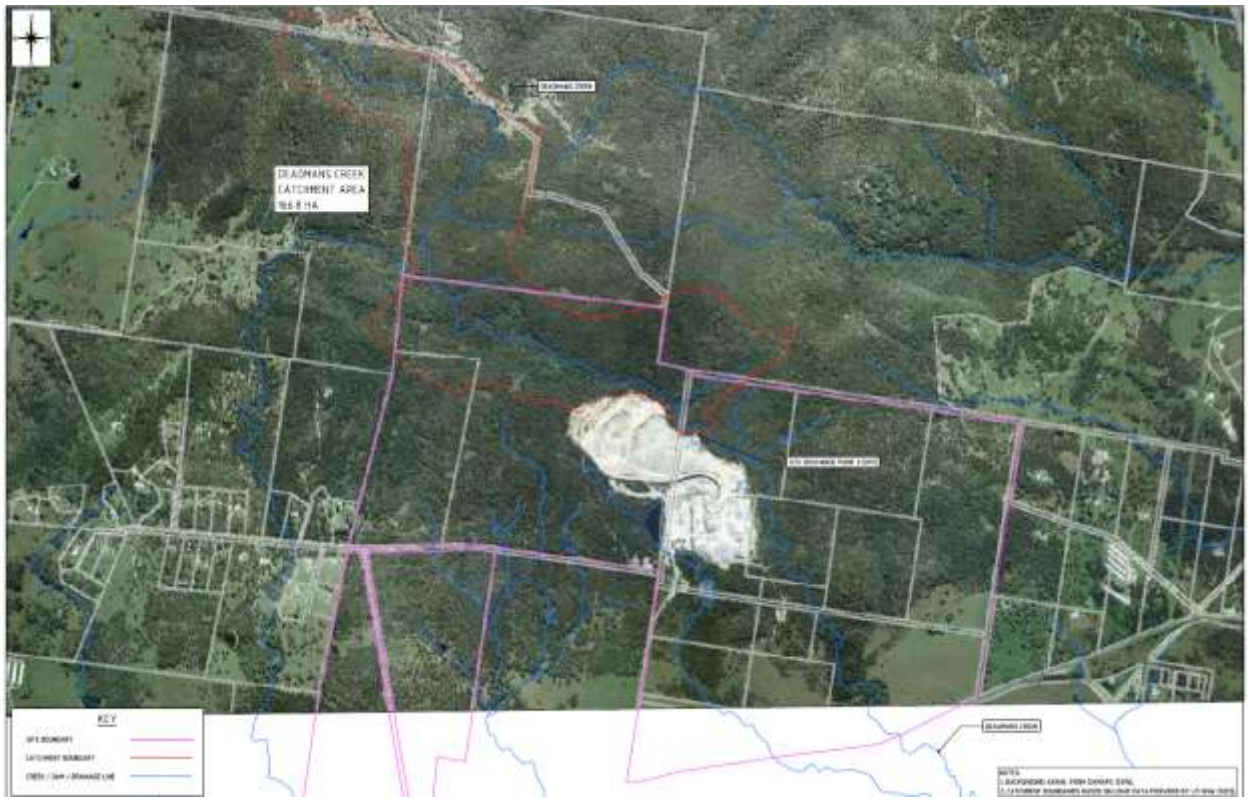

Figure 6.26: Site Surface Water Features

5.11.2.3 *Methodology*

The Surface Water Impact Assessment has been prepared in consultation with the following agencies, of which the complete details are provided the *Surface Water Assessment* (**Appendix 13A**);

- NSW Department of Planning and Environment (DoPE)
- NSW Office of Water (NOW).
- NSW Environmental Protection Authority (EPA).
- NSW Office of Environment & Heritage (OEH).
- Hunter Water Corporation.
- Hunter Local Land Services (previously Hunter-Central Rivers Catchment Management Authority).

Martens undertook field investigations was undertaken on 24th September 2014 which included inspection of existing water cycle quarry infrastructure and the surface water drainage diversion system.

The quarry conducts site specific water quality sampling at groundwater bores, Deadman's Creek and surface water bodies. These were assessed for water salinity, Total Suspended Solids (TSS), total nitrogen and total phosphorous.

The Surface Water Impact Assessment included preparation of:

1. **Methodology for the surface water management plan** referring to;

- Landcom (2004), Managing Urban Stormwater: soils and Construction Handbook
- Department of Environment and Climate Change NSW (2008), Managing Urban Stormwater Soils and Construction Volume 2E Mines and Quarries.
- Department of Land and Water Conservation NSW (2000), Soil and Landscape Issues in Environmental Impact Assessment

The Surface Water Management Plan provides a description of elements proposed for the site surface water management system and the identification of performance criteria and design objectives. The Surface Water Management Plan includes a review of current surface water management systems, controls and design. The Plan then applies relevant mitigation measures to ensure that off-site land is protected. Assessment has included the various stages of the project life where applicable.

The existing sedimentation basins have been reviewed for design adequacy for current and future operations.

2. **Methodology for the water balance assessment**

Water Source and Demand

The water balance assessment applies a mean annual rainfall to determine the long term water demand and supply balance. This is appropriate for the long term, with water balance sensitivities assessed using wet and dry conditions. Stormwater inflows are calculated based on the quarry pit catchment area at each stage of expansion. The mean annual rainfall from Tocal BOM station of 934mm/year was applied, with a runoff coefficient of 0.9 from DECC (2008) which is based on high runoff from steep, well drained, unvegetated rock quarry faces. Western dam stormwater inflows are calculated similarly to pit inflows, except that the volumetric runoff coefficient of 0.2 is applied for the forested catchment area (Landcom, 2004).

Groundwater inflows are determined through modelling completed by Martens (**Appendix 13**) and have been applied to the water balance assessment.

Roof water was calculated by applying the total roof area of 800m^2, and adopting a runoff coefficient of 0.8 and an average annual rainfall of 934mm/year.

Water Demands

Water demands were calculated using 12 months of daily water usage and production volumes capturing seasonal demand variations typical during a year of production. Evaporative loses are conservatively estimated using sedimentation basin surface areas.

Water demand for staff amenities is calculated by assessing the proposed staffing numbers and applying the demand of 50 L/person/day.

Water Balance

A water balance assessment was calculated for average rainfall conditions and also extreme wet and extreme dry conditions. The extreme dry conditions assessment was undertaken based on the 95th percentile lowest annual rainfall on record at Tocal (679 mm from 1969 – 2013).

Extreme wet conditions assessment has been undertaken based on 95th percentile highest annual rainfall on record at Tocal (1,235 mm).

Water Balance Sensitivity Analysis

Water Balance Sensitivity Analysis was conducted by comparing water balances for each stage for 95 th percentile dry, average and 95 th percentile wet conditions. Water security and maximum discharge assessment was conducted in the same manner.

3. Methodology for the water quality assessment

The methodology adopted for the surface water quality impact assessment is as follows;

- Water quality indicators assessed include total suspended solids (TSS), total phosphorus (TP), total nitrogen (TN) and salinity.
- Assessment compares water quality for existing conditions (i.e. pre development) and proposed Stage 5 conditions (i.e. post development). Stage 5 was adopted considering it would have the highest amount of runoff and hence the most pollutants.
- Water discharged from the quarry is a combination of surface water runoff and groundwater inflows.
- Surface water contributions were determined through stormwater quality modelling of flow and pollutant concentrations, using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC). The model was supplemented with salinity concentration data from site surface water monitoring.
- Groundwater contributions were determined based on groundwater flows (modelled as part of Martens and Associate's Hydrogeological Assessment of the site) and monitored concentrations to evaluate pollutant groundwater concentrations from the site.
- Resultant discharge water quality was assessed based on contributions from both surface water and groundwater (Section 5.6).

4. Methodology storm water quantity assessment

Channel-forming discharge has been assessed in respect to the Average Recurrence Interval peak flow rate. The DRAINS (Stormwater Drainage System design and analysis program) software package (version 2015.11 – 16 October, 2015) was used with the RATFS hydrological engine to assess the 1 in 2 year ARI peak flow rates for a range of storm durations between 2 hours and 72 hours to determine the maximum channel forming discharge flow rate for Deadman's Creek.

5. Methodology for the Impact Assessment

An impact assessment of the following identified potential impacts was performed:

- Reductions in downstream water quality due to changes to catchment land use;
- Reductions to off-site surface water flows due to catchment loss;
- Geomorphic impacts to natural watercourses due to changed site discharge regime;

- Increased stormwater runoff from the proposed quarry and increased risk of flood impacts;
- Changes in surface water supply to licensed water users and changes to basic landholder rights of adjacent properties; and
- Changes to regional water supply and impacts on associated infrastructure.

The assessment also presents a contingency response plan in the event that sampling and/or inspection indicates that TSS, pH or oil and grease in sedimentation basins exceed trigger-criteria.

6. **Methodology for Long Term Surface Water Management**

The long term surface water management regime is based on the on the Surface Water Management Plan presented in Section 3 of the Surface Water Management Plan (**Appendix 13**).

5.11.2.4 *Impact Assessment*

1. **Surface Water Management Plan**

Sediment and Erosion Control

Should management of runoff and sediment be ineffective, potential impacts are:

- Soil loss and land disturbance;
- Degradation of vegetation and the ecological value of land downstream.
- Alteration of and damage to natural drainage channels and creeks;
- Increased sediment pollution in receiving waters.
- Increased salinity and clogging in waterways and surface water bodies;
- Soil degradation through nutrient decline, structural decline and the disturbance of acid sulphate soils; and
- Reduced aesthetic values of off-site bushland and waterways.

  (DLWC 2000, Landcom 2004)

In order to mitigate these potential impacts, bunds, sediment fences and sedimentation basins shall be installed to protect off-site land.

Wastewater Management System

Managed in accordance with the *Wastewater Management Assessment* (Martens 2015).

Water Storages (see **Figure 6.27**)

The following details the water storages on-site;

- Western Dam;
- Sedimentation Basins;
- Treated Stormwater Storage; and
- Rainwater Tanks.

Discharge Points and Criteria

Reuse of water from sedimentation basins will reduce discharge volumes, with surplus water discharge to be suitably managed for each stage of development. Discharges will only occur if EPL conditions are met (i.e. TSS < 50 mg/L) and when all site water storage dams are at capacity.

Discharge regimes are detailed in **Appendix 13A –** *Surface Water Impact Assessment.*

Water Transfers and Reuse

Water transfers are proposed during each development stage to maximise reuse and minimise risk of uncontrolled overflow. Water transfers and reuse are shown in Attachment B and are summarised in Table 6 and Table 7 of **Appendix 13A** – *Surface Water Impact Assessment.*

Basin Operations

Basins are managed in accordance with required performance criteria. Criteria and basin performance are detailed in **Appendix 13A** – *Surface Water Impact Assessment*.

Licencing Requirements

Neither of the sedimentation basins captures clean water via runoff or pumping. Site sedimentation basins are excluded from the harvestable rights dams' capacity calculation and are exempt from *Water Management Act (2000)* licencing in accordance with NSW Government Gazette 40 dated 31 March 2006 (pages 1628 to 1631).

The only proposed surface water structures other than site sedimentation basins are the Stage 3-5 storage dam (8.9 ML) and the western dam (maximum 26.79 ML under existing conditions). These are below the site's maximum harvestable right dam capacity of 49.9 ML based on the NOW online calculator and are also exempt from Water Management Act licencing. Therefore, capture of surface water runoff within the quarry void is an authorised supply and is considered reliable.

Rehabilitation Areas Management

The site shall generally drain towards the backfilled quarry pit. Runoff from rehabilitated areas within the site is not anticipated to be a potential source of water pollution. All runoff will naturally be captured and detained within the pit, preventing any offsite migration of sediments.

Figure 6.27: Water Stores Location on Site

2. Water Balance

A water balance is used to describe the flow of water in and out of a system. It reflects the relationship between input and output of water through an area. The water balance for the project has been applied as per methodology outlined in **Section 5.11.2.3.** The water balance assessment for Brandy Hill has been calculated to determine the long term water demand and supply balance. This section outlines the impact assessment associated with the calculation of the site's water balance.

Water Source and Supply Assessment

Water will be sourced from the following:

- Surface runoff into the quarry pit.
- Groundwater inflow into the pit.
- Harvested roof water.

Pit stormwater inflows are calculated based on the quarry pit catchment area at each stage of expansion. Average pit stormwater inflow calculations are shown in **Table 5.11:1** below. The western dam will continue to receive stormwater during Stages 1 and 2 before it is removed in Stage 3. Western dam average stormwater inflow calculations are detailed in **Table 5.11:2.**

Table 5.11:1: Pit Average Stormwater Inflow Calculations

Stage	Pit Catchment Area (ha)	Pit Stormwater Inflow (ML/year)2
Stage 1	24.6	207.0
Stage 2	38.4	322.7
Stage 3	43.6	366.4
Stage 4	60/9	511.6
Stage 5	72.8	611.7

Table 5.11:2: Western dam average stormwater inflow calculations.

Stage	Western Dam Catchment Area (ha)	Western Dam Stormwater Inflow (ML/year)2
Stage 1	7.9	14.8
Stage 2	6.2	11.6

Groundwater Inflows

Groundwater inflows modelled for each stage of proposed works are summarised in **Table 5.11:3** below. These values are used as inputs into the water balance calculation.

Table 5.11:3: Groundwater dewatering rates due to the quarry void

	Dewatering Rate (ML/yr)		
Stage	Minimum	Maximum	Average
Stage 1	103.0	172.0	137.5
Stage 2	172.0	315.1	243.6
Stage 3	315.1	423.7	369.4
Stage 4	423.7	515.7	469.7
Stage 5	515.7	642.2	578.9

Roof water

A roof water supply of approximately 1.6 KL/day is assumed for all stages of quarry expansion, assuming adequate roof water tanks are provided. Roof water supplies shall be supplemented

by a water cart, using water supplied from the quarry water stores. The roof water assessment is detailed further in **Appendix 13A** – *Surface Water Impact Assessment.*

Quality of Water Supply

Roof water runoff is assumed to have a salinity concentration of 500 mg/L (i.e. fresh water), adopted on upper bound concentrations from sampling of over 150 roofs in eastern Sydney. This value is applied to demonstrate that water quality will be suitable for all staff amenities.

Stormwater is assumed to have a salinity concentration of 420 mg/L (i.e. fresh water) based on an average of site monitoring. Groundwater is assumed to have a salinity concentration of 1,800 mg/L (i.e. brackish water) based on an average of site monitoring. Water used for site dust suppression, material conditioning and maintenance is likely to be brackish (approx. 1,000 mg/L) which is considered suitable for site operational uses.

Water Demand

Water demands consider:

- Site operational demands;
- Evaporation; and
- Site amenities.

Daily water usage and production volumes have been monitored for 12 months (ongoing), capturing seasonal demand variations, site operations and water management regimes. This data is appropriate for tong-term (i.e. average) water balance assessment.

Water Balance – Average Rainfall Calculations

Reuse opportunities: Site stormwater runoff is to be collected and stored in sedimentation basins and recycled to meet operational requirements.

Staff amenities: Staff amenities, administration building and maintenance sheds shall be supplied by harvested rainwater for internal uses. Where required the tank shall be supplemented with trucked-in water.

Water Balance: there is a water supply surplus for all stages of the proposed development.

Martens' complete water balance assessment is detailed in **Appendix 13A** – *Surface Water Impact Assessment.*

Surplus Water Management

- Surplus water will be available during all stages of quarry development.
- All surplus waters from sedimentation basins shall be discharged via licensed site discharge points in accordance with the Surface Water Management Plan and site EPL #1879.
- Discharge will occur on an *ad hoc* basis in response to rainfall and site requirements.

Water Balance Assessment – Extreme Dry / Wet Conditions

Martens and Associates have completed a water balance assessment based on extreme wet and dry rainfall conditions (see **Section 5.11.2.3**). The water balance comparison of water balances for each stage for the 95th percentile dry (**Table 5.11:4**) and 95th percentile wet conditions; (**Table 5.11:5)** representing the potential range of water balance outcomes for each stage of the development and demonstrating the sensitivity of water balance to meteorological conditions.

Table 5.11:4 and **Table 5.11:5** below show that in all scenarios besides stage 1 (95% dry conditions), that the supply of water will exceed project demands i.e. water will be in oversupply. **Table 5.11:6** summarises the information presented in **Table 5.11:4** and **Table 5.11:5,** illustrating that the peak excess water balance occurs in stage 5 during the 95% wet conditions assessment. 1441 ML/yr will be discharged during stage 5 and the environmental impacts of this are presented in **Section 5.5.2.3** and **Appendix 7E.** Proposed mitigation measures are outlined in **Appendix 7E.**

Table 5.11:4 All stages water balance summary for 95th percentile dry conditions

Stage	Supply (ML/yr)	Demand	Balance (ML/yr)
Stage 1	279	335	56
Stage 2	450	310	140
Stage 3	581	278	303
Stage 4	771	349	422
Stage 5	937	298	639

Table 5.11:5: All stages water balance summary for 95th percentile wet conditions.

Stage	Supply (ML/yr)	Demand	Balance (ML/yr)
Stage 1	443	35	408
Stage 2	716	39	677
Stage 3	910	31	879
Stage 4	1217	43	1174
Stage 5	1475	34	1441

Table 5.11:6: All stages annual water balance summary for average 95th percentile dry and 95th percentile wet conditions (ML/yr).

	Balance (ML/yr) – excess / (deficit)		
Stage	95th Percentile Dry Conditions	Average Conditions	95th Percentile Wet Conditions
Stage 1	(56)	181	408
Stage 2	140	410	677
Stage 3	303	587	879
Stage 4	422	792	1174
Stage 5	639	1031	1441

Water Security

The average annual water balance assessment demonstrates that all stages of the project have adequate water for operations and will have varying volumes of surplus water (**Table 5.11:6**). Analysis for the 95th percentile dry conditions estimated a water deficit of 56 ML/year in stage one. During extreme dry conditions, production and site area based usage rates are likely overestimated as they involve extrapolation from daily usages to yearly usages, without consideration of any wet days in the 'dry' year. It is improbable that Stage 1 will experience significant water deficit even in 95th percentile dry conditions. If water deficit is anticipated (prolonged drought conditions and low water storage levels) site management practices can be adapted to reduce water demands.

Maximum Discharge

In 95th percentile wet conditions there is potential for stage 5 water surplus of 1441 ML/year, which is 40% higher than the average conditions surplus (**Table 5.11:6**). The surplus water is treated on site to ensure compliance with EPL criteria before discharge via the licenced discharge points. The potential environmental impacts associated with this volume of water discharge per annum are presented in **Section 5.5.2.3** and **Appendix 7E.** Proposed mitigation measures are also outlined in **Appendix 7E.**

5.11.2.5 *Impact Assessment*

Potential impacts associated with the proposed project include:

- Reduction in downstream water quality due to changes to catchment land use;
- Reductions to off-site surface flows due to catchment loss;
- Increased stormwater runoff from the proposed quarry and increased flow impacts;
- Changes in surface water supply to adjacent users; and
- Changes to regional water supply and associated infrastructure.

Water Quality

The Project will result in an alteration in annual sediment loads due to changed land use of existing vegetated areas. Sediment loads will be managed through site sediment and erosion control plans and conservative design of site sedimentation basins. Basins will be designed to capture, treat, and contain sediment loads from stormwater flows. Basin design will ensure the surplus water is treated on site to ensure compliance with EPL criteria before discharge via the licence discharge points.

Concentrations of TSS, TP and TN are shown to reduce by the water assessment modelling. These concentrations will meet adopted DECCW (2006) objectives and have neutral or beneficial effects. Modelling also confirms site discharges of these pollutants will not have an unacceptable impact on the environment.

Concentration of salinity was determined to increase by up to 18%, in the proposed stage 5 conditions. This is due to increased proportion of groundwater to stormwater inflow. Discharge salinity will consequently increase gradually over proposed development staging up to this maximum concentration. The drainage network downslope of the site is an area of agricultural use where existing aquatic values are likely to be already altered due to agricultural activities and intermittent flow from Deadman's Creek. The most likely use of receiving waters is for stock purposes. The small increase in salinity will not affect this use. Martens concludes that increased salinity concentrations will not have an unacceptable impact on the environment or the creek's use.

In summary, the DECCW objectives are achieved in that discharge water quality will be acceptably maintained and aesthetics will not be adversely affected.

Water Quantity

A stormwater quantity assessment has been undertaken to assess the channel forming discharge flow rate in the receiving natural watercourse (Deadman's Creek). This assessment will inform the site's excess water discharge regime's design and allow and evaluation of potential geomorphic impacts resulting from identified likely excess water requiring discharge from the site during all stages.

Channel forming discharge is the 1 and 2 year Average Recurrence Interval (ARI) peak flow rate (U.S. Army Corps of Engineers, 1994). Flow rates below this threshold are unlikely to resulting geomorphic impacts to natural channels such as Deadman's Creek. The critical 1 in 2 year ARI storm duration was determined to be 9 hours, and the channel forming discharge flow rate was determined to be 3.45 m^3/s, or 3,450 L/s.

The maximum average conditions discharge during all stages of the development occurs during Stage 5 and is 1,031 ML/yr, or 32.7 L/s if discharged constantly. The extreme wet / dry conditions assessments show Stage 5 discharge could vary between 639 ML/yr and 1,441 ML/yr, or 20 – 46 L/s on average.

If excess waters are only discharged on wet days for 24 hours a day then the Stage 5 average flow rate would be 93 L/s (over 24 hours). The flow rates for 95th percentile dry and wet years is 58 L/s and 130 L/s (over 24 hours) respectively. These flow rates represent less than 5% of the

channel forming discharge, and will only occur during Stage 5, as all other stages have less excess water.

Further, if excess waters are only discharged on wet days (the lowest number of wet days per year on record was 75 in 1968); the Stage 5 average flow rate would be 160 L/s (over 24 hours). Equivalent 95th percentile dry and wet year flow rates would be 99 L/s and 223 L/s. These flow rates represent less than 7% of the channel forming discharge flow rate. Based on this it is highly unlikely that any water leaving the site will have a potential to alter the current geometric form of Deadman's Creek.

A reduced catchment size will result in a reduction in volume of water passing through the drainage lines during storm events. There will be negligible change to Deadman's Creek catchment, and no consequent alteration in flow rates and volumes in the creek. Overall the reduction in the catchment area of drainage line 2 represents approximately 2% of the entire Deadman's Creek catchment to the Williams River and henceforth changes to the Williams River and the Hunter River will be negligible. There will be a reduction in the catchment size of drainage line 2 and 3 which drain onto grassed depressions and will have no environmental consequence.

Pit dewatering of collected stormwater runoff and groundwater inflow will increase overall flows to downstream drainage lines.

> Recommendations: Martens recommends that site discharges only occur on wet days to emulate existing natural flow of receiving waters.

Geomorphic Impacts

The Proposed discharge regime for excess waters represents at most less than 5% of channel forming discharge in the receiving waterway. Sensitivity analysis for extreme wet years shows the discharge is less than 7% of channel forming discharge. The proposed discharge regime is therefore not expected to result in any adverse geomorphic channel change and impacts are considered acceptable.

Flooding

Flood flows up to and including the Probable Maximum Flood (PMF) will not increase flows from the project in comparison to existing flows. The PMF is the largest flood that could conceivably occur at a particular location which is based on environmental data (i.e precipitation etc.). The depth of the pit below ground level is more than 18m for all stages. The pit will consequently contain any flood flows within the void. Discharge flows will be controlled using a pump and will therefore not increase over existing discharge flow rates.

Licenced Water Users and Basic Landholder Rights

Under the *Water Management Act (2000)* there are three types of basic landholder rights being;

- Domestic/stock;
- Native title rights; and
- Harvestable rights (dams).

Martens are not aware of any downstream surface water licenced extractors. There are no online dams on Deadman's Creek downstream of the site which could have their domestic/stock rights and native title rights impacted by the proposed development. The Surface Water Impact Assessment has proven that if there were downstream licenced surface water users, they would not be adversity affected for these reasons:

- Apart from extreme dry conditions during stage 1, all other modelled stages of quarry development will discharge excess water and increase the availability of water to any downstream users.
- There will be no increase in TSS, TP, or TN concentrations resultant from the proposed development. Minor increases to salinity concentrations are not expected to materially affect downstream users.
- The proposed discharge regime for excess waters will not result in any adverse geomorphic channel changes downstream of the site.

The project will have no impact on basic landholder rights of adjacent users to collect 10% of rainfall as per harvestable rights. The development will not cross Hanson property boundaries or reduce offsite land areas.

Based on the foregoing, the proposed development would not adversely affect downstream licenced water users or basic landholder rights of adjacent properties.

Regional Water Supply

Seaham Weirpool is located on the Williams River 6km upstream of the confluence with Deadman's Creek. All excess surface water from the proposed development discharges to Deadman's Creek and is therefore downstream of the weir.

Any changes to surface water flows due to the proposed development will have no impact of the quality or quantity of regional water supplies. There is no other regional surface water supply infrastructure in the local area.

Occasional water demands for supplementary water supply (during periods of prolonged low rainfall) shall be extremely small and shall not impact on regional water supplies.

5.11.2.6 *Mitigation and Conclusion*

Mitigation measures have been incorporated within the quarry's design and include the following:

- sediment basins and water capture, recycling and reuse systems; and
- management of water discharge systems to maintain existing downstream flow regimes.

Complete details of the Surface Water Management Plan can be located in Appendix B of the *Surface Water Impact Assessment* (**Appendix 13A**) which illustrates the location of sedimentation basins.

The Surface Water Impact Assessment includes a Surface Water Monitoring Plan which will be implemented for the life of the project unless otherwise agreed by the regulatory body. This will include:

- Visual inspection of basins and the outlet; and
- Water quality testing in the event of discharge, particularly TSS, oil and grease, and pH.

Contingency and Response Plan

In the event that inspection and/or sampling indicates that TSS, pH or oil and grease in sedimentation basins exceed trigger-criteria, the contingency plan detailed in section 6.4 of the *Surface Water Impact Assessment* (**Appendix 13A**) will be applied.

Martens Surface Water Impact Assessment has determined that no other mitigation measures are considered necessary.

5.11.3 Groundwater

5.11.3.1 *Background*

The site's Hydrogeological Assessment was undertaken by Martens and Associates (Martens) and peer reviewed by Dr. Noel Merrick of Hydro Algorithmics Pty Ltd. The assessment reviews potential groundwater drawdown at licenced water bores from extraction pit dewatering, potential groundwater drawdown at surrounding groundwater dependent ecosystems, dewatering rates, and rehabilitation equilibrium conditions and timing. The complete *Hydrogeological Assessment* is in **Appendix 13** of the EIS. Dr. Noel Merrick's peer review report is included in **Appendix 13**.

Proposed Extraction Staging

Site extraction operations are proposed to be completed in five stages. Extraction staging is shown in Attachment B of the Surface Water Impact Assessment (**Attachment 13)** and is summarised below:

- Stage 1: Increased extraction extends 140m west and 160m south of the existing pit and to a maximum depth of 22 m AHD. Construct concrete batching plant.
- Stage 2: Increased extraction extends 270m south of the Stage 1 pit boundary (to the southern site boundary) and to a maximum depth of -8m AHD.
- Stage 3: Increased extraction extends 280m east of the Stage 2 pit boundary (along the southern site boundary) and to a maximum depth of -38m AHD.
- Stage 4: Increased extraction extends 430m east and 80m south of the Stage 3 pit boundary and to a maximum depth of -58 mAHD. Relocate the site plant and stockpiling area.
- Stage 5: Increased extraction extends 100m east and 140m south of the Stage 4 pit boundary and to a maximum depth of -78m AHD.

Rehabilitation: the post quarrying void is proposed to be partially filled with water from direct rainfall, upstream run off and groundwater inflow.

5.11.3.2 *Existing situation*

Brandy Hill Quarry Characteristics

The existing Brandy Hill Quarry is situated on the eastern slopes of Brandy Hill adjacent to the Deadman's Creek incised valley. Pre-quarrying contours show slopes of 10% - 30%. Slopes to the south of the quarry are mostly consistent with pre-quarrying slopes. Slopes north of the quarry gradually increase to steeper slopes of greater than 50% (opposite site of Deadman's Creek). Brandy Hill Quarry has been an extractive industry and used for the processing of hard rock since 1983. The site occupies approximately 561 ha, 18.6 ha is occupied by the quarry; 11.1 ha by the crushing plant; and 5.3 ha by the aggregate stockpile area. The remainder of the site is bushland and cleared lands.

Excavation Depth

The quarry is currently approved to a maximum excavation depth of 30m AHD, and quarries rhyodacite.

The site has a total of 10 boreholes around the quarry expansion area which have been drilled to a depth where sandstone or mudstone is reached. There are 9 monitoring loggers installed over the site which measure the groundwater level at regular intervals continuously throughout the day.

Surrounding Licenced Groundwater Bores

There are 13 licenced groundwater bores within the project study area. Of these, the closest offsite bore is 2.1 km south east of the quarry which is a supply bore (See **Figure 6.28**).

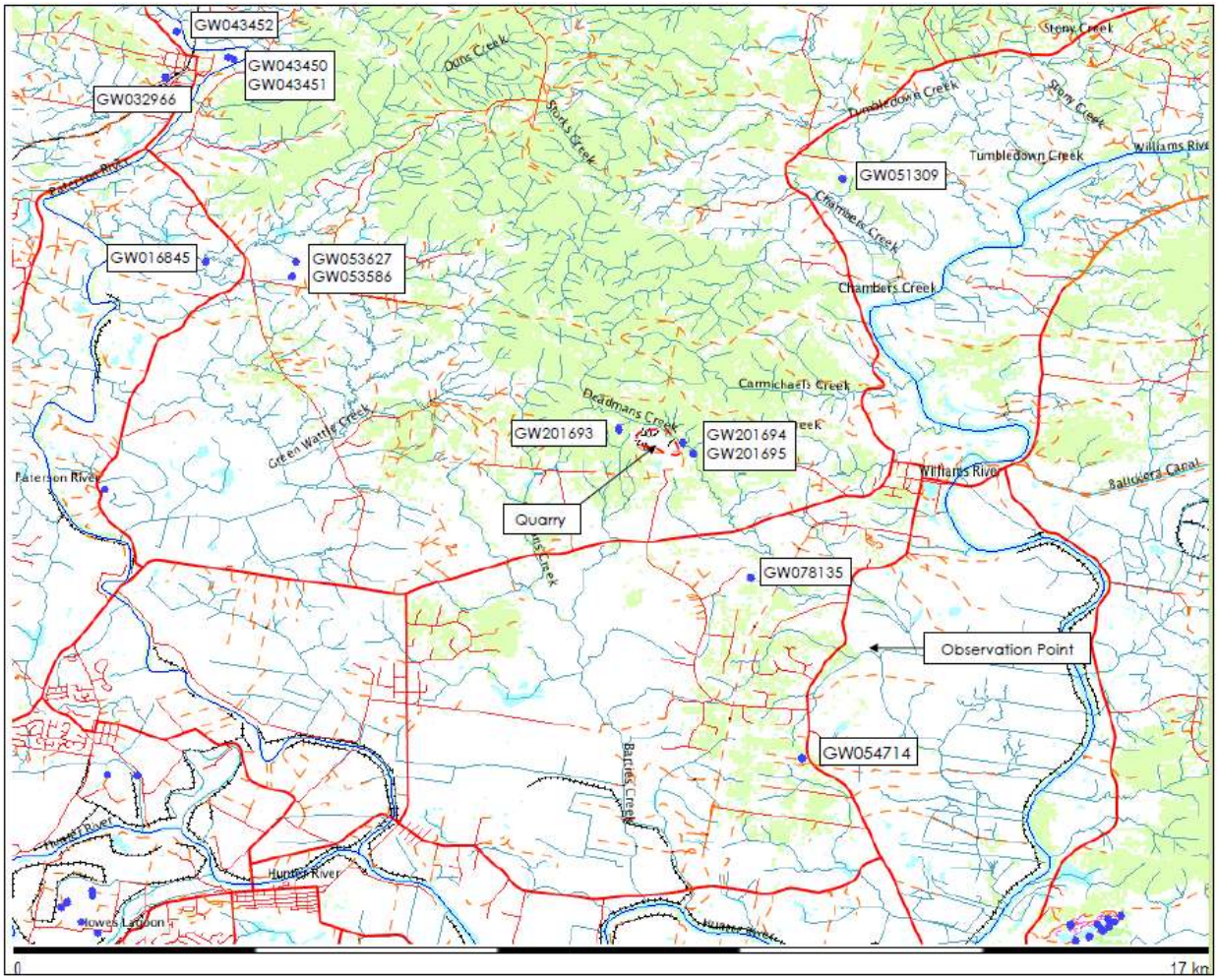

Figure 6.28: Surrounding Licenced Groundwater Bores

5.11.3.3 *Methodology*

The groundwater assessment compromises the following tasks:

- Government agency consultation,
- Data collection and analysis,
- Predictive groundwater modelling, and
- Sensitivity analysis.
- Peer review

Agency Consultation

Consultation with NSW Office of Water (NOW) was undertaken in preparation of this EIS. Details of correspondence are provided in the Hydrogeological Impact Assessment (Appendix 13).

Available Data

- Climate and River Gauge Data: Data from the Tocal BOM station has been used for rainfall and evaporation analysis. The NSW Office of Water River and Stream Data website details two river gauges in the study area, at Raymond Terrace and Green Rocks, which report water level, but do not record stream flow.
- Groundwater Levels: Time series plots of groundwater levels and daily rainfall were calculated for the project. An additional assessment was conducted for individual bore holes.
- Groundwater Quality: Site quality sampling was undertaken at 8 of the 9 site groundwater monitoring bores by VGT Environmental Compliance Solutions. 78 samples were taken over the period 26 August 2014 to 1 May 2015; noting the sampling regime is ongoing. Regional groundwater data was consulted to confirm salinity concentrations.
- Groundwater Productivity: Groundwater system productivity was assessed using the Department of Primary Industries Office of Water NSW Aquifer Interference Policy.

Hydraulic Conductivity: Hydraulic Conductivity of ignimbrite has been calculated using packer test data. Additional review of bore logs and rock core photographs was also undertaken.

Methodology - hydrological assessment

The hydrological assessment contains four components:

1. Hydrological Conceptualisation and Modelling;
2. Assessment of existing conditions applying numerical groundwater models;
3. Predictive numerical groundwater models; and
4. Sensitivity/uncertainty analysis.

Hydrological Conceptualisation and modelling

Full details of the hydrogeological conceptualisation are included in the Hydrogeological Assessment (**Appendix 13**). In summary the assessment addresses:

- *Conceptual Hydrogeological Model*
- *Rock Jointing/Fracturing*
- *Hydraulic Conductivity (K), Storage and Confinement*
- *Flow Directions and Water Table Elevation*
- *Sources and Sinks*

Existing conditions applying numerical groundwater models

Site field data including groundwater level monitoring data, packer test data and borehole data was assessed to develop a conceptual hydrogeological model. This model was used to develop a 3D numerical groundwater model using MODFLOW, which was calibrated in steady and transient states, with subsequent predictive and combined sensitivity / uncertainty models. These models were applied to quantify likely drawdown at licenced bore and Groundwater

Dependent Ecosystems (GDEs), groundwater ingress and quarry dewatering rates using predictive modelling scenarios.

1. Pre quarry conditions – contours shown in the 1983 quarry EIS were digitised to represent pre quarrying terrain.
2. Existing development – final form – extraction to 30 mAHD in the base of the quarry pit.
3. Proposed development – increased extraction area and extraction to –78m AHD in the base of the quarry pit following proposed extraction staging (Attachment B).
4. Post quarry rehabilitation equilibrium conditions – groundwater levels at the conclusion of proposed development quarrying. The proposed development model was used to form the initial head for the post quarrying model.

Predictive numerical groundwater models

Two predictive groundwater models were established, these being:

Pre quarry conditions to the end of the proposed development conditions.

End of proposed development conditions and onward to determine end of quarry life requirements.

The Proposed Development Model The model runs over a 67 year period, from pre-quarry status to end of the quarry's life. This Model applies boundary conditions, stress periods, time steps and site data to model groundwater characteristics associated with the project.

The end of quarry life model runs from the year 67 to year 567, in which transient quarry drains, transient quarry recharge, evaporation, conductivity and storage boundaries were applied specifically to end of life modelling.

A varying rainfall predictive model was also completed for the project. The results from this model have not been relied upon for impact analysis but have been referred to in discussion of natural fluctuation in study area groundwater characteristics.

Sensitivity/Uncertainty Analysis

Various sensitivity/uncertainty runs were completed in addition to the base case using the transient calibration model.

Peer Review

HydroAlgorithmics Pty Ltd. Modelling scenarios and details of the assessment methodology were refined in consultation with Dr Merrick.

5.11.3.4 *Impact Assessment*

The groundwater assessment evaluates these factors of the project:

1. Rehabilitation
2. Groundwater quality
3. Groundwater system productivity

4. Impacts on groundwater dependent ecosystems (GDEs)
5. Drawdown at offsite licenced bores
6. Dewatering
7. Impacts on rivers and creeks
8. Post Quarry Rehabilitation
9. Salinisation
10. Licencing requirements

Quarry Rehabilitation – Proposed Partial Water Filling

The post quarrying void is proposed to be partially filled with water from direct rainfall, upstream runoff and groundwater inflow. Water in the void will rise to an equilibrium level of approximately 25.6m AHD where total inflow equals total outflow (refer Section 6.3.5 and Section 8.4 for details). The final balanced water level is below the current maximum depth quarry floor level (30m AHD) and below pre quarry ground level (30 – 85m AHD). The final quarry depth is appropriate for rehabilitation.

Groundwater Quality

Groundwater of the site's rock aquifer is brackish and therefore unsuitable for potable use. It may be of some agricultural use if adequate yield were achieved (which is unlikely given the low permeability of rock).

Groundwater System Productivity

The site and study area groundwater systems do not meet the criteria for groundwater quality or supply and are considered to have low productivity or usage potential.

Drawdown at GDEs

The GDEs identified by Biosis (Section 3.10 of the Hydrogeological Assessment, **Appendix 13**) are all terrestrial vegetation which is dependent on the soil moisture 'groundwater' system in the shallow soil profile and at the soil rock interface. This groundwater system will not be significantly impacted by proposed quarrying as it is reliant on local rainfall recharge and infiltration which will be unchanged by the project.

Importantly, the GDEs identified are not dependent on the regional ground water table being drawn down. The predicted drawdown will not impact identified GDEs.

Drawdown at Offsite Licenced Bores

A greater than 2m drawdown criterion has been applied to the impact assessment as this is consistent with the maximum permissible drawdown before 'make good provisions' apply in accordance with the NSW Aquifer Interference Policy (2012). One offsite licenced bore within the model domain is affected by a greater than 2m drawdown from the pre-quarry head level.

Dewatering Rates

Pit dewatering rates peak at the conclusion of proposed quarrying, when the pit is at its lowest proposed level (-78mAHD). The de-watering rate at this time is 642 ML/year. Management of excess groundwater includes retention, reticulation and disposal schemes as outlined in Martens' Surface Water Impact Assessment (**Appendix 13A** and outlined in the mitigation measures **Section 5.11.3.5**

River and Creek Rates

River Impact Assessment: The maximum reduction to the Williams River base flow consequent to quarry expansion is 7.9 ML/year, and the permanent reduction at rehabilitation equilibrium conditions is 1.6 ML/year. This is considered to be a conservative measure and represents 0.002% of mean annual flow in Williams River. Additionally the permanent reduction of 1.6ML/year is similarly insignificant compared to annual river flow rates.

Maximum drawdown extents are sufficiently distant not to cause impacts to alluvial water of the Hunter River.

Creek Impact Assessment: the predicted maximum reduction in creek base flow caused by the proposed quarry expansion is not considered significant and impacts are deemed acceptable.

Post Quarry Rehabilitation

The equilibrium lake surface area is approximately 25.6 mAHD and occurs after 163 years after rehabilitation following quarry closure. There will be some permanent changes to the groundwater regime within the model domain, however these will not be significant for current or future groundwater users (refer to Section 8.5 of the Hydrological Assessment – **Appendix 13B**).

Salinisation

Salt mass balances have been assessed to quantify the potential impacts of both surface and groundwater salinisation resultant from evaporation from the rehabilitation lake's surface.

Quarry Lake Equilibrium Saline Concentration: Results show that at equilibrium conditions, groundwater entering the pit lake at 1,560 ppm salinity will exit at 2,068 ppm which represents an increase in 508 ppm or 33% over existing conditions. The additional salt load in the groundwater leaving the site will be 110, 329 kg/yr.

Surface Water Salinity Impact Assessment: Due to the large existing salt mass in the Hunter River, there is no significant change in average salinity caused by additional salt from the rehabilitated quarry lake. Minimum annual flow recorded at Greta (45, 496 ML/yr) results in an outflow concentration of 3,753 ppm which represents a 0.06% change in river salinity.

Groundwater Salinity Impact Assessment: In equilibrium conditions groundwater salinity at bore GW078135 will increase by 452ppm. This represents 12.6% increase; however there is no change in beneficial groundwater use as the groundwater will still be (slightly more) brackish. Such water classification is unsuitable for potable and most agricultural purposes.

Salinity impacts are considered acceptable in accordance with the NSW Aquifer Interference Policy (2012).

Licencing

The site is to be located within the *North Coast Fractured and Porous Rock Groundwater Sources Water Sharing Plan (WSP)*, however at the time of writing this plan was still in development and had not been gazetted. Site groundwater licencing is therefore covered by the *Water Act, 1912*.

Water licencing with a sufficient share component for the taking of water shall be required is anticipated. Granting of the water licence and management of the allocation and share components of the grant are bound by the provisions of the Water Act.

At equilibrium conditions there is no net groundwater outflow from the quarry void and no permanent groundwater licencing is required as a result. Reaching equilibrium conditions is estimated to take 165 years after quarrying is completed. There will be long term requirements for the site to maintain groundwater extraction licences.

Licensable groundwater take at each stage of the proposed development and through the rehabilitation period is detailed in Table 29 of the Hydrogeological Assessment (**Appendix 13B**). The table details the maximum licensable groundwater take predicted to occur during stage 5 of the Project, at 642 ML/yr. Annual groundwater licencing requirements are to be reviewed regularly based on ongoing data collection.

5.11.3.5 *Mitigation and Conclusion*

The hydrogeological impact assessment concludes that the Project can proceed with an acceptable level of impact to the environment and stakeholders, including licenced bore users. Mitigation measures are necessary, to be implemented to minimise impacts. These measures are:

- Further assessment at licenced bore GQ51309 (or representative location) prior to quarrying below the existing approved quarry floor level, due to the greater than 2m drawdown modelled, to provide an appropriate benchmark for impact assessment.
- Hanson will ensure ongoing yield of the bore is available to the licenced user or ‘make good’ to compensate any loss of bore yield.
- Predicted groundwater take will be licenced in accordance with the *Water Act 1912.*
- A monitoring program will be developed in consultation with NOW and any other relevant agencies following Project approval.
- Two additional groundwater bores will be installed at the south and south eastern site boundaries should drawdown greater than that predicted be detected in these locations.

Conclusion

The quarry will not significantly or detrimentally effect local hydrogeological systems. Impacts on nearby groundwater users and ecological systems will be acceptable, for the duration of the proposed project and following rehabilitation.

5.12 Waste Management

5.12.1 Background

The SEARs stipulate that the EIS include:

Requirements under the SEARS

accurate estimates of the quantity and nature of the potential waste streams of the development; including any leachate and acid generating potential;

a waste disposal strategy, including any leachate;

details of the importation of materials onto the site; and

a description of measures that would be implemented to minimise production of other waste, and ensure that that waste is appropriately managed.

Supplementary Information

Waste Classification Guidelines (EPA)

A Waste Management Impact Assessment has been conducted by Hanson Construction Materials Pty Ltd. A complete report is in **Appendix 14**.

Legislative requirements for managing waste are prescribed by these Acts and Regulations:

- Protection of the Environment Operations Act 1997.
- Protection of the Environment Operations (Waste) Regulation 2005.
- Waste Avoidance and Resource Recovery Act 2001.

Waste is classified in groups that pose varying risks to human health and the environment. This allows for appropriate management of these waste-types and their disposal. The Department of Environment, Climate Change and Water (DECCW) *Waste Classification Guidelines 2008* identifies six waste classes:

- Special waste
- Liquid waste
- Hazardous waste
- Restricted solid waste
- General solid waste (putrescible)
- General solid waste (non-putrescible)

5.12.2 Existing Environment

Management of waste at BHQ follows a hierarchy established under the *Waste Avoidance and Resource Recovery Act (2001)* which ensures that resource management options are considered with the following priorities:

- **Avoidance** including action to reduce the amount of waste generated.

- **Resource Recovery** including reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources.
- **Disposal** including management of all disposal options in the most environmentally responsible manner.

5.12.3 Methodology

A Waste Management Impact Assessment has been prepared by Hanson Construction Materials Pty Ltd. The assessment involved review of the wastes that are currently managed at BHQ as well as a prediction of wastes generated throughout the project.

An assessment of the following waste types included;

10. Domestic Waste
11. Sewage
12. Oil and Grease
13. Batteries
14. Sediment
15. Tyres
16. Metal
17. Overburden
18. Construction waste

5.12.4 Impact Assessment

The assessment has summarised the waste currently generated at Brandy Hill Quarry and the waste likely to be generated at maximum production levels. The data is presented in **Table 5.12:1** and **Table 5.12:2** below:

Table 5.12:1: Waste quantities currently generated at BHQ

Waste	Quantity
Domestic waste (admin)	65m^3 per year
Domestic waste (workshop)	170m^3 per year
Sewage	Unidentifiable due to transpiration system[1]
Sediment	Removed when required and used on site
Overburden	All stripping has occurred in the current extraction area
Tyres	4 – 8 per year
Metal	26m^3 per year
Oil and grease	18,000 litres per year

Batteries	4 – 6 batteries per year

[1]Effluent flows through preformed pipes into an underground lined bed, covered with vegetation. The water is removed by evaporation and transpiration through the vegetation. The volume of effluent passing through this system is not quantified.

Table 5.12:2: Predicted waste generated at BHQ at maximum production levels

Waste	Quantity
Domestic waste (admin)	65m^3 per year
Domestic waste (workshop)	340m^3 per year
Sewage	Unidentifiable due to transpiration system
Sediment	Recycled on site
Overburden	2M m^3 to be used on site over 30 year consent
Tyres	6 – 12 per year
Metal	52m^3 per year
Oil and grease	36,000 litres per year
Batteries	4 – 6 batteries per year
Construction waste	40m^3 during construction of concrete plant

5.12.5 Mitigation and Conclusion

Hanson will establish a general recycling program as part of ongoing project operations. The Plan will address the following in accordance with **Table 5.12:1** and **Table 5.12:2**;

- Identify the various waste streams;
- Estimate the volumes of waste material that would be generated by the Project.
- Describe and justify the proposed strategy for disposing of this waste material;
- Describe what measures would be implemented to meet the requirements of the Rehabilitation Management Plan – See Section 5.16 and Appendix 18; and
- Implement a program to monitor the effectiveness of these measures.

5.13 Greenhouse Gases

5.13.1 Background

Requirements under the SEARS

- a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions;
- a qualitative assessment of the potential impacts of these emissions on the environment; and
- an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency.

Supplementary Information

National Greenhouse Accounts Factors (Australian Department of Climate Change (DCC))

Guidelines for Energy Savings Action Plans (DEUS)

Scientists have developed a system called Global Warming Potential to allow GHGs to be described in terms equivalent to CO_2, which is the most prevalent greenhouse gas. This is called equivalent carbon dioxide emissions (CO_2-e), with a unit of one tonne of CO_2-e (t CO_2-e) as the basic unit used in carbon accounting. An emissions inventory, or 'carbon footprint', is calculated as the sum of the emission rate of each greenhouse gas multiplied by the global warming potential.

5.13.2 Existing Situation

A greenhouse gas (GHG) assessment has been undertaken by VIPAC engineers. This assessment determines the carbon dioxide equivalent emissions (CO_2-e) from the project according to international and Commonwealth guidelines. Greenhouse gases include water vapour, carbon dioxide (CO_2), methane, nitrous oxide and some artificial chemicals such as chlorofluorocarbons. These gases vary in in respect to their effect and longevity in the atmosphere.

Blast Fume

The process of blasting has the potential to generate both dust and noxious gases such as Nitrogen Dioxide (NO_2) and Carbon Monoxide (CO). Blast fumes can vary greatly depending on a number of factors but largely depend on the tendency of a particular blast to generate significant NO_2 emissions.

5.13.3 Methodology

The Commonwealth Department of Environment has published a methodology for calculating greenhouse gas emissions, known as the National Greenhouse Accounts (NGA) Factors

Workbook(Department of Environment, 2014), which is based on a range of anthropogenic activities known to produce greenhouse gases (GHG).

As defined by the NGA Factors Workbook, the scope of reporting is determined by:

Scope 1: Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO2-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.).

Scope 2: Indirect emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO2-e per unit of electricity consumed.

Scope 3: Indirect emissions for organisations that:

a. Burn fossil fuels: to estimate their indirect emissions attributable to the extraction, production and transport of those fuels; or

b. Consume purchased electricity: to estimate their indirect emissions from the extraction, production and transport of fuel burned at generation and the indirect emissions attributable to the electricity lost in delivery in the transmission and distribution network.

Emission factors used in this assessment have been derived from either the Department of Environment, site-specific information or from operational details obtained from similar emission sources. This is elaborated upon in **Appendix 11.**

The operation of the BHQ will result in GHG emissions from power generation, mobile plant use, staff travel, and product transport fuel emissions.

5.13.4 Blast Fume

The National Pollution Inventory (NPI) Emission Estimation Technique Manual for Explosives Detonation and Firing Range (Department of Sustainability, Environment, Water, Population and Communities, 2012) provides the following emission factors:

- NOx – 0.2 kg/tonne of explosive; and
- CO-17 kg/tonne of explosive.

The assessment has applied similar blasting requirements (i.e. applied average quantity of explosives per blasts (12,035kg)).

5.13.5 Impact Assessment

5.13.5.1 *Ammonium Nitrate Fuel Oil (ANFO)*

Scope 1 emissions are also produced by ANFO. The Mining Association of Canada provides an emission factor of 0.189 tonnes carbon dioxide per tonne. Based on information provided by Hanson relating to the amount of area currently blasted at Brandy Hill, it has been calculated that for 1.5 Mtpa, 8 tonnes of explosive will be used per annum. The calculated CO_2 emissions are 1.5 tonnes per annum and 45 tonnes CO_2 over the 30 year life of the quarry.

5.13.5.2 *Purchased Power Supply*

Proposed annual Scope 2 and Scope 3 emissions of CO_2-equivalents from the consumption of purchased electricity are;

- Scope 2 (indirect): 2, 847.6 t CO_2-e
- Scope 3 (embodied): 621.9 t CO_2-e
- Total: 3, 469.4 t CO_2-e

5.13.5.3 *Equipment Fuel*

The proposed annual emissions for machine fuel (diesel, petrol and E10) is 2, 527.4 t CO_2-e.

5.13.5.4 *Product Transportation and Staff Travel*

Proposed annual product transportation inclusive of product transportation and staff travel for direct (Scope 1) and embodied (Scope 3) emissions is 8,093.1 t CO_2-e.

5.13.5.5 *Total Annual Emissions*

Total annual emissions including machine fuel, electricity, product and staff transportation is equal to 14, 089.9 t CO_2-e.

In 2012, the reported net GHG emissions for Australia was 558 Mt CO_2-e (Department of the Environment, 2013). Compared with the Scope 1 emissions from BHQ, the lifetime emissions from BHQ will represent approximately 0.0005% of total emissions. A reduction in GHG emissions can be achieved through the reduction in consumption of fuel. This can be achieved through reduction of haulage distances within the pit, mobile plant operational time and reduced consumption of purchased electricity.

The potential installation and operation of more efficient plant during relocation of the processing plant will assist BHQ reduce GHG emissions; however these potential reductions in energy consumption have not been calculated in this assessment.

5.13.5.6 *Blast Fume*

The bulk load of explosive for Brandy Hill in the past 12 months was 144,423kg with an average of 12, 035kg used per month.

Emissions are calculated at;

- NOX – 2,407kg/blast or 28.9 tonnes/annum; and
- CO – 204, 600kg/blast or 2,455.2 tonnes/annum

The NSW EPA emissions inventory for the site shows similar values for the human emissions inventory for NOx and CO between the current operations and the proposed Project. Therefore an increase in NOx and CO emissions is not expected.

6.11.1.1 Summary

Calculating the GHG emissions for the life of BHQ, based on an extraction rate of 1.5 Mtpa for 30 years the following GHG emissions are expected:

- Scope 1 emissions: 296,072.5 tonnes CO2-equivalent;
- Scope 2 emissions: 85,426.5 tonnes CO2-equivalent; and
- Scope 3 emissions: 41,242.5 tonnes CO2-equivalent.

5.13.6 Mitigation and Conclusion

There are no direct mitigation measures proposed for the Project to manage GHG emissions. Hanson actively and continuously assesses consumption of purchased energy, including equipment fuel, product and staff travel and total emissions through the Company's Continuous Improvement Initiative. Whilst this program is in operation, it will be applied to the Brandy Hill Quarry.

5.14 Visual Impact Assessment

5.14.1 Background

Requirements under the SEARS

- A detailed assessment of the:
    - changing landforms on site during the various stages of the development; and
    - potential visual impacts of the development on private landowners in the surrounding area as well as key vantage points in the public domain.
- A detailed description of the measures that would be implemented to minimise the potential visual impacts of the development.

A Visual Impact Assessment (VIA) of the proposed Brandy Hill Quarry Expansion site has been prepared by Hanson Construction Materials Pty Ltd. The purpose of this assessment is to identify and document the character of the existing surrounding visual landscape and identify any potential visual impacts of each stage of the Project.

The visual impact assessment adopted the commonly accepted methodology, which identifies potential viewing platforms, photographic recordings of existing conditions, photomontage composition, and a quantification of these visual impact element viewing platforms. The assessment accounted for vegetation characteristics and location, land form geomorphology, view quality, visual absorption capacity and visual impact significance. This methodology enables definitive predictive determination of visual impacts pertaining to the Project.

This chapter presents a summary of the potential projected impacts to the visual amenity associated with the proposed Project. The complete report is in **Appendix 15.**

5.14.2 Existing Environment

The Project PVC is bounded by native vegetation to the north, northwest, and northeast. Privately owned properties encapsulate the eastern, southern and western perimeters of the site. Dwellings on these properties are mainly situated in the township/rural locality of Seaham/Brandy Hill, many are located along Clarence Town Road to the south of the Project, Croft Road to the west of the Project, and Mooghin Road to the east of the Project.

In the broader geographic context, the Project is strongly defined by the low lying basin of the Port Stephens Region. Additionally, Wallaroo National Park is situated 10km to the east of the Project and Uffington State Forest and Columbey National Park are located 7km to the north east. These areas act as long-distance visual barriers, filtering visual pollution from viewing platforms situated in surrounding regional locations.

There are three (3) main aspects of the proposed Project expansion that have potential to alter the visual impact of Brandy Hill Quarry on the surrounding visual amenity. These are the

proposed expansion of the quarry footprint, the relocation of the quarry plant, and thirdly the construction of a concrete batching plant.

Figure 6.29: Existing Environment facing north to Brandy Hill (1)

Figure 6.30: Existing Environment facing north to Brandy Hill (2)

Figure 6.31: Existing Environment facing north to Brandy Hill (3)

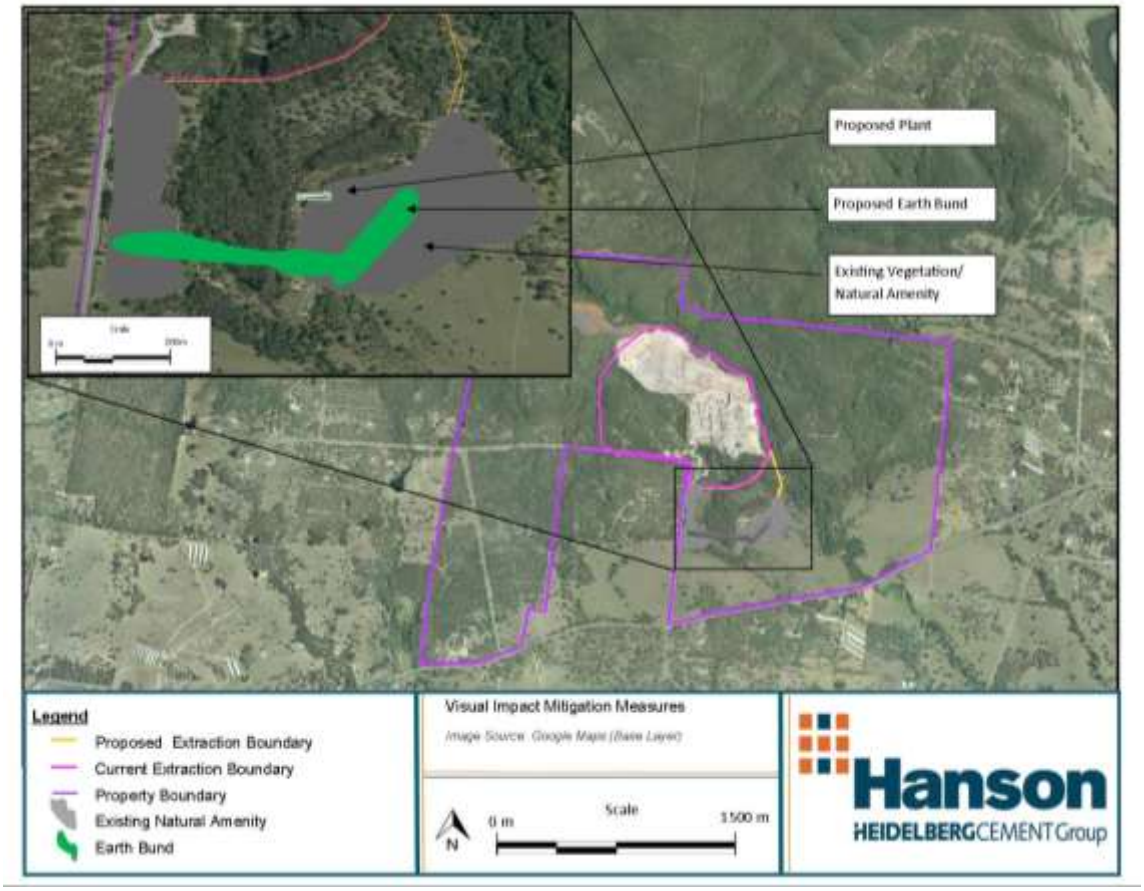

Figure 6.32: Visual Impact Bund

5.14.3 Methodology

The visual impact of the Project was assessed using a two part Visual Impact Assessment approach, including mitigation measures to ameliorate any potential visual impacts of Project. The assessment methodology firstly assesses the existing landscape settings from various viewing platforms, and secondly awards a visual impact score. Twelve (12) viewing receptors were selected based on a variety of environmental physical landscape variables, including but not limited to, vegetation height, vegetation position and density, terrain, gradient, viewing corridors and land use. Visual impact was quantified as the product of visual sensitivity and visual effect. The visual impact assessment is documented in full in **Appendix 15**.

Figure 6.33: Primary Visual Catchment

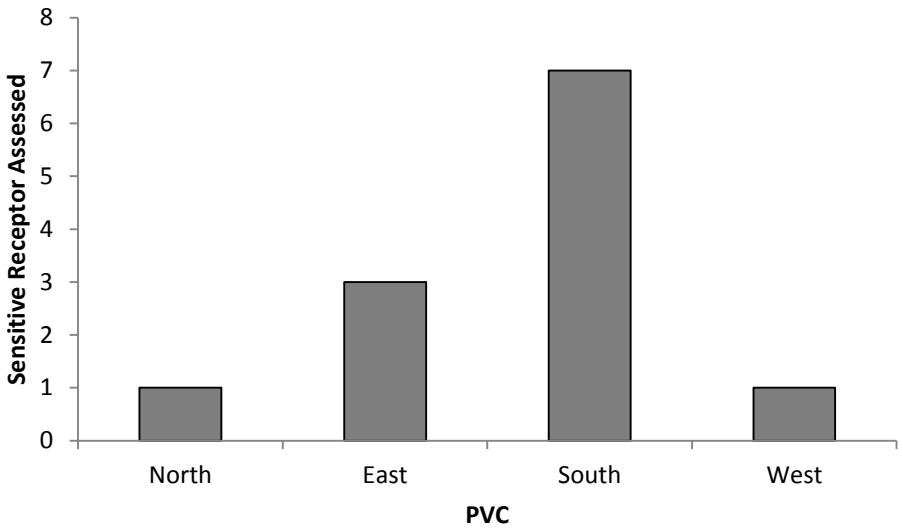

Figure 6.34: Sensitive Receptor Representation

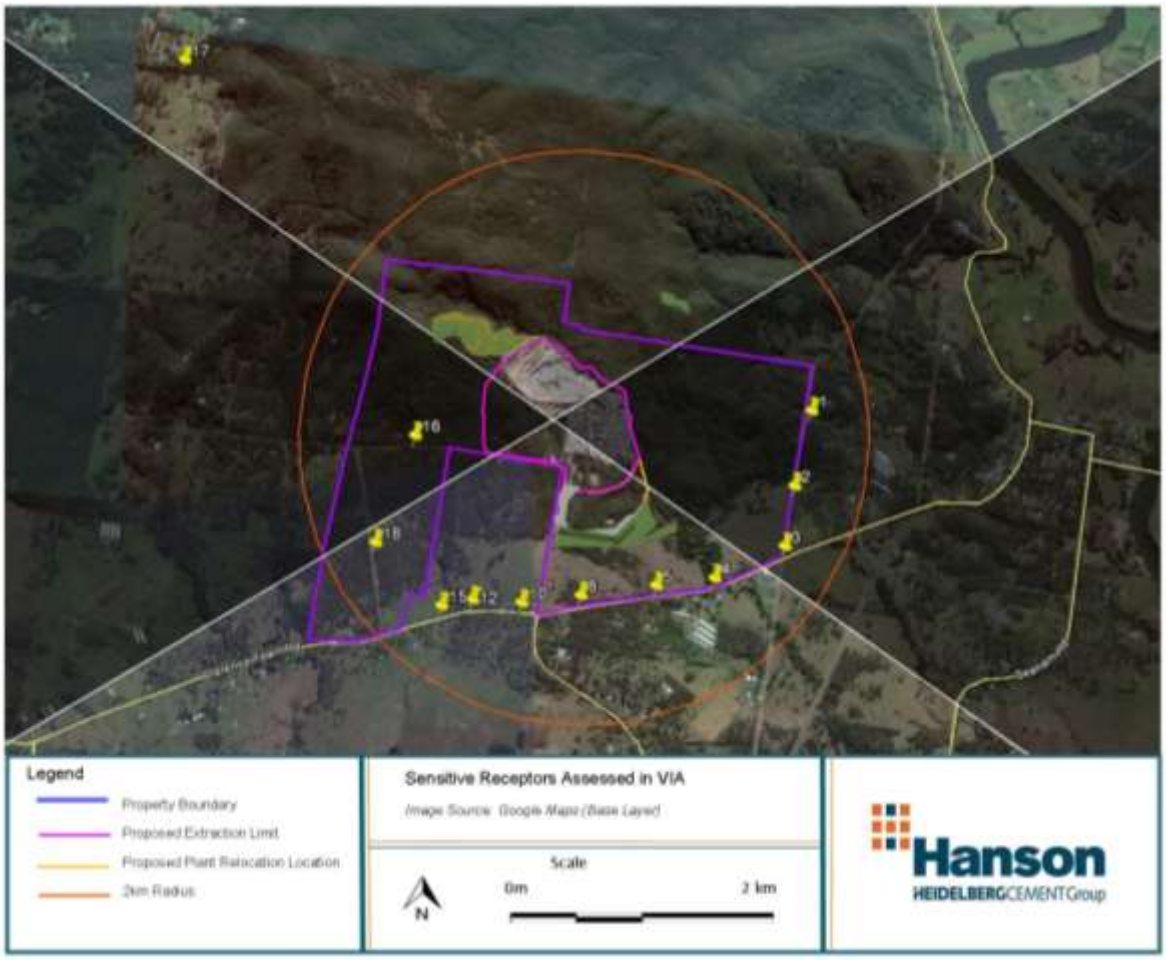

Figure 6.35: Sensitive Receptors Assessed in VIA

5.14.4 Findings

The impact of the proposed project will have very low, low, or moderate visual impact on viewing platforms. No views to the Project were classified as high visual impact due to a combination of existing topography and vegetation screens. Mitigation measures will significantly reduce visual harm, and where possible Hanson will commit to the maintenance of the existing vegetative buffer.

Table 5.14:1: Summary of Visual Impact

Sector	Receptor	Calculated Visual Impact Score	Overall Sector Visual Impact Score
Northern	17	Very Low	Very Low
Eastern	1	Very Low	Low
	2	Low	

	3	Low	
Southern	4	Low	Low/Moderate
	5	Moderate	
	8	Low	
	10	Moderate	
	12	Moderate	
	15	Moderate	
	18	Low	
Western	16	Moderate	Moderate
Overall			Low

5.14.5 Mitigation measures

Hanson proposes to construct an 18m high earth bund using overburden won from pit extension. A bund is considered the most effective way of shielding views to the project as well as assisting in the minimising other potential environmental impacts (i.e. noise and air). The bund is included in the visual impact assessment, and will shield views of the Project from sensitive receptors in the eastern and southern viewing sectors. The bund will be vegetated in accordance with the surrounding natural landscape. Additionally Hanson is committed to maintaining the site's existing vegetative buffer (outside of the disturbance area) and replace/replant dead plants where possible.

Figure 6.36: Bund Location (Stage 5)

Conclusion

The Project will have minimal impact on the existing local visual amenity. Where moderate visual impact has been detected in visual assessment modelling, mitigation measures will be applied to buffer sensitive receptors and the project area.

5.15 Hazards

5.15.1 Background

Requirements under the SEARS

Paying particular attention to public safety, including bushfires.

Supplementary Information

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Hazardous and Offensive Development Application Guidelines - Applying SEPP 33

Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis

Hanson Construction Materials Pty Ltd has prepared a Hazard Impact Assessment for the Project which is provided in **Appendix 16** and is summarised below.

An assessment has also been made of whether the Project should be considered a hazardous or potentially hazardous industry under State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33).

5.15.2 Existing Environment

Hazardous materials are defined within DP&E ***Hazardous and Offensive Development Application Guidelines Applying SEPP 33*** (2011), as substances falling within the classification of the Australian Code for Transportation of Dangerous Goods by Road and Rail (Dangerous Goods Code). As detailed in **Table 5.15:1** below, it is apparent that all materials on site are stored in accordance with relevant standards.

Table 5.15:1: Hazardous material storage at Brandy Hill Quarry

Material	Australian Dangerous Goods Class	Description	Storage Quantity	Storage Location	SEPP 33 Trigger
Diesel Fuel	Class 3, C1	Combustible liquids: flashpoint above 61°C but not exceeding 150°C	55 000L	Above ground tank	Diesel would not be stored with other Class 3 materials. Therefore *SEPP 33 does not apply*.
Lubricating and hydraulic oils and grease	Class 3, C2	Combustible liquids flashpoint above 150°C	10 000kg	Workshop Area	Lubricating and hydraulic oils and grease would not be stored with other Class 3 materials. *SEPP 33 does not apply*.
Precoat Supa 30	Class 3, C1		50,000L	On ground tanks	Precoat Supa 30 would not be stored with other Class 3 materials. *SEPP 33 does not apply.*
Industrial grade oxygen	2.2	Non-flammable, non-toxic gases: gases which are	70m3	Workshop Area - G & E size	Not considered to be potentially hazardous with respect to off-site risk.

		neither flammable nor poisonous whether compressed or cryogenic.		cylinders	
Industrial grade acetylene	2.1	Flammable gases (gases which ignite on contact with an ignition source).	50m3	Workshop Area - G & E size cylinders	Quantity below the threshold of 500 kg. SEPP 33 does not apply.
LPG	2.1	Flammable gases (gases which ignite on contact with an ignition source).	50kg	Workshop Area	Quantity below the threshold of 10 tonnes. *SEPP 33 does not apply*.
Unleaded Petrol	Class 3, PGII	Flammable liquids: flashpoint of less than 23° C and boiling point above 35° C.	40L	Workshop Area	Quantity below the threshold of 5 tonnes. *SEPP 33 does not apply.*

5.15.3 Methodology

The hazard analysis emphasises preventing or minimising major hazardous incidents on-site, such as fire and explosion or the release of significant quantities of toxic or biologically harmful chemicals that could result in significant off-site effects.

Suitability of the site to accommodate existing or proposed development of a potentially hazardous nature has been based on consideration of:

- the nature and quantities of hazardous materials stored and processed on the site;
- the type of plant and equipment in use;
- the adequacy of proposed technical, operational and organisational safeguards;
- the surrounding land uses or likely future land uses; and
- the interactions of these factors.

This information is incorporated into the Project's hazard analysis and provided in more detail in **Appendix 16**.

5.15.4 Impact Assessment

Data presented in **Table 5.15:1** indicates the Project presently stores and will continue to store and manage use of potentially hazardous materials so that an assessment under SEPP 33 is not required.

Transportation of Dangerous Goods and Hazardous Materials

In all cases, the transportation of dangerous goods and hazardous materials to the project site would be below the thresholds requiring assessment under SEPP 33. This indicates that risks associated with transport of dangerous goods and hazardous materials are insignificant.

Bushfires

The land is subject to bushfire risk as identified by bushfire mapping prepared by Port Stephens Council. Most of the existing quarry pit is not bushfire prone land, however the perimeter of the disturbed quarry areas are mapped as vegetation buffer -100m & 30m.

The nature of the proposed development will not increase or adversely impact on the potential or severity bushfires in the locality. The proposed development involves the clearing of land mapped as Vegetation Category 1. This will result in a reduction in bushfire fuel loads.

5.15.5 Mitigation and Conclusion

Bushfire prevention initiatives, in accordance with NSW Rural Fire Service Guidelines, are proposed as listed below. Bushfire prevention initiatives including:

vegetation maintenance;

maintenance asset protection zone;

- all quarry-related activities will be undertaken, where practicable, in cleared areas;
- all mobile equipment will be maintained in good working order with appropriate exhaust and fire suppression systems;
- all mobile equipment working in vegetated areas will be inspected to ensure that they do not pose a risk of starting a bushfire. This will include inspection of exhaust and electrical systems, including, in the case of vehicles using unleaded petrol, catalytic converters; and
- mobile equipment working in vegetated areas will not be left unattended with the engine running.

Bushfire Control:

- provision of access to strategic areas on the site;
- provision of water from the sedimentation ponds;
- stockpiling of cleared vegetation with a minimum 10m cleared buffer zone; and
- creating suitably located and cleared fire breaks.

Implementation of these measures will effectively reduce bush fire hazards throughout the life of the project.

5.16 Closure and Rehabilitation

5.16.1 Background

Requirements under the SEARS

- The proposed rehabilitation strategy for the site having regard to the key principles in the Strategic Framework for Mine Closure, including:
    - rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria;
    - nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and
    - the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.

Supplementary Information

Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)

Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)

Strategic Framework for Mine Closure (ANZMEC-MCA)

5.16.2 Existing Environment

Brandy Hill Quarry currently practices progressive rehabilitation on site. The project's rehabilitation would continue throughout the 30 year project life, as part of a planned program of activities to achieve an acceptable final land form.

5.16.3 Methodology

Key principles are identified within Strategic Framework for Mine Closure, prepared by the *Australian and New Zealand Minerals and Energy Council (ANZMEC) and Minerals Council of Australia (MCA) (ANZMEC/MCA, 2000), which this Project will observe.* Other relevant guidelines have been consulted, provided by the *DRE, ESG3: Mining Operations Plan (MOP) Guideline (DRE, 2013).* Although these documents more relevantly relate to closure and rehabilitation of mining projects, they do provide practical advice for establishing comprehensive and targeted rehabilitation objectives, performance criteria and measurable completion criteria for quarries as well.

The primary objective of a quarry rehabilitation plan is to address the key requirements of final land form design, revegetation, water drainage and the future sustainability of the site in respect to its ability to be used for other purposes. According to *Mine Rehabilitation- Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth of Australia):

> *"Rehabilitation is the process used to repair the impacts of mining on the environment. The long-term objectives of rehabilitation can vary from simply converting an area to a safe and stable condition, to restoring the pre-mining conditions as closely as possible to support the future sustainability of the site."*

There are a number of key considerations when developing a plan to satisfy this objective. These include:

- Safety;
- Legal requirements;
- Key physical constraints:
    - Climate,
    - Location and topography,
    - Size of the site,
    - Soils, and
    - Availability of water and drainage, and
- Community views.

Importantly the final land form must be stable and self-sustaining, or one where maintenance requirements are consistent with the agreed post-quarry land use.

> *"It should not be assumed that the objective of all rehabilitation is some form of natural ecosystem approximating what existed prior to mining" (Mine Rehabilitation-Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth of Australia) 2006:4)

Rehabilitation Objectives

The site's rehabilitation objectives are separated into short, medium and long term objectives, with short term objectives being centred on the stabilisation of the site which are no longer required for quarrying activities. This would involve:

Short Term Objectives

- Safety- Ensuring quarry pit benches are stable.
- Conservation of soil resources where possible, particularly top soil;
- Minimisation of exposed surfaces that are potential sources for windblown dust; and
- Erosion and sediment control.

Long Term Objectives

- Legal requirements and standards;
- Environmental and management requirements;
- Regeneration of indigenous vegetation and development of ecological habitat, to sustain/re-establish biodiversity;
- Decommissioning of plant, buildings and infrastructure;
- Stakeholder involvement and community expectations;
- Final land form; and
- Financial costing and provisioning

5.16.4 Impact Assessment

A quarry void with a base floor level 78 metres below sea level will be back filled with water from rainfall and any groundwater seepage. During the life of the quarry and site rehabilitation, changing circumstances may alter preferences for final land use(s). Community needs and expectations are a vital consideration in this regard. Government policies and guidelines recognise that this can be the case with most quarries and therefore provide flexibility to monitor and manage quarry rehabilitation accordingly throughout the quarry's life-cycle.

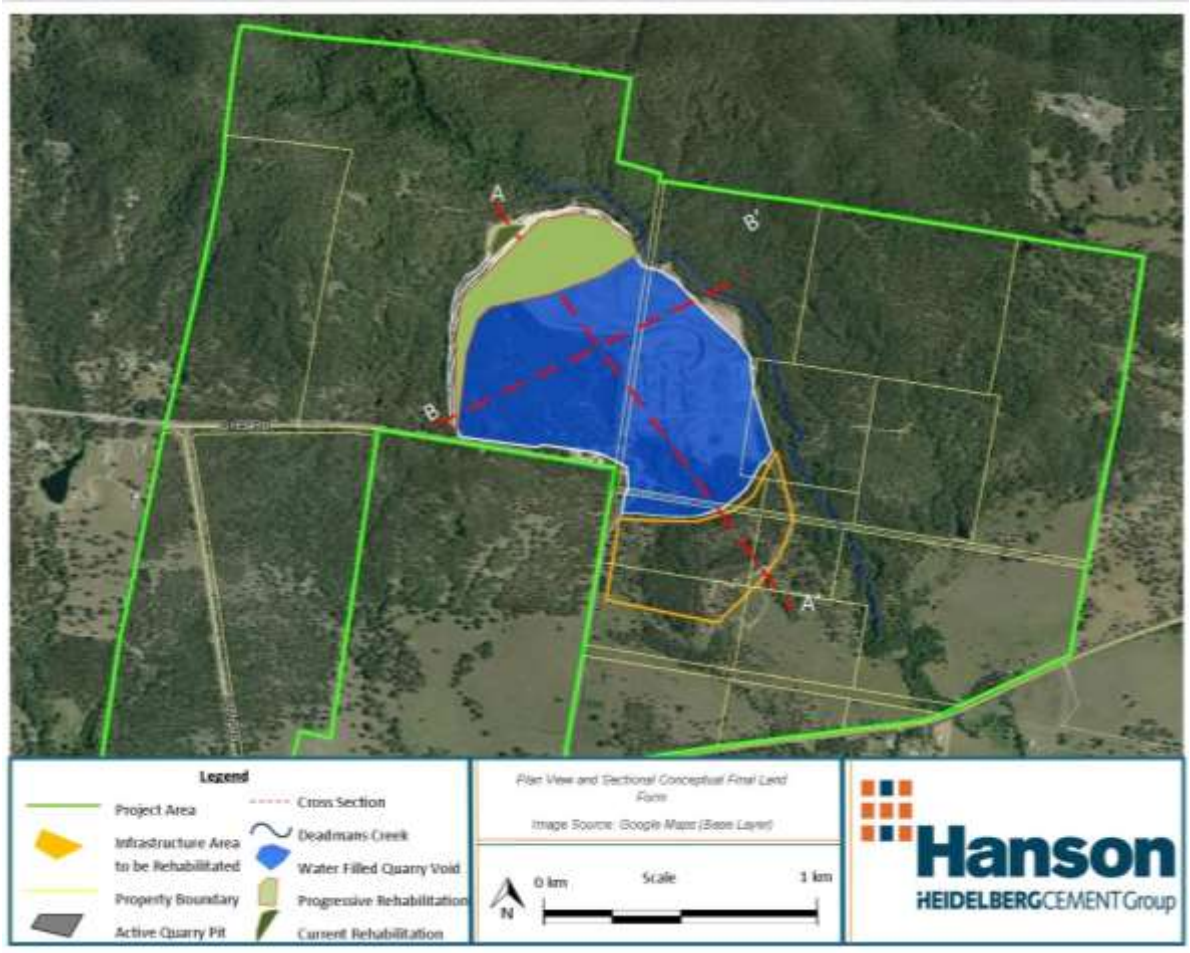

Figure 6.37: Plan view and sectional lines of the Conceptual Final Land Form.

Upon cessation of quarrying it is anticipated that the quarry void will have a top of bench at the lowest height of approximately 30m AHD where the void intersects the surrounding ground level on the southern side of the void. This is the area where the processing plant will be relocated during Stage 4 of the Project.

The upper benches above 30m AHD will be geotechnically stabilised and graded to ensure free drainage to the sides of the benches. The benches will then be covered with top soil and revegetated with local indigenous species suitable for a rocky ledge environment.

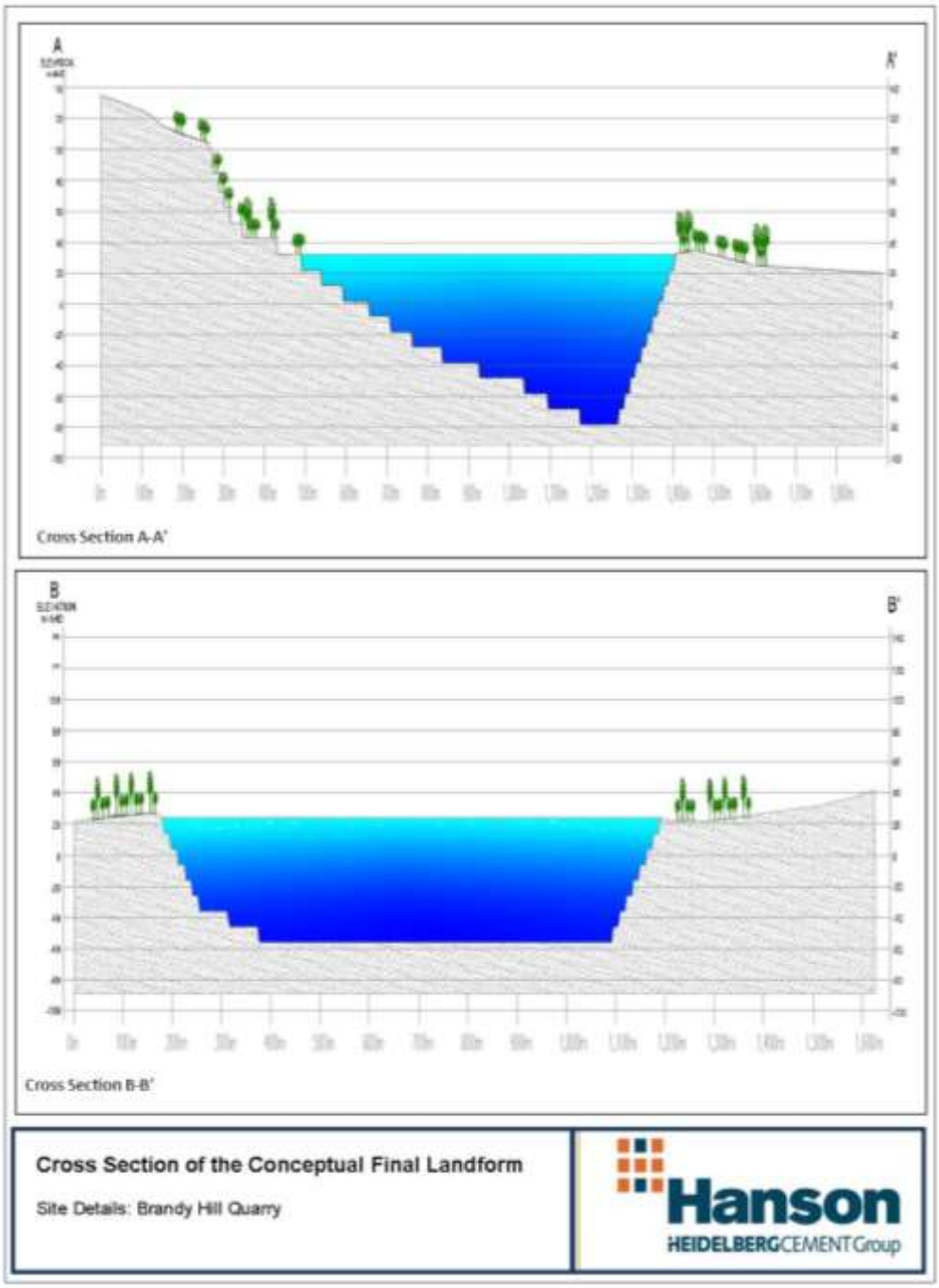

Figure 6.38: Cross Section of the Conceptual Final Landform

Rehabilitation Objectives

Table 5.16:1: Rehabilitation Objectives

Objectives	Completion Criteria	Performance Indicator	Monitoring Strategy
Short Term			
Safety	The stabilised benches do not pose a security or safety risk.	The terminal quarry pit and associated infrastructure area are y stable.	Geotechnical assessment of terminal benches on closure of quarry. Develop and carry out action plan based on findings and recommendations from geotechnical assessment. Conduct periodic geotechnical assessments adopting a risk management approach.
Conservation of soil resources	Rehabilitated areas should have adequate soil depth and quality to support revegetation.	Top soil has adequate nutrient levels to support revegetation.	Top soil from stripping should be stockpiled separately and securely and the location recorded by GPS and noted in the Rehabilitation Management Plan.
Minimisation of the areas of exposed surfaces that are potential sources for windblown dust	Rehabilitated areas to have surface areas stabilised and remain undisturbed.	Compliance with operational air quality compliance criteria.	Quarry Operation Air Quality Management Plan criteria, Controls and monitoring commitments to be implemented.
Erosion and sediment control	The rehabilitated area adequately manages erosion and sediment run-off.	Erosion is prevented from entering neighbouring land or receiving waters.	Quarry operational erosion controls as detailed in the Erosion and Sediment Control Plan.
Long Term			
Legal requirements and standards	All stakeholders to develop standards that are both acceptable and achievable. Agreed standards are to be adopted into the Rehabilitation and Landscape Management Plan.	Compliance with the Rehabilitation and landscape Management Plan.	Rehabilitation will be regularly reported on in the Project's Annual Review.
Environmental management requirements	Rehabilitated quarry should not present an ongoing environmental liability.	Rehabilitated quarry is consistent with the final landform approved in the project's Rehabilitation and landscape Management Plan.	Rehabilitation will be regularly reported on in the Project's Annual Review.
Decommissioning of plant, buildings and infrastructure	Demolition/removal of buildings no longer in use in accordance with Australian code of practice applicable at the time of quarry end of life.	Completed to the satisfaction of the regulating body i.e. Port Stephens Council and/or DP&E.	A demolition report will be prepared, consulting with relevant approval authorities.
	Maximise the recycling of building materials.	Buildings, plant, and structure materials are recycled and not disposed of in land-fill.	Demolition and decommissioning plan to detail how building materials will be

			recycled.
	Identification of contaminated sites for remediation.	Remediation of any contaminated land.	Clearance certificates.
	All internal roads, car parks, office structures, auxiliary structures, the processing plant and the concrete batching plant are removed.	Survey of infrastructure to be removed at the time of quarry closure.	Site assessment by a suitably qualified person.
Stakeholder involvement	Stakeholder identification, consultation, involvement and communication with the long term rehabilitation process and final land form.	Compliance with the Rehabilitation and Landscape Management Plan.	Included in the Community Consultative Committee meeting agenda.
Final land form planning	Conceptual Closure Plan for use during feasibility, development and detailed design;	Closure planning is required to ensure that closure is technically, economically and socially feasible.	The Closure Plan should be modified as a result of any operational change, new regulations or new technology, and should be comprehensively reviewed on a regular and pre-determined cycle (e.g. every 3 to 5 years). It should always remain flexible enough to cope with unexpected events. The Plan should include the management of social as well as environmental issues.
Financial costing and provisioning	A cost estimate for closure should be developed from the closure plan.	The relevance of closure costs for financial stewardship reporting purposes is recognised by the accounting profession.	Closure cost estimates should be reviewed regularly to reflect changing circumstances.
	Adequate securities should protect the community from closure liabilities.	Financial surety instruments.	Financial securities accounted for and reconciled annual through the Project's Annual Review.
Objectives	**Completion Criteria**	**Performance Indicator**	**Monitoring Strategy**
Short Term			
Safety	The stabilised benches don't pose a security or safety risk.	The terminal quarry pit and associated infrastructure area are stable.	Geotechnical assessment of terminal benches on closure of quarry. Develop and carry out action plan based on findings and recommendations from geotechnical assessment. Conduct periodic geotechnical assessments based on a risk assessment approach.
Conservation of soil resources	Rehabilitated areas should have adequate soil depth and quality to support revegetation.	Top soil has adequate nutrient levels to support revegetation.	Top soil from stripping should be stockpiled separately and securely and the location recorded by GPS and noted in the Rehabilitation Management Plan.

Minimisation of the areas of exposed surfaces that are potential sources for windblown dust	Rehabilitated areas to have surface areas stabilised and undisturbed.	Compliance with operational air quality compliance criteria.	Quarry Operation Air Quality Management Plan criteria, controls, and monitoring commitments to be implemented.
Erosion and sediment control	The rehabilitated area adequately manages erosion and sediment run-off.	Sediment is prevented from entering neighbouring land or receiving waters.	Quarry operational erosion controls as detailed in the Erosion and Sediment Control Plan in Section 3 of Appendix 13 of the EIS.
Long Term			
Legal requirements and standards	All stakeholders to develop standards that are both acceptable and achievable. Agreed standards are to be adopted into the Rehabilitation and Landscape Management Plan.	Compliance with the Rehabilitation and landscape Management Plan.	Rehabilitation will be regularly reported on in the Project's Annual Review.
Environmental management requirements	Rehabilitated quarry should not present an ongoing environmental liability.	Rehabilitated quarry is consistent with the final landform approved in the project's Rehabilitation and landscape Management Plan.	Rehabilitation will be regularly reported on in the Project's Annual Review.
Decommissioning of plant, buildings and infrastructure	Demolition/removal of buildings no longer in use in accordance with Australian code of practice applicable at the time of quarry end of life.	Completed to the satisfaction of the regulating body i.e. Port Stephens Council and/or DP&E.	A demolition report will be prepared conjunction with the relevant approval authorities.
	Maximise the recycling of building materials.	Buildings, plant, and structure materials are recycled and not disposed of in land-fill.	Demolition and decommissioning plan to detail how building materials will be recycled.
	Identification of contaminated sites for remediation.	Remediation of any contaminated land.	Clearance certificates.
	All internal roads, car parks, office structures, auxiliary structures, the processing plant and the concrete batching plant are removed.	Survey of infrastructure to be removed at the time of quarry closure.	Site assessment by a suitably qualified person.
Stakeholder involvement	Stakeholder identification, consultation, involvement and communication with the long term rehabilitation process and final land form.	Compliance with the Rehabilitation and Landscape Management Plan.	Included in the Community Consultative Committee meeting agenda.
Final land form planning	Conceptual Closure Plan for use during feasibility, development and detailed design.	Closure planning is required to ensure that closure is technically, economically and socially feasible.	The Closure Plan should be modified as a result of any operational change, new regulations or new technology, and should be comprehensively reviewed on a regular and pre-determined cycle (eg. every 3 to 5 years). It should always remain flexible enough to cope with unexpected events. The Plan should include the

			management of social as well as environmental issues.
Financial costing and provisioning	A cost estimate for closure should be developed from the closure plan.	The relevance of closure costs for financial stewardship reporting purposes is recognised by the accounting profession.	Closure cost estimates should be reviewed regularly to reflect changing circumstances.
	Adequate securities should protect the community from closure liabilities.	Financial surety instruments.	Financial securities accounted for and reconciled annual through the Project's Annual Review.

The rehabilitation of Brandy Hill Quarry will involve the following activities;

- Removal of buildings and structures in the infrastructure area;
- Removal of redundant roads and tracks;
- Erection of exclusion fencing;
- Revegetation;
- Weed management;
- Pest management; and
- Bushfire management.

5.16.5 Mitigation and Conclusion

There are no proposed mitigation measures for the Project's rehabilitation plan. Should the rehabilitation plan be adhered to, it is reasonable to expect that the Project's closure and rehabilitation will satisfy rehabilitation objectives, in conjunction with the Strategic Framework for Mine Closure, *Mine Rehabilitation- Leading Practice Sustainable Development Program for the Mining Industry*, and DRE's Mining Operations Plan.

SEAR Checklist

Section 6

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

6 Regulatory Checklist

The SEARS issued by the Department of Planning and Environment are required to be addressed in this EIS. A checklist has been prepared to direct the reader to where these issues have been addressed in this Environmental Impact Statement.

6.1 SEARS Checklist

Table 6.1:1: SEARs Checklist

SEAR Requirement	Located in EIS
Secretary/Director General Requirements	
Description of the Proposal need for the proposed development; alternatives considered; likely components and staging of the development including construction, operational stage/s and rehabilitation; plans of any proposed building works; and the likely interactions between the development and any other existing, approved or proposed extractive industry development in the vicinity of the site (such as the Martins Creek Quarry).	Section 1.1, Introduction Section 2, Description of Proposal
Relevant environmental planning instruments, including; • Identification and justification of any inconsistencies with these instruments.	Section 4, Planning Context
Risk Assessment of the potential environmental impacts of the development, identifying the key issues for further assessment.	Section 5.1, Environmental Risk Assessment
Detailed Assessment of key issues involving; • a description of the existing environment, using sufficient baseline data; • an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and • a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment.	Section 7.4, Key Environmental Issues
Statement of Commitments	Section 7 Statement of Commitments
Capital investment value calculation	Appendix 21
Estimation of job creation	Section 5.3, Socio-Economic Appendix 17
Certification validating information accuracy	Appendix 21
Key Issues	
Land resources including a detailed assessment of the potential impacts on: • soils and land capability; • landforms and topography, including rock formations, steep slopes, land slippage, etc;	Section 5.4, Land Resources,

• land use, including agricultural use; and • extractive material resources, including assessment of the size and quality of the resource and description of the methods used to assess the resource and its suitability for the intended applications.	Appendix 5 Appendix 6
Biodiversity including: • accurate estimates of proposed vegetation clearing and impacts on regionally significant remnant vegetation, or vegetation corridors; • a detailed assessment of potential impacts of the development on any terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities listed under State or Commonwealth threatened species legislation; • a detailed assessment of potential impacts of the development on any groundwater dependent ecosystems; and • a detailed description of the measures that would be implemented to avoid, reduce or mitigate impacts on biodiversity, including an appropriate biodiversity offset strategy.	Section 5.5, Biodiversity Appendix 7
• Traffic and Transport including: • accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for the transportation of quarry products, the public roads in the Dungog Shire, Maitland City and Port Stephens LGAs likely to be so used and the times during which those roads would be used; • an assessment of potential traffic impacts on the safety and efficiency of the road network; and • a detailed description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road networks in the surrounding area over the life of the development.	Section 5.6, Traffic and Transport Appendix 8
Noise including a quantitative assessment of potential: • construction, operational and off-site transport noise impacts; • reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and • monitoring and management measures, in particular real-time and attended noise monitoring.	Section 5.7, Noise and Vibration Appendix 9
Blasting including proposed hours, frequency, methods and impacts.	Section 5.8, Blast, Appendix 10
Air Quality including a quantitative assessment of potential: • construction and operational impacts, with a particular focus on dust emissions including PM2.5 and PM10; • dust generation from blasting and processing, as well as diesel emissions; • reasonable and feasible mitigation measures to minimise dust and diesel emissions, including evidence that there are no such measures available other than those proposed; and • monitoring and management measures, in particular real-time air quality monitoring.	Section 5.9 ,Air Quality, Appendix 11
Heritage including; • an Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must: - demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; - outline any proposed impact mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); • a historic heritage assessment (including archaeology) which must: - include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items; - outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures);	Section 5.10, Aboriginal and European Heritage Appendix 12
Water Resources • a detailed assessment of the potential impacts of the development on: - the quantity and quality of regional water supplies; - regional water supply infrastructure; and - affected licensed water users and basic landholder rights (including downstream water users); • a detailed site water balance, including 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; - an assessment of proposed water discharge quantities and quality/ies against receiving water quality and flow objectives; • identification of any licensing requirements or other approvals under the Water Act 1912 and/or Water Management Act 2000; • demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP); • a description of the measures proposed to ensure the development can operate in accordance	Section 5.11, Water Resources Appendix 13

with the requirements of any relevant WSP or water source embargo; and • a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;	
Waste including: • accurate estimates of the quantity and nature of the potential waste streams of the development; including any leachate and acid generating potential; • a waste disposal strategy, including any leachate; • details of the importation of materials onto the site; and • a description of measures that would be implemented to minimise production of other waste, and ensure that that waste is appropriately managed.	Section 5.12 Appendix 14
Greenhouse Gases a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions; a qualitative assessment of the potential impacts of these emissions on the environment; and an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency;	Section 5.13 Appendix 11
Visual including; • a detailed assessment of the: - changing landforms on site during the various stages of the development; and - potential visual impacts of the development on private landowners in the surrounding area as well as key vantage points in the public domain; • a detailed description of the measures that would be implemented to minimise the potential visual impacts of the development.	Section 5.14 Appendix 15
Hazards paying particular attention to public safety, including bushfires.	Section 5.15 Appendix 16
Social and Economic including: • an assessment of potential impacts on local and regional communities, including impacts on social amenity; • a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the development, including any infrastructure improvements, or contributions and/or voluntary planning agreement or similar mechanism; and • a detailed 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.	Section 5.3 Appendix 17
Rehabilitation including the proposed rehabilitation strategy for the site having regard to the key principles in the Strategic Framework for Mine Closure, including: • rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; • nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and • the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region.	Section 5.16 Appendix 18
Inclusion of relevant plans, architectural drawings, diagrams and relevant documentation required.	Noted
Consultation Consultation with relevant local, State and Commonwealth Government authorities, service providers, Aboriginal stakeholders, community groups and affected landowners. In particular you must consult with the: - Commonwealth Department of Environment - Office of Environment and Heritage (including the Heritage Branch); - Environment Protection Authority; - Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services; - Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, and Crown Lands division; - Roads and Maritime Services; - Hunter Local Land Services; - Dungog Shire Council; - Maitland City Council;	Section 3 Consultation

- Port Stephens Council; and
- Community groups including, but not limited to: Bolwarra Heights Community Group, Brandy Hill and Seaham Action Committee and the Voice of Wallalong and Woodville.

The EIS must:

- describe the consultation process used and demonstrate that effective consultation has occurred;
- describe the issues raised by public authorities, service providers, community groups and landowners;
- identify where the design of the development has been amended in response to issues raised; and
- otherwise demonstrate that issues raised have been appropriately addressed in the assessment.

6.2 Supporting Material

Table 6.2:1: Supporting Material

Environmental Assessment Topic	Policies, Guidelines and Plans
Risk Assessment	AS/NZS 4360:2004 Risk Management (Standards Australia) HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land Resources	Agricultural Impact Assessment Guidelines 2012 (DP&I) Agfact AC25: Agricultural Land Classification (NSW Agriculture) Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC) Agricultural Issues for Extractive Industries (NSW Department of Trade and Investment, Regional Infrastructure and Services) Soil and Landscape Issues in Environmental Impact Assessment (DLWC)
Biodiversity	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW 2009) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DECC 2004) Guidelines for Threatened Species Assessment (DoP 2005) BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW 2011) The Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007) NSW State Groundwater Dependent Ecosystem Policy (DLWC) Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries) State Environmental Planning Policy No. 44 – Koala Habitat Protection Principles for the Use of Biodiversity Offsets in NSW (OEH) Significant impact guidelines 1.1 – Matters of National Environmental Significance (Commonwealth Department of Environment 2013)
Traffic & Transport	Guide to Traffic Generating Development (RTA) Road Design Guide (RTA)

Noise and Blasting	NSW Industrial Noise Policy (DECC) Environmental Noise Management – Assessing Vibration: a technical guide 2006 (DEC) NSW Road Noise Policy 2011 (DECCW) Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC) Environmental Criteria for Road Traffic Noise (EPA)
Air Quality	Protection of the Environment Operations (Clean Air) Regulation 2002 Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2005 (DEC) Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC) Guidelines from the USEPA, the California EPA Office of Environmental Health and EPA Victoria relating to respirable crystalline silica
Heritage	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC 2005) The Burra Charter (The Australia ICOMOS charter for places of cultural significance) Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH) Code of Practice for Archaeological Investigations of Objects in New South Wales 2010 (OEH) Historic NSW Heritage Manual (NSW Heritage Office)
Water Resources	NSW Water Management Act 2000 National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ) National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ) National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC) National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC) Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC) State Water Management Outcomes Plan Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 NSW Government Water Quality and River Flow Objectives (DECC) Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC) Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries. Managing Urban Stormwater: Treatment Techniques (DECC) Managing Urban Stormwater: Source Control (DECC) Floodplain Development Manual (DIPNR) Floodplain Risk Management Guideline (DECC) A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

	Technical Guidelines: Bunding & Spill Management (DECC) Environmental Guidelines: Use of Effluent by Irrigation (DECC)
	NSW Water Management Act 2000 NSW Water Act 1912 Office of Water Guidelines for Controlled Activities (2012) National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC) NSW State Groundwater Policy Framework Document (DLWC, 1997) NSW State Groundwater Quality Protection Policy (DLWC, 1998) NSW State Groundwater Quantity Management Policy (DLWC, 1998) Guidelines for the Assessment & Management of Groundwater Contamination (DECC, 2007) Any relevant Water Sharing Plan for groundwater and surface water resources NSW Aquifer Interference Policy (2012)
Waste	Waste Classification Guidelines (EPA)
Greenhouse Gases	National Greenhouse Accounts Factors (Australian Department of Climate Change (DCC)) Guidelines for Energy Savings Action Plans (DEUS)
Hazards	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development Hazardous and Offensive Development Application Guidelines - Applying SEPP 33 Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
Socio-Economic	Draft Economic Evaluation in Environmental Impact Assessment (DoP) Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)
Rehabilitation	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia) Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia) Strategic Framework for Mine Closure (ANZMEC-MCA)

Statement of Commitments

Section 7

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

7 Statement of Commitments

This Statement of Commitments has been prepared to address Secretary's Environmental Assessment Requirement to prepare:

> **Requirements under the SEARS**
> A statement of commitments, outlining all the proposed environmental management and monitoring measures included in the EIS.

Following completion of the detailed studies which inform this EIS, Hanson has developed and composed an extensive **"Statement of Commitments"**. This document reflects Hanson's intent to carry out the Project to the highest environmental standards where reasonable and feasible. Should approval be granted to the Project under the EP&A Act, Hanson will commit to the following Project controls.

The Statement of Commitments will apply, unless otherwise approved by the Secretary of the Department of Planning and Environment (e.g. approval of a Management Plan).

7.1 Compliance with the Environmental Impact Statement

Project development will be compliant with the objectives set out in the Project EIS or the most current documentation approved/recognised by the Secretary (or their delegate).

7.2 Project Operation

7.2.1 Project Life

This EIS seeks a project life of 30 years. If the Project is approved for an additional 30 years, it will operate for a maximum period of 30 years from the date of commencement of operations as stipulated in the Project Approval. Rehabilitation upon quarry closure will be undertaken in conjunction with the Project rehabilitation management plan. Rehabilitation works may be undertaken outside of the 30 year operational approval period.

7.2.2 Production Limits and Concrete Sales

A maximum of 1.5M tonnes of hard rock will be transported from the quarry annually.

An on-site concrete plant will be capable of producing 15, 000m^3 per annum and able to receive up to 20, 000 tonnes per annum of concrete for recycling.

7.2.3 Hours of operation

The Project will operate in accordance with the hours stipulated in **Table 7.2:1** below;

Table 7.2:1: Proposed Operating Hours

Activity	Current Approvals		Proposed Major Project Consent	
	Day	Time	Day	Time
Construction works	N/A	N/A	Monday-Friday	5am-8pm
			Saturday	5am-5pm
			Sunday and Public Holidays	None
Blasting	Monday-Friday	8am-5pm	Monday-Friday	8am-5pm
	Saturday, Sunday and Public Holidays	None	Saturday, Sunday and Public Holidays	None
Load and Haul	Any day	24hrs	Monday-Saturday	5am-12am
			Sunday and Public Holidays	None
Primary Crusher	Any day	24hrs	Monday-Saturday	5am-1am
			Sunday and Public Holidays	None
Secondary and Tertiary Plant	Any day	24hrs	Any day	24hrs
Sales and dispatch	Any day	24hrs	Any day	24hrs
Maintenance	Any day	24hrs	Any day	24hrs

7.2.4 Extraction Boundary

The Project will remain within the extraction boundary identified in **Figure 3** of this EIS, which is an area of 78.5ha, and a maximum depth of RL -78 (AHD). These boundaries will be mapped using digital software and made available to both site management and regional management. If stipulated by the Secretary, the approved extraction area will be clearly and permanently marked with survey posts by a registered surveyor.

7.2.5 Licences

All relevant licences and approvals will be obtained and maintained throughout the project's life.

7.2.6 Demolition

Hanson shall ensure that all demolition work is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.

7.2.7 Consultation

The development will provide contact details for a Hanson employee, with whom complaints can be lodged.

The site will transition the currently formed informal Community Consultative Committee to a formal Committee.

The Company will publish Project Updates on the Company website to keep the wider community informed regarding matters agreed and reviewed by the formal Committee, as required.

7.3 Environmental Management, Monitoring and Reporting

7.3.1 Environmental Management Strategy

Within six months of receiving project approval for the proposed Project or the surrender of existing consent (whichever comes sooner), Hanson will produce an Environmental Management Strategy to be submitted to the Secretary and implemented on site at the time of its completion. This will incorporate environmental monitoring and management initiatives outlined in the Project's EIS.

7.3.2 Annual Review

Hanson will produce an annual review detailing rehabilitation, monitoring results, complaints register, instances of non-compliance, trends in the monitoring data and proposed environmental improvement performance initiatives for the past calendar year. Hanson will provide a copy of this document to the Department of Planning and Environment and make it available to other government agencies, community groups and the general public.

7.3.3 Audit

The Project will be compliant with EP&A auditing requirements for the Project.

7.4 Key Issues

7.4.1 Ecology

Hanson will implement the following mitigation measures to ameliorate potential adverse Project impacts on site ecology. These are outlined subsequently;

- Biodiversity Management Plan including;
- Vegetation Management Plan detailing;
    - continuous weed removal;
    - progressive rehabilitation effort in conjunction with the Project's Rehabilitation Impact Assessment. All rehabilitation works will be documented on site and will commence as soon as practical after incurred disturbance;
    - restoration initiatives; and
    - ongoing management of remnant/retained vegetation within the site.

- Threatened Species Management Plan
    - Developed with attention given to threatened species on site, particularly the koala *Phascolarctos cinereus,* which is listed by the Commonwealth EPBC Act as a threatened/endangered (?) species.
    - Endangered Ecological Communities
        - Spotted Gum-Ironbark Forest
        - Hunter Lowland Redgum Forest
        - Swamp Sclerophyll Forest on Coastal Floodplains

- Pre-clearance surveys by a suitably qualified and experienced ecologist or biodiversity/fauna officer of the proposed disturbance area prior to vegetation clearance, to identify the presence of any threatened species, with particular attention given to the koala. If a koala or other threatened species are identified, operations will not commence/cease and appropriate regional koala authorities or regional animal care groups will be contacted and the safe removal and relocation of the koala(s) or other species conducted.
- Vegetation to be cleared will be marked prior to removal unless constantly supervised by quarry management or project management personnel to ensure compliance with extraction boundaries.
- An appropriate Biodiversity Offset Strategy is to be implemented for the Project to mitigate for project impacts that cannot otherwise be managed. The strategy is outlined in **Section 5.5** and subject to approval by the Department of Planning and Environment.

7.4.2 Aboriginal and European Heritage

Hanson will commit to recommendations outlined in the Archaeological Report (**Section 5.10 Appendix 12)**; these are replicated below:

- **Discovery of unanticipated Aboriginal Objects:** Should any Aboriginal objects be encountered during works associated with the Project, works will cease in the vicinity and the find will not be moved until assessed by a qualified archaeologist.
- **Discovery of Aboriginal Ancestral Remains:** Works will immediately cease if suspected human remains are discovered. The NSW Police Force and OEH's Environmental Line (131 555) will be contacted as soon as practical and provided with details and location of the remains. Work will not re-commence in this location unless authorised in writing by OEH and clearance provided by the Police, if required. If skeletal remains are deemed to be of Aboriginal origin, a representative of the local Aboriginal Community and the DECCW are to be contacted.
- **Continued consultation with registered Aboriginal stakeholders:** Key relevant Aboriginal stakeholders will be informed of any unanticipated discoveries for the life of the Project.
- **Lodgement of the final report:** Information on how to access the final report will be sent to the:
    - OEH Hunter Central Coast Region
    - Worimi LALC
    - Nur-Run-Gee Pty Ltd
    - Gomeroi Namoi

- If required, Hanson will prepare an Aboriginal Cultural Heritage Management Plan (ACHMP) for the development, which will detail the findings and management initiatives from the EIS Heritage Impact Assessment (**Appendix 12**).

Should archaeological deposits or sites be identified during the Project's life, salvage of features, retrieval of information through excavation or collection and interpretation will be investigated.

7.4.3 Traffic and Access

The site will maintain compliance with all requirements of Port Stephens Council and NSW Roads and Maritime Services (RMS) for the life of the Project.

The operator (Hanson) will aim to limit truck movements to day-time operating periods except when a Project customer specify night-time deliveries, or if Hanson is required to deliver outside daytime operating times to meet Company demands (i.e. delivery of materials to other Company concrete plants).

The operator will operate a Driver Code of Conduct for the life of the Project. If required a Traffic Management Plan will also be implemented for the Project.

7.4.4 Noise and Blast

- All site operations will endeavour to remain within noise criteria limits for the life of the Project. These will be stipulated in the Project Approval.
- In the event of non-compliance, any exceedance will be mapped and recorded. Exceedances and their management will be published in the site's Annual Report.
- Real time and attended noise monitoring will be applied at sensitive receptors as stipulated in the Noise and Blast Impact Assessment **(Attachment 9 & Attachment 10).** Unless otherwise agreed with the Secretary DP&E, quarterly Noise Monitoring will be conducted.
- The project will remain within the acceptable limit of applicable Traffic Noise Criteria.

7.4.5 Air Quality

The site will maintain existing dust suppression and control measures including:

- routine water application to major unsealed site haul roads and unsealed surfaces;
- water spraying of stockpiles and stockpile transfer points;
- minimisation of work during times of high winds and in areas with high potential for dust dispersion; and
- utilisation of a sealed driveway from the weighbridge to Clarence Town Road to minimise dust dispersion off-site.

The site operator will implement the following measures;

- housing of crushers and screens in the plant relocation and upgrade (occurring in stage 4);
- implementation of an Air Quality Management Plan;
- full and partial enclosure of screens and conveyors where possible;

- maintenance of a high standard of repair and servicing for all trucks associated with the quarry;
- creation of an earth bund as identified in **Figure 5.2** to minimise dust dispersion off-site;
- minimise the amount of exposed surfaces and stockpiles, as much as possible;
- revegetation of any bunding or exposed areas to minimise erosion in these locations; and
- maintenance of on-site haul roads.

The site will implement a monitoring and/or management plan for the life of the project.

7.4.6 Surface Water and Groundwater

The site will maintain the following existing water management practices:

- monitoring of groundwater bores with continuous readings taken daily and extracted approximately every 6 months and reported upon in the site's Annual Review. Readings will include depth and temperature;
- maintenance of the condition of existing settlement dams;
- water discharge compliance with Environmental Protection Licence (EPL) conditions; and
- maintenance of closed water system management.

The site will engage in the following additional water management practices:

- Application of a revised or new EPL, following Project approval;
- Obtain any required Water Access Licences;
- Monitor potential drawdown at nearby boreholes and the development of measures to address loss of bore yield, if any;
- installation of new settlement dams as required throughout the life of the Project; and
- implementation of relevant Water Management Plan/s.

A site water management plan and/or monitoring program will be prepared and implemented for the life of the Project.

7.4.7 Greenhouse Gas and Energy

In order to reduce the Project's greenhouse gas emissions, Hanson will commit to the following on site initiatives:

- continued documentation and evaluation of energy use of the Project;
- appropriately sized, high efficiency motors will be used on all pumps, crushers & equipment;
- variable speed drives (VSDs) will be provided on electric motors in order to ensure energy savings and to deal with the results of varying loads on equipment;
- timer switches will be applied where possible to relevant electrical appliances and sensor lights installed where possible to reduce energy use;
- vehicle sourcing will consider fuel economy and energy use;
- minimisation of vehicle idling time by ensuring vehicles are turned off during breaks in their use;

- regular servicing of vehicles and equipment including optimising fuel economy for vehicles and maximum energy efficiency for other site equipment; and
- driver training to ensure all vehicles and machinery is operated at maximum efficiency; and;
- use of alternative fuels when feasible and available.

7.4.8 Hazards

Storage and use of hazardous materials

- The site will maintain compliance with objectives under State Environmental Planning Policy 33 – Hazardous and Offensive Development (SEPP 33) including the storage of hazardous chemicals or other materials.
- The Project will maintain sufficient bushfire controls including;
    - an asset protection zone of 10m will be established around all built structures within the Infrastructure Area, including areas where hydrocarbons may be stored, and the Site Access Road; and
    - trees and shrubs will be maintained in such a manner that the vegetation is not continuous, taking into account the requirement for an effective visual screen, and grass will be maintained..
- Ignition Sources that are Company-controlled will be managed in accordance with internal procedures and policies and requirements of the Rural Fire Service. The following is a list of potential ignition sources and associated mitigation commitments.
    - Mobile Equipment.
    - All Quarry-related activities will be undertaken, where practicable, in cleared areas.
    - All mobile equipment will be maintained in good working order with appropriate exhaust and fire suppression systems.
    - All mobile equipment working in vegetated areas will be inspected to ensure that they do not pose a risk of starting a bushfire. This will include inspection of exhaust and electrical systems, including, in the case of vehicles using unleaded petrol, catalytic converters.
    - Mobile equipment working in vegetated areas will not be left unattended with the engine running.
    - Quarry dams may be used in the event of a local or regional bushfire.
    - Perimeter roads will be maintained to ensure safe access around the site.

7.4.9 Rehabilitation and Closure

- The Project will engage in progressive rehabilitation as soon as practical after disturbance.
- Rehabilitation will utilise species identified in the rehabilitation management plan **(Appendix 18**).
- A closure plan will be developed if necessary prior to the cessation of quarrying activities.
- Organic top-soils will be stripped and stockpiled for rehabilitation and landscaping uses.
- A rehabilitation plan will be prepared for the project, outlining the proposed rehabilitation for the project, with the flexibility to be adapted or altered as required.

7.4.10 Geotechnical

- Rock Excavation: Quarry pit slopes will be maintained in accordance with geotechnical report submitted with the Project EIS and updated over the life of the quarry where adjustments are advised.
- Benches: Benches will be graded to ensure stormwater, seepage, and groundwater are drained off the bench towards the on-site water collection points (i.e. settlement dams).
- If batter slopes exhibit failure signs then all excavations will cease in the affected area and a geotechnical engineer will be consulted to determine the appropriate course of action.
- Batter slopes will be constructed in accordance with site geotechnical modelling.

7.4.11 Contamination

The site has undergone a contamination assessment to address SEPP 55 requirements **(Appendix 6**). This report identified several contamination risks associated with the Project. Hanson will commit to the following practices to address these potential contamination concerns:

- Prior to any demolition or works being undertaken on the site, an accredited asbestos consultant will be engaged to conduct a formal site audit to;
    - determine if there is any asbestos (and the precise location/extent of asbestos) in accordance with Australian Standard 4964 – "*Method For the Qualitative Identification of Asbestos in Bulk Samples*", and
    - Where appropriate, this assessment will focus on maintenance, the storage shed and office.
- Regular visual inspections will be undertaken to assess the state of pesticide storage and heavy metal storage on site to ensure compliance with hazardous materials storage management as outlined in **Section 5.15.**
- Drums, containers and intermediate bulk containers (IBCs) will be visually inspected regularly by site personnel, to ensure storage devices are in a safe and suitable condition. Structural assessments will be conducted as and when required.
- Above ground storage tanks (AST) will be maintained in a safe and suitable condition and visually inspected regularly by site personnel. Structural assessments will be conducted as and when required.

7.4.12 Sediment and Erosion Control Measures

Sediment and erosion will be managed in accordance with the following:

- Regeneration/replanting of exposed areas as soon as practical following exposure to enhance soil stability and eliminate run off:
- Installation of erosion/sediment diversion bunds if required; and
- Application of sedimentation dams to collect "dirty water" on site, allow sediment to settle and then release "clean" water to EPA standards at the EPL approved site.

7.4.13 Wastewater/Effluent Disposal

Wastewater will be managed in accordance with the mitigation measures detailed in the Wastewater Impact Assessment.

The site's effluent disposal system is being upgraded to meet EPA standards. The upgrade will comply with Port Stephens Council's On-Site Sewage Management Requirements. The effluent and wastewater management system will be updated during plant relocation in stage four. Any additional upgrades stipulated by the EPA or Council will be adhered to.

7.4.14 Social and Economic

Hanson intends to formalise the existing informal Brandy Hill Community Consultative Committee, if stipulated by the DP&E (see **Appendix 17**).

The Company will advertise new positions generated by Project expansion on the Company Website, and to promote local employment, new jobs will be advertised to local Brandy Hill residents and residents of the surrounding region.

Conclusion and Justification

Section 8

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

8 Conclusion and Justification

8.1 Planning and Project Overview

The Project Proposal is to extract more than 500,000 tonnes of material per year and to access greater than 5M tonnes of reserves. Therefore the development meets the criteria listed by clause 7 (1)(a) and (b), Schedule 1, State Environmental Planning Policy (State and Regional Development) 2011 for assessment as a 'state significant development' (SSD), under section 89C (2) of the *Environmental Planning and Assessment Act 1979* (the EP&A Act).

The Planning Minister has the power to determine all SSD projects under section 89D of the EP&A Act. However, the Minister is able to delegate authority to the Planning Assessment Commission (PAC) and the Department of Planning and Environment (DoPE), to grant consent to SSD project applications lodged by private developers.

This Environmental Impact Statement has been prepared to satisfy the requirements of Section 78A, EP&A Act. This EIS outlines the process undertaken to identify all potential environmental impacts of the Project. All identified issues have been addressed within this document. A list of the Secretary's Environmental Assessment Requirements (SEARs), is provided in **Appendix 1**. A table has been compiled in **Section 6** to provide an index for where, within this document, each SEAR has been addressed.

The primary objective of the Project is to extend the life of the current Brandy Hill Quarry by expanding the currently approved quarry footprint and by increasing the quarry's annual production limit. This will enable Hanson's Brandy Hill Quarry to provide construction materials for local, regional and state significant development.

The proposal will involve increasing production from the currently approved 700,000 tonnes per annum (tpa) to 1,500,000 tpa and also extending the approved extraction area to facilitate this increase. To accommodate the proposed increase in production limit, the Project will involve the relocation and upgrade of processing equipment. The Project is additionally seeking approval to install a concrete batching plant at BHQ. The concrete batching plant would be capable of producing up to 15,000m^3 of pre mixed concrete annually. Hanson is also seeking permission to receive up to 20,000 tonnes of waste concrete annually to be recycled on site.

The Project is additionally assessed as a bilateral agreement under the Environment Protection and Biodiversity Conservation Act.

8.2 Environmental Impact Overview

This Environmental Impact Statement provides a comprehensive assessment of environmental impacts pertinent to the Project, which have been identified through a detailed process involving;

- Site assessment.
- Consultation with government agencies, local community members, and the Aboriginal community.
- Technological assessments conducted by the Proponent and expert consultants.

Key issues have been detailed in the Project's SEARs, which guided the environmental assessment process. Comprehensive technical assessments were conducted for each key issue and the results are detailed in **Section 5.1** and **Section 7.4** of this EIS.

Particular consideration was given to minimising both social and environmental impacts during the scoping stage and in the final Project design. Additionally, to reduce social and environmental impacts the Project has:

- maximised use of existing, approved disturbance areas;
- refined the project area to reduce clearance and maximise distance to sensitive receptors; and
- proposed reasonable control measures to maximise on-site containment of potential pollutants.

Applying an assessment procedure with the aim of avoiding, minimising and managing project generated impacts, has revealed that that the Project is expected to proceed without significant, detrimental environmental and social impacts on the locality and its population and more broadly, the region.

8.3 Site Suitability

The site is located on Clarence Town Road and is 3.5 km east of Seaham, 15km north east of Maitland and 30km north of Newcastle, within the Port Stephens Shire. The surrounding area is predominately zoned as rural landscape and primary production is limited. The proposed extraction area sits wholly within the RU2 Rural Landscape zone, and can be utilised for extractive industries with consent, per the Port Stephens Local Environmental Plan 2013.

Quarry activities have been undertaken for more than 30 years on the site, on the following lots;

- 1 DP 47313,
- 101 DP 712886, and
- 56 DP 752487.

During its 30 year operating life, Brandy Hill Quarry has developed comprehensive quarry operations consisting of extracting, and processing construction materials utilised in the local, regional and State construction industries. The site is well placed on regional and state road networks to ensure direct and continued supply of construction materials primarily to Newcastle and surrounding regional markets. Geological assessments revealed that an excess of 78 million tonnes of hard rock is available for extraction. A complete land-resources assessment is in **Appendix 6**, with further details of environmental issues provided in **Section 5.0**, which states that the site is suitable for the proposed activity and that environmental impacts generated by the proposal can be effectively minimised through targeted management initiatives.

8.4 Benefits of the Proposal

The prime benefit of the proposal is securing the ongoing supply of construction materials for local, regional and state markets. This will enable regional development and support the Port Stephens Planning Strategy and the Hunter Regional Plan. The Project is well-located geographically to supply materials to identified growth areas in the Hunter region.

The Project has an estimated expansion cost of approximately $22.5M over five broad project stages. Ongoing operational and employee expenditure will inject further economic benefits into the local and regional economies for the life of the Project. Additional immediate benefits of the proposal include maintaining and generating approximately 31 employment positions to service the Project. Flow-on benefits initiated by the Project include the creation of further employment in the construction industry.

Expanding the current quarry by maximising the quarry operating life delays the need to develop a Greenfield site and consequently reduces environmental impacts and potential social impacts. The quarry is located close to regional and state road networks which promote efficient transport and delivery of construction materials, reducing transport impacts on the local road network.

8.5 Regional and State Planning

The Project is consistent with applicable regional and state planning instruments. The supply of construction materials is a necessary and integral component in enabling the Hunter region and the Port Stephens area to meet their development objectives as outlined in these strategic planning documents:

- Port Stephens Local Environment Plan, 2013,
- Hunter Regional Strategy 2016,
- Lower Hunter Regional Conservation Plan, 2009
- Port Stephens Economic Development Strategy, 2007
- Port Stephens Planning Strategy 2011 – 2036, 2011, and
- Port Stephens Futures Strategy, 2009.

8.5.1 Environmental Planning and Assessment Act 1979

The EP&A Act promotes ecologically sustainable development within the state of NSW. As the Project is identified as State Significant Development, approval is required from the Minister for Planning (or delegate), and as such the Minister needs to be satisfied that the Project is consistent with the principles of ecologically sustainable development. Therefore this section assesses the applicability of the precautionary principle, inter-generational equity, conservation of biological diversity, and valuation of pricing resources to the Project.

Schedule 2 of the EP&A Regulation (2000) states;

"the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development …"

The principles of ecologically sustainable development dictate that future generations should not inherent an environment of a lesser quality than that inherited by the current generation. The Environmental Impact Statement for Brandy Hill Quarry comprehensively assesses each principle in an overarching theme. These are further elaborated upon in **Sections 8.5.1.1 – 8.5.1.4.**

8.5.1.1 *Precautionary Principle*

Under Schedule 2 Clause 7 (4)(a) of the Environmental Planning and Assessment Regulation (2000) defines the precautionary principle as;

> ***"…** if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
> *(ii) an assessment of the risk-weighted consequences of various options"*

Relevance to EIS

This EIS has been composed with technical expertise to achieve a high level of scientific certainty surrounding key potential impacts of the Project. The Environmental Impact Assessment process applies best practice engineering and scientific modelling to predict potential impacts. Findings from these technical environmental assessments shape management initiatives that avoid, where possible, irreversible damage to the environment.

Specifically, the Proponent has adopted the following practices to promote awareness and understanding of potential Project-generated environmental impacts:

1. Stakeholder consultation, to enable a fluid exchange between government bodies, community members, other stakeholders and Hanson. This process identified potential environmental concerns and guided the technical assessment process.
2. Hanson has an existing environmental policy to ensure both existing and proposed quarry operations are conducted according to best practice principles, thereby mitigating and reducing environmental degradation.
3. Technical assessments were undertaken using the best available methodology and technology at the time of EIS preparation. Scientific uncertainty has been identified in each assessment and limitations associated with the findings have been documented.
4. Technical assessments adopt a worst-case-scenario approach where uncertainty in the data exists to effectively manage ambiguity in the available data and ensure possible scenarios that may affect the environment can be managed.
5. Hanson will continue the Company's internal and external auditing of quarry safety and performance to verify the quarry is operating at a high competence level and maintaining compliance with environmental standards and legislative obligations.

8.5.1.2 *Inter-generational Equity*

Schedule 2, Clause 7(4)(b) of the Environmental Planning and Assessment Regulation (2000) defines inter-generational equity as;

> *"that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations".*

Inter-generational equity is the concept that humans hold the earth's resources in common with members of both past and future generations. The concept dictates that we, the current

generation, have inherited the earth from our predecessors. With this we have an obligation to pass the earth on in the same or in an improved state to future generations.

Relevance to EIS

For this project inter-generational equity involves the difficult task of effectively utilising the quarry products to meet the needs of the community in the present whilst managing potential and/or predicted environmental impacts. To prevent intergeneration harm, Hanson has commissioned experts to assess and identify impacts to enable effective and targeted mitigation measures. Specifically Hanson has addressed rehabilitation objectives to ensure the site is left available for future generations.

The Environmental Assessment (**Section 5**) concludes that the Project can proceed without imposing a significantly detrimental environmental, economic or social impact on the locality or the region. Mitigation measures have been applied to minimise potential adverse impacts and thereby secure resource availability for the future.

Specifically, the Project is committed to promoting inter-generational equity, by:

- minimising the quarry footprint/disturbance area;
- developing a biodiversity offset strategy to mitigate impacts of clearance on threatened species and ecological communities; and
- preparing a rehabilitation strategy to ensure that the site is returned to acceptable pre-project environmental standards.

8.5.1.3 *Conservation of Biological Diversity and Ecological Integrity*

Schedule 2 Clause 7(4) of the Environmental Planning and Assessment Act defines conservation of biological diversity and ecological integrity as;

> *"Conservation of biological diversity and ecological integrity namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration"*

Biological diversity and ecological integrity are quantified through genetic diversity in species, populations, communities and ecosystems and interconnections between these. Biological diversity and ecological integrity promote ecosystem functioning and ecosystem services including soil fertility, water purification and pollination.

Relevance to EIS

All predicted ecosystem impacts associated with the Project have been documented in **Section 5.5** and further detail provided in **Appendix 7**. The Project design has excluded Deadman's Creek from the disturbance/clearance area to minimise impact on this waterway. Conservation of natural water sources is integral to the maintenance of ecological diversity as such areas promote ecological interactions necessary to the maintenance of biological diversity.

Additionally Hanson will mitigate impacts by preparing a Biodiversity Offset Strategy. Mitigation measures outlined in the Biodiversity Assessment Report (BAR) (**Appendix 7**), aim to promote ecosystem function and conserve threatened species and endangered

ecological communities through the management of habitat within the Project area. The offset strategy will further promote this aim.

8.5.1.4 *Valuation and Pricing of Resources*

Schedule 2, Clause 7(4)(d) of the Environmental Planning and Assessment Regulation (2000) defines inter-generational equity as:

> *"Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:*
>
> *I. polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
>
> *II. the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste*
>
> *III. environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems"*

Improved valuation identifies the need to determine an appropriate value for environmental assets and services. It is difficult to implement a standard method for applying pricing to environmental resources as the natural world is intricately interconnected and the value of environmental services is still being discovered. This principle aims to accurately apply economic value to the environment to reflect its level of ecological value, and to ultimately promote conservation.

This principle states that the polluter should pay based on the level or amount of harm to the environment, and the polluter is responsible for returning the environment to its previous condition.

Relevance to EIS

The Project has conducted a detailed assessment of potential impacts associated with the Project. To mitigate potential impacts, Hanson has compiled a Statement of Commitments for the Project, which outline Hanson's intention of avoiding/minimising detrimental environmental impacts. Hanson has opted to invest in the quarry's expansion so the Project minimises environmental impact by adopting efficient extraction of minerals through engineering, appropriate equipment, and extraction planning. Specifically conveyor enclosures, dust suppression initiatives and environmental monitoring equipment are included in the Project design to minimise environmental impact.

Project design and mitigation measures aim to minimise potential environmental, economic and social impacts, particularly on existing waterways, groundwater and the local community, thereby avoiding the need to attribute an economic cost under this principle; as impacts will be effectively mitigated. A Rehabilitation Management Plan has been prepared to ensure the site can be used for post quarry purposes consistent with community and government requirements.

Matters of National Environment Significance (MNES)

Hanson has conducted a detailed assessment, in conjunction with Biosis Pty Ltd, of MNES in accordance with the EPBC Act. Species Impact Statements included in the BAR conclude that potential impacts can be adequately mitigated through proposed management measures for the life of the project.

8.6 Conclusion

The Project will provide construction materials for a 30 year project life, enabling necessary and planned local, regional and state development. This will have significant economic benefits to the local economy through job security and the creation of direct and indirect employment. This environmental impact statement has thoroughly assessed the potential environmental impacts associated with the Project and identified proposed mitigation measures to minimise detrimental environmental impacts. Hanson has also submitted a Statement of Commitments (**Section 7**) to outline the Company's commitment to environmental management for the life of the project.

Overall the Project is integral to providing construction materials to enable the development of infrastructure to support anthropogenic growth, in line with regional and state development plans, whilst mitigating potential negative environmental outcomes through effective management initiatives. It is considered that the Project has conducted an adequate assessment of relevant environmental concerns, and has proposed acceptable environmental management initiatives to mitigate potential impacts and ensure the Project exhibits environmentally sustainable development.

References

Section 9

Brandy Hill Quarry Expansion Project

Environmental Impact Statement

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